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The Incidence of and Payoff to Employer Training: A Review of the Literature with Recommendations for Policy

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The Incidence of and Payoff to Employer Training: A Review of the Literature with Recommendations for Policy

Abstract
[Excerpt] The theory of on-the-job training predicts that workers should pay the full costs of training that is useful at other firms. In fact, however, workers receiving training are not paid less than other similar workers and new hires who require extra training are paid only slightly less than new hires who require less than average amounts of training. Many employers offer workers the opportunity to learn general skills such as word processing and other computer applications programs on company time. Studies of the costs and benefits of apprenticeship training programs find that employers do not recoup their investment during the apprenticeship contract. Clearly, employers are sharing the costs of general training.

Keywords
benefit, school, education, work, jobs, training, occupation, labor, cost, force, market. recommendation, payoff, German, Japanese, American

Comments

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The Incidence of and Payoff to Employer Training: A Review of the Literature with Recommendations for Policy

John Bishop

Working Paper 94–17

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The Incidence of and Payoff to Employer Training: A Review of the Literature with Recommendations for Policy

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Highlights of
The Incidence and Payoff to Employer Training:
A Review of the Literature with Recommendations for Policy

1. Employers are sharing the costs of general training and under provision results

The theory of on-the-job training predicts that workers should pay the full costs of training that is useful at other firms. In fact, however, workers receiving training are not paid less than other similar workers and new hires who require extra training are paid only slightly less than new hires who require less than average amounts of training. Many employers offer workers the opportunity to learn general skills such as word processing and other computer applications programs on company time. Studies of the costs and benefits of apprenticeship training programs find that employers do not recoup their investment during the apprenticeship contract. Clearly, employers are sharing the costs of general training.

The theory also predicts that those who get general training will reap all of its benefits in the form of higher wage rates regardless of whether there is subsequent turnover. In fact, however, training that employers report is general raises productivity as much more than it raises wage rates, implying that employers share in the benefits of the training. Why do employers often share the costs of general training? Five reasons follow:

(a) Federal regulations require that workers be paid while engaged in employer provided training that improves productivity in their current job. This prevents the cost sharing arrangements predicted by theory,

(b) Network externalities—Problem solving techniques and computer applications programs are new modes of communication within the firm. Network externalities are created so it is highly desirable for everyone to develop the skill. This will not occur without requiring participation in training and that in turn means that training must occur on company time even when the skill (e.g. use of a spread sheet program) is general.

(c) Workers are liquidity constrained. Unlike their employers, they are unable to borrow to finance investments in general training. As a result, their employers take over some of the responsibility of financing general training.

(d) General skills are poorly signaled to the labor market. As a result, workers who did a particularly good job of developing new skills on a job will not receive wage increases commensurate with their higher productivity at another firm.

(e) Worker risk aversion results in employment contracts which adjust wages only partially with differentials in productivity between workers. Workers who screw up do not suffer the full costs of their mistake and those who make outstanding contributions do not receive 100 percent of the benefits they generate. Training investments are

risky and employers are better informed about which skills will raise a worker's productivity (in part because they control the work environment which determines whether a skill yields productivity improvements) and are better able to bear the risks of making a mistake.

If employers are paying some of the costs of general training they are not doing it for altruistic reasons. They are comparing the training costs incurred to the expected productivity benefits the firm will receive from the workers who stay at the firm. Benefits received by other employers and by the trainee will have zero weight in their calculation. **Thus, turnover causes the firm to take only a portion of the true social benefits of general training into account. The result is under investment in training.**

Policy lesson: Workers and firms under invest in employer sponsored training. Employer provided training produces externalities in many of the same ways that schooling does. Furthermore, the tax system—specifically the non-deductibility of non-work time devoted to training and progressive tax rates—discourages investments in training. Nevertheless, employer provided training receives no subsidy and government regulations often act as barriers to such investment. Mechanisms for stimulating improvements in the quality and quantity of the training sponsored by employers are needed.

2. Training sponsored or paid for by employers is more effective than school provided training initiated by adult incumbent workers.

While training provided by employers or funded by them have substantial effects on worker wages, adults (people over age 25) who initiate occupational training without sponsorship of their employer do not benefit from such training.

Policy Lesson: This implies that efforts to stimulate incumbent worker training should focus on inducing employers to provide or sponsor more of it. If there are to be public subsidies of incumbent worker training, they should be funneled through firms not schools!

Policy initiatives designed to increase the number of adults who initiate and pay for school-provided occupational training would be a mistake. Examples of policy initiatives which research reviewed in sections 2 and 3 indicates would not benefit trainees or improve competitiveness are:

* lower tuition charges for education and training programs targeted on adults
* making more adults eligible for Pell grant aid or guaranteed student loans
* allowing adults to use IRA savings to pay tuition costs of retraining
* offering training vouchers to displaced workers, welfare recipients or other JTPA eligibles
* allowing deductions or tax credits for tuition charges paid for self-initiated training

Public subsidies of occupational training received at educational institutions are already substantial. Additional subsidies for incumbent workers initiating such training on their own are not needed.

3. Substantial payoffs to occupational training of youth

Occupational training of youth in high schools and community colleges and vocational-technical institutes does raise earnings particularly of women.

Policy lessons: Public subsidies of school-based occupationally specific education of youth should continue. Training programs sponsored by schools should focus on youth not adults.

4. Payoffs to JTPA financed on-the-job training

On-the-job training subsidized by the government has a somewhat more spotty record. Programs which arrange and subsidize OJT for disadvantaged workers raise the wages of adults who participate, but appear to lower the wages of youth (under age 22) who participate. On the other hand, analysis of a very small sample of JTPA trainees in the NFIB data suggests that stigma may be biasing these evaluations and that firms that hire JTPA trainees may be getting better employees than expected and paying them lower wages than is typical for the job.

Policy lessons: We need to continue to look for ways to make JTPA more effective.

5. Restructured work environments tend to be more training intensive.

Modernization and training appear to be complementary—i.e. training is often critical to the implementation of new technology or a reorganization and, therefore, companies that are modernizing are more likely to be investing heavily in training. However, this research does not imply that modernization is the only occasion where training is worthwhile. Most studies that have established that training raises wages and productivity have evaluated training incidents not occasioned by modernization or a TQM reorganization. Taken altogether the economic literature on the effects of training suggests that, as long as the company is initiating and paying for training, one can be pretty confident that most of these investments are profitable both for the worker and the firm.

6. Training is context specific.

Training has high average rates of return for both the firm and the worker. High levels of training are associated with high levels of organizational productivity. TAO successfully raise productivity, training must, however, be customized and adapted to the needs of the specific

work place. There are no standardized training packages that can enhance organizational productivity at all or even a large number of work places. While the typical training program yields very substantial benefits, some fail. Training is a risky investment. Very little rigorous research comparing different methods of training or comparing payoffs to training of different types has been conducted.

Policy lesson: If training is to remain effective, what is taught, who is to learn it and how it is to be delivered must be decided locally (by the employer and her employees), not by government or trade associations. If there is to be any subsidy of employer training, incentives for efficiency and effectiveness must be kept in place by requiring that employers and workers pay most of the costs of training and receive most or all the benefits. So little is known about which types of training are most effective, any government efforts to promote training should be general rather than targeted on specific purposes or modes of training.

7. The Centrality of Informal Training and Learning by Doing

The great bulk of skill development results from learning by doing and informal training. Formal and informal training together account for only about 30 percent of the growth of a worker's productivity during the first two years on a job (Bishop 1991). Learning by doing accounts for the rest. For new hires, nine-tenths of the time they spend in training is spent watching others do the job or being shown it by coworkers and supervisors. Only one-tenth involves participation in formal training programs.

The productivity effects of training are substantial. Rates of return on the investment appear to be high both for the firm and the worker. The hours devoted to informal training have just as large an effect on productivity growth as hours devoted to formal training.
Time devoted to training has a positive effect on wage growth, but these effects are substantially smaller than the productivity effects of training, suggesting that the labor market views many of the skills developed as effectively specific to the firm. Hours devoted to formal training have larger effects on wage growth than hours and/or generates skills that are more useful at other firms.

Policy Lesson: Policy and research should focus on broad issues like on-the-job learning and enhancing organizational productivity not on one little piece of the puzzle-formal training. Policies that induce firms to formalize training and learning that is already successfully accomplished by informal means would be a mistake.

8. Promising Policy Options

The policy options that appear to have promise are:

1) End regulatory barriers which prevent workers from voluntarily participating in training programs developing general skills that are useful on one's current job during uncompensated time. Workers, unions and firms should have the option of arranging to share the costs of training programs. Federal regulations compel employers to pay all of the costs of training in skills useful on both one's current job and jobs at other firms, and as a result most companies provide little of such training.
2) Improve training practice by funding a systematic program of research on employer-provided training including randomized field trials of alternative ways of delivering training.
3) Pursue policies designed to lower turnover such as improved signals of competencies developed in school and on previous jobs.
4) Expand and improve systems of certifying skill development.
5) Establish industry-based systems for publicly recognizing excellence in training.
6) Partially guaranteed loans to firms for training with Sallie Mae organizing a secondary market for them.
7) State run partial subsidies of customized training necessary to restructure work or improve organizational productivity.
8) Subsidize a firm's training expenditures above a threshold percentage of payroll that rises with firm size and turnover.

The first seven of these policy options are low in cost and either in operation or currently under development in some states or some industries. Consequently, they do not appear to be very controversial and are, therefore, good candidates for a federal initiative to stimulate incumbent worker training. With the exception of the research initiative which might discover something of truly great significance, impacts on aggregate training investment are likely to be modest during this century. Even though the benefit-cost ratios of each initiative are almost certainly very high, federal investment in stimulating training is so low one cannot legitimately expect competitiveness and real wage growth to be perceptibly affected. In my judgement, only option #8, the Marginal Training Subsidy, has the potential of having an immediate and large impact on training investment by employers. Once in place, some form of it would be likely to become a permanent part of the tax code. Its cost is larger and more uncertain, however, and it is likely to generate considerable controversy if it is proposed.

A number of other policy options were examined and were found to be either ineffective, difficult to administer, distorting, or politically infeasible. Exemptions of jobs with high training content from the minimum wage would be difficult to administer, not very effective in stimulating training and politically difficult to sell. Making workers who are undergoing a significant amount of general on-the-job training eligible for low-interest guaranteed student loans would be extremely difficult to administer and have minimal effects because firms not workers decide when training is to occur. An outcome based subsidy of on-the-job training

which prepares workers for occupations experiencing a shortage of skilled workers is rejected because of doubts about the government's ability to pick occupations that are truly in shortage and to close down the subsidy when the shortage disappears. Ways of improving the structure of a training mandate are suggested, but even the improved mandate is more distorting and less effective than a tax credit for training above a high threshold. If a training mandate were implemented in the U.S., it would be unlikely to survive a change of administrations.

The Incidence and Payoff to Employer Training: A Review of the Literature

A growing number of commentators point to employer sponsored training as a critical determinant of competitiveness and standards of living. American employers and workers, it is charged, are failing to invest sufficient time and resources in on-the-job training (OJT) (Commission on the Skills of the American Workforce 1990). The Office of Technology Assessment (1990), for example, concluded:

> When measured by international standards, most American workers are not well trained. Many in smaller firms receive no formal training. Larger firms provide more formal training, but most of it is for professionals, technicians, managers, and executives. Our major foreign competitors place much greater emphasis on developing workforce skills at all levels .... Our major trading competitors provide more and better worker training (p. 3,4).

Training is an important issue, but hard to study. Government statistical agencies have only recently begun asking questions about it and there is, at present, no standardization of data collection procedures across countries. Most training is informal in character and hard to measure. Its effects on productivity are also difficult to quantify. An elegant theory has been developed that attempts to explain how the quantity of training is determined and who pays for and benefits from it. However, the absence of data on the key theoretical constructs of the theory—general training, specific training, informal training and productivity growth—means that the only predictions of the theory that have been tested relate to the effects of formal training and tenure (interpreted as a proxy for informal training) on wage growth and turnover. Until recently, definitive tests of the OJT theory were infeasible because the large number of unobservables means that any given phenomena had many alternative explanations (Garen, 1987).

Employers arrange for and pay for training because it raises productivity; not because it raises wages. Policy maker's interest in training derives primarily from its effect on productivity; not its effect on wages. The two effects are generally not the same. Consequently, this review

of the literature will pay closest attention to studies of the productivity effects of employer training. This paper is organized into the following 12 sections.

Part A—Literature Review

1. **THE INCIDENCE OF EMPLOYER TRAINING. Which firms provide the most training? Which individuals receive the most? What is the relative importance of formal had informal on-the-job training? How does the type of training vary across individuals and organizations? How much time is devoted to employer training?**

2. **THE EFFECTS OF TRAINING ON WORKER WAGES. Does the positive association between past training and wages reflect a causal effect of training on wages. Which has larger effects: on-the-job training or off job training; formal training sponsored by the firm or training initiated by the worker?**

3. **THE PAYOFF TO EMPLOYER TRAINING. What is the impact of different types of employer training on the productivity of individuals and work groups?**

4. **INTERNATIONAL COMPARISONS. Do Americans receive less training from employers than their counterparts overseas? If so, why are American workers less well trained and less skilled?**

5. **MARKET FAILURE IN THE PROVISION OF EMPLOYER TRAINING?**

6. **EMPLOYER FINANCING OF GENERAL TRAINING-- Evident: of under provision of general training.**

7. **WHY EMPLOYERS SHARE THE COSTS OF GENERAL SKILLS TRAINING.**

Part B—Policy Conclusions and Options

8. **COMPETENCE IN COMMUNICATION AND MATHEMATICS IS NOT SUFFICIENT. BASIC SKILLS CANNOT SUBSTITUTE FOR OCCUPATIONAL SKILLS.**

9. **IS OCCUPATIONALLY SPECIFIC TRAINING BECOMING LESS NECESSARY BECAUSE OF GROWING OCCUPATIONAL TURNOVER?**

10. **SCHOOL PROVIDED OCCUPATIONAL TRAINING. Is it a substitute or a complement for training on the job?**

11. **POLICY OPTIONS for stimulating an increase in the quantity and quality of employer training.**

12. **The TRAINING MANDATE OPTION**

13. **Options for SUBSIDIZING EMPLOYER TRAINING**

14. **SUMMARY OF POLICY OPTIONS**

I. The Incidence of Employer Provided Training?

Many household surveys now ask questions about formal training provided by employers, so a good deal is known about who receives formal training (Lillard and Tan 1986, Tan 1987, Tan et al 1991, Mincer and Higuchi 1988, Mincer 1989, Bartel & Sicherman 1993, Lynch 1992; Black and Garen 1989; Barron, Berger and Black 1993a, 1993b; Black, Berger and Barron 1993, Veum 1993) .

1.1 Who gets Formal Training?

Holding other worker characteristics constant, the likelihood and amount of formal training in a given year is higher for workers:

Job Characteristics

-- in high value added jobs where the individual has great responsibility

-- in cognitively complex jobs (e.g. professional, technical and managerial jobs)

-- in sales jobs for complicated, changing and customized products

-- who use expensive machinery on their job. The elasticity of response was .066 for training intensity and .081 for weeks to become fully trained and qualified (Bishop 1991).

-- in regular non-temporary jobs

-- in full time jobs (Bishop 1991, Barron, Berger and Black 1993) In a multi-variate model explaining variations in training intensity across jobs in the same broad occupational group, a 10 percent increase in hours worked per week is associated with a 7 percent increase in training time.[1] When, however, one compares two individuals doing the same job at the same firm, hours worked per week had no effect on training time. Both of these results suggest that the demand for training may be inelastic (Bishop 1991).

-- in jobs where the skills learned are not useful at many other firms in the community (Bishop 1991). This suggests that training intensity rises when firms have monopsonistic power in the local labor market.

Firm Characteristics

-- at larger establishments (Barron, Black and Lowenstein 1987, 1989; Bishop 1Q91, Haaber, Cordes and Barth 1988; Idson and Holtmann 1993)

-- at large unionized manufacturing establishments. Managers of large unionized establishments reported spending $1121 per worker (42.5 hours per year) on the training of bargaining unit employees or about 4.5 percent of annual earnings (Katz 1993)

-- at firms which have multiple establishments (Bishop 1991, Barron, Berger and Black 1993)

-- at companies employing flexible or high performance production systems (Kochan and Osterman 1991, MacDuffie and Kochan 1993, Katz 1993).

--in industries or firms experiencing rapid technological progress and rapid output growth (Lillard and Tan 1986, Tan 1987, Tan et al 1991, Mincer and Higuchi 1988, Mincer 1989, Bartel & Sicherman 1993)[2]

-- in firms which have not experienced a competitive crisis in the last decade. Large unionized firms that have experienced a crisis perceive a greater need to increase training but currently invest about 20 percent less per worker than comparable firms that have not experienced a crisis (Katz 1993).

-- in industries which have established industry standardized and certified training

-- at firms that have long probationary periods for new hires (Bishop 1991).

-- at firms where firing an employee is reported to be difficult once the probationary period is over (Bishop 1991).

-- in industries with low unemployment rates (Bartel and Sicherman 1994). Training appears to increase when demand for an industry's product is strong and capacity utilization is high.

-- located in areas of low unemployment. (One study found that young people received less training when unemployment was high and older workers received more training.) Another study found that firms saying it was "hard to find reliable unskilled workers" provided 24 percent more training to its typical new hire than firms that reported no problem finding reliable an skilled workers (Bishop 1991). The findings regarding the effect of the unemployment rate suggest that new hire training is procyclical.

-- located in metropolitan areas

-- located outside the South

Worker Characteristics

-- with many years of education—in particular workers who have completed high school or college

-- who scored well on tests assessing verbal, mathematical and technical competence when they were in school and who have been out of school for many years. For people aged 24 to 33, the impact of a population standard deviation increase in all subtests, increased the incidence of company training by about 36 percent, holding schooling, experience, tenure and firm size constant. (Bartel and Sichermen 1993). For workers who have just left school, there is no such relationship (Bishop and Kang 1988, Parsons 1991).

-- with vocational training that is relevant to their current job (Bishop 1991)

-- who are recently hired (it declines with age and tenure on the job)

-- who are expected to have low rates of turnover

-- who are male (Lynch 1992, Veum 1993, Barron Berger and Black 1993)

-- who are married (Lynch 1992, Mincer 1989)

-- who are white (Lynch 1992, Veum 1993, Barron, Berger and Black 1993)

Receipt of training is positively correlated with the social class of one's parents but the correlation is much weaker than the correlation between years of schooling and parental social class.

1.2 Estimates of the Amount of Formal On-the-Job Training from Household Surveys

Only a minority of workers report that they have participated in formal company training programs. When the Current Population Survey asked "Did you need specific skills or training to obtain your current job?", 55.4 (55.8) percent reported in 1983 (1991) that they had needed qualifying training. Schools were cited as the source of qualifying training by 29.5 percent of respondents in 1983 and by 32.1 percent in 1991. Informal OJT was the next most common form of qualifying training—cited by 27.9 percent in 19983 and 27.1 percent in 1991 (Bowers and Swaim 1992). Formal company training was the least common form of qualifying training, but its incidence has grown—from 9.6 percent in 1983 to 12.1 percent in 1991.

Respondents were also asked, "Since you obtained your present job, did you take any training to improve your skills?" The proportion responding affirmatively grew from 36.4 percent in 1983 to 41.7 percent in 1991. The incidence of formal company training rose from 12.0 percent to 16.8 percent and informal OJT rose from 15.2 percent to 16.2 percent. Proportions saying they had received skill improvement training at a school rose from 12.1 to 13.1 percent (Bowers and Swaim 1992).

Lynch (1992) reports that in a three year period shortly after completing school, only 4 percent of 16 to 25 year olds received formal on-the-job training lasting more than four weeks. When the definition of formal company training is broadened to include spells of less than four weeks. 21.3 percent of 21 to 29 years olds in 1986 received formal company training in the next five years, 1.5 percent took apprenticeship training and 11 percent went to one or more seminars outside of work. Those receiving formal company training spent an average of 180 hours being trained during the five-year period and those attending seminars devoted 64 hours

to it. When the hours devoted to all three forms of training are summed and averaged over the entire NLSY population, the estimates of time devoted to formal company training were 3 hours per year for high school drop outs, 19 hrs/yr. for college graduates and 12 hrs/yr. overall (Veum 1993a).

For women 42 to 57 in 1979, 24.4 percent participated in one or more company training programs during the next ten years. Those who did get company training averaged 176 hours of it. Time devoted to formal company training thus averaged 4.3 hours a year for the Mature Women's cohort of the National Longitudinal Survey (BLS 1993b).

Thus, assuming a 2000-hour standard working year, **formal on-the-job training accounts on average for only 0.6 percent of the potential working time of young adults and 0.2 percent of the potential working time of mature women.** Is this the full extent of investment in improved skills on the job? NO, it is not.

Formal OJT accounts for only a small part of on-the-job learning. Simple introspection tells us that most learning about one's job comes from watching others do it, from day to day supervision, from asking questions and from getting help when needed. Note, this is not just :earning by doing. Time that might otherwise have been used to produce something is being devoted, instead, to learning how to do the job better. Economists refer to these activities as informal on-the-job training. When, however, one asks workers about "training", they do not think in these terms. The January 1983 CPS, for example, asked "Since you obtained your present job, did you take training to improve your skills." The problem with this question is that one does not take informal training. As one might anticipate, this question results in a significant under estimate of the extent of informal training; only 42 percent of the respondents reported they had "taken" any skill upgrading training and about 40 percent of this training was reported to be informal. This means that the questions about training in the CPS, the SIPP, the NLS and High School and Beyond fail to pick up much of the informal OTT that workers receive. Consequently, studies using these data are looking at only one species of tree, not at the whole forest. If we are to really understand how learning on the job occurs both for individuals and for organizations, it will be necessary to change the way we ask questions about training in the CPS and other surveys.[3]

There are, however, two surveys which have taken a different approach. The surveys focused on a randomly selected new hire at randomly selected firms. Detailed questions about training were asked and they were asked of **employers** not employees. Let us examine the findings of studies based on these data.

1.3 Estimates of On-the-Job Training of New Hires based on Employer Surveys

The first survey of this type was the EOPP Employer Survey sponsored by the National Center for Research in Vocational Education. Firms hiring low wage workers were over sampled. The Gallup Organization conducted the phone interviews between February and June 1982. The employers were asked to select "the last new employee your company hired prior to August 1981 regardless of whether that person is still employed by your company." The study examined 2594 employers who had hired someone in the time frame requested. Seventy percent of the establishments had fewer than 50 employees, and only 12 percent had more than 200 employees. Most respondents were, thus, owners or managers of small firms who were quite familiar with the performance of each of the firm's employees. If the primary respondent was unable to answer questions about the training received by a specific newly hired worker, that part of the interview was completed by talking to a supervisor or someone else with line responsibility.

For that new hire, the employer was asked to estimate how much time was "spent" in the first three months on four different kinds of training activities: (1) "formal training such as self-paced learning programs or training done by specialized training personnel", (2) "training activities in which he or she is watching others do the job rather than doing it himself", (3) "total number of hours management and line supervisors spent away from other activities giving informal individualized training or extra supervision", and (4) total number of hours co-workers who are not supervisors spent away from their normal work giving informal individualized training or extra supervision." For this sample of firms and jobs, the means for the typical worker during the first three months on the job were: 10.7 hours for formal training programs, 47.3 hours watching others do the job, 51 hours for informal training by management and 24.2 hours for informal training by co-workers. Of the 520 hours available during the first three months on the job, 133 hours was spent in some form of training (Bishop 1991).

In 1992 the Small Business Administration funded the University of Kentucky's Survey Research Center to replicate the EOPP survey on a national stratified random sample of employers. Similarly worded questions were asked about the time devoted to training during the first three months on the job of the last worker hired prior to May 1992. The means for the training questions were 18.6 hours for formal training, 58.8 hours for informal training by managers, 33.9 hours for informal training by coworkers and 41.1 hours for informal training by watching others. The SBA results imply that, of the 520 hours available in the first three

months on the job, 152 hours were devoted to some form of training (Black, Berger and Barron 1993).

Estimates of the incidence and the time devoted to skill upgrading training derived from the EOPP and SBA surveys are, as expected, much higher than those generated by surveys asking workers about training "taken." In part this is because, employers report about 22 percent more time devoted to training than employees asked the same question (Barron, Berger and Black 1994). The primary reason for the higher estimate of training is the greater care in defining the activities that are to be counted as training. Estimates of time devoted to formal training from the NLS and CPS surveys are consistent with estimates coming from the EOPP and SBA employer surveys. The difference is in the estimates of time devoted to informal training. According to EOPP and SBA surveys, new hires spend most of their training time either watching others do the job or being shown the job by supervisors and coworkers. Formal training provided by specialized training personnel accounts for somewhere between 8 and 12 percent of the time new hires are engaged in training activities.

These results also cast doubt on the usefulness of surveys of training directors. Training directors are able to describe the formal training programs offered by their company but are typically not aware of the full extent of the on-the-job training that occurs continuously on the shop floor. It also implies that international comparisons of training cannot focus on the training that is managed by corporate training departments. Probabilities of responding are no doubt related to the resources allocated to the training department, so one gets a biased picture of the extent of formal training in the full population of firms. Training departments are typically larger in big American corporations than in Japanese corporations. In Japan corporate training budgets are quite small—0.5 percent of the wage bill in firms with more than 5000 employees and 0.1 percent in firms with 30-99 employees (Dore and Sato 1989). The massive investments that Japanese firms make in cross training and employee rotation do not appear in these budgets.

How Training Varies with Occupation

The impact of occupation on the amount of on-the-job training typically received by a new employee is examined in table 1. The first four rows of the table describe the average number of hours devoted to four distinct training activities during the first 3 months after being hired. The distribution of training activities is similar across occupations. The amount of training rises with job complexity.

The fifth row of the table merges the information on time devoted to particular types of training into a single overall estimate of investment in training during the first 3 months on the job. The index values the time that managers, coworkers and the trainee devote to training and express it in terms of hours of trainee time. Training investment for service jobs is estimated to be 130 hours implying that the time invested in training a typical newly hired service worker in the first 3 months is equal in value to about 25 percent (130/520) of that worker's potential productivity during that period. Investments in training are considerably greater in other occupations. Retail (and service sector) sales and blue collar jobs have a mean index of 185 to 200 hours respectively or 35 to 38 percent of the new employee's potential productivity. Clerical jobs typically required training that costs about 45 percent of the new worker's potential output. Professional, managerial and sales representatives outside the retail and service sectors required training costing nearly 60 percent of the new worker's potential output.

The sixth row of the table reports the geometric mean of the answers to the question "How many weeks does it take for a new employee hired for this position to become fully trained and qualified if he or she has no previous experience in this job, but has the necessary school-provided training." Service jobs are reported to require an average of only 3 to 4 weeks of training, retail sales and clerical jobs slightly under 7 weeks, and professional and managerial over 10 weeks.[4]

The reported productivity of new employees increases quite rapidly (by roughly a third) during the first month or so at the firm (see row 7). Despite the much greater time interval, the percentage increases between the first quarter and the end of the second year (see row 8) are smaller than those during the earlier period for blue collar, service, clerical and sales jobs. For these occupations training investments and learning by doing seem to be large in the first few months on the job but to diminish rapidly thereafter. In the higher level, managerial and professional jobs, reported increases in productivity are larger between the third and 24th month than in the first few months. This reflects the more prolonged training period for these occupations. The occupations which devote the least time to training—the service occupations—are the occupations with the smallest increase in productivity with tenure. The reported productivity of service workers improves an average of 28 percent in the first month or so and a further 17 percent in the next 21 months. Occupations for which a lot of time is devoted to training in the first 3 months—professionals, clerical workers, managers and sale representatives outside of retail and service industries—also seem to have larger than average increases in reported productivity as the worker gains in tenure. Clerical workers, for instance,

are reported to be improving their productivity by 40 percent in the first month or so and by a further 32 percent by the end of the second year on the job.

Table 1
Training and Productivity Growth of Typical New Employees By Occupation

	Profes-sional	Mana-geral	Sales Not Retail	Retail Sales	Clerical	Blue Collar	Service
Hours Spent in Training in First 3 Months							
Watching others do the job	60.0	65.0	82.8	39.2	50.4	48.1	32.7
Formal training programs	9.1	12.1	23.9	8.2	13.5	9.1	5.7
Informal training by management	76.6	80.4	71.8	48.5	54.6	49.3	35.1
Informal training by co-workers	31.8	23.0	33.9	23.9	26.2	26.8	16.7
Investment in Training Time	293	295	350	185	235	200	130
Weeks to become fully trained if no previous experience	11.1	13.4	9.2	6.5	6.7	9.0	3.4
Increase in Reported Productivity (%)							
Between first 2 wks. & next 10 wks.	28 %	32 %	50 %	30 %	40 %	32 %	28 %
Between first 3 mo. & end of year 2	2 8 %	33 %	56 %	25 %	32 %	23 %	17 %
Increase in Real Wage in First 2 Yrs. (%)	5.0%	7.7%	22.6%	9.7%	11.5%	11.5%	3.7%
Number of cases	95	112	76	203	429	649	334

NOTE: Tabulation of the EOPP Employer Survey. The sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

Establishment Size

It is well established that workers at very large firms receive substantially more formal training than the employees of smaller firms (Barron, Black and Lowenstein 1987, Lynch 1992, Bartel and Sicherman 1993). Theory predicts a positive relationship between firm size and training. The discounted value of future payoffs to training should be higher at large firms due to lower turnover, lower required rates of return (resulting from better access to capital markets) and lower marginal costs for formal training due to economies of scale (one trainer can teach many workers simultaneously and the development costs of training programs are spread across a larger number of users).

Table 2 suggests a somewhat more complicated story. Establishment size also effects who does the training. Large establishments tend to invest more heavily in formal training and informal training by coworkers. At small establishments managers and supervisors do a great deal of the training. New hires at very small companies received more informal training by managers and supervisors than workers at larger establishments. Time spent watching others

was little affected by establishment size. When other factors are controlled, the relationship between establishment size and training is curvilinear with the minimum level of training during the first three months occurring at 25 employees (Bishop 1991, Table 6).

In the SBA data set, establishment size had a significant positive effect on the incidence of formal training, the incidence and amount of informal training by coworkers and the incidence of training by watching others. Establishment size did not have a positive effect on informal training by management (Barron, Berger and Black 1993b). Holding establishment size constant, establishments that are part of multi-establishment firms do more training than single establishment firms (Bishop 1991, Barron, Berger and Black 1993b).

Reported increases in productivity during training were substantially bigger at large establishments in both EOPP and SBA data. In EOPP data the very smallest establishments reported a 29 percent productivity increase in the first few months and a further 26 percent increase by the end of the second year. The largest establishments reported a 49 percent increase in the first few months and a 34 percent increase during the next 21 months. In SBA data, the productivity increase during the first three months was 23.5 percent at firms with 1-24 employees and 35 percent at firms with more than 500 employees.

The ratio of the proportionate increase in productivity to time devoted to training is lower at very small firms. The cause of this pattern is probably a lower opportunity cost of the time devoted to informal training at small establishments. Small establishments typically operate with a higher ratio of capacity (staff on hand) to demand (staff interacting with a customer or engaged in production) because they are unable to spread the risk of stochastic demand as well as larger establishments.[5] Scheduling of training is also probably more flexible, so training can be done during periods of slack work when opportunity costs of trainer and trainee time are low. This lower opportunity cost of training time is one of the reasons why small firms are often the first employer of young unskilled workers (Bishop 1991; Black, Berger and Barron 1993).

Table 2
Training and Productivity Growth of Typical New Employee by Establishment Size

	Number of Employees			
	0-10	11-50	51-200	201+
Hours Spent in Training in First 3 Months				
Watching others do the job	48.7	45.4	48.3	55.4
Formal training programs	11.8	7.4	9.2	17.0
Informal training by management	59.1	44.4	52.8	48.0
Informal training by coworkers	23.3	24.3	27.5	32.4
Investment in Training Time	224	184	213	248
Weeks to become fully trained if no previous experience	8.1	6.4	6.1	8.3
Increase in Reported Productivity (%)				
Betw. first 2 wks. & next 10 wks.	29 %	33 %	37 %	49
Betw. first 3 mos. & end of year 2	26 %	24 %	26 %	34
Increase in Real Wage in First 2 Yrs. (%)	12.1	7.3	8.7	9.6
Number of cases	792	678	296	.23

NOTE: Tabulation of the EOPP Employer Survey. The sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

Schooling: Type and Amount

The relationship between type and amount of schooling of the new hire and the on-the-job training typically received by the typical occupant of the job is explored in Table 3. One would expect schooling to be positively related to the rate at which a new hire can learn new skills. When the job being filled requires a great deal of training if applicants have no experience, we would expect employers to attempt to reduce training costs by giving preference to applicants with more than average schooling and to graduates of relevant vocational training programs.

Both of these hypotheses are supported by the data. People with more schooling and with relevant vocational training in school took jobs that have longer training periods for

inexperienced workers and that offered more intensive training during the first three months on the job. High school drop outs with no vocational training typically got jobs in which training investments in the first 3 months were only 22 percent of the new hire's potential productivity. Graduating from high school raised the training that was typical for the job to 38 percent of the new hire's potential productivity. Getting vocational training in high school raised training that was typical for the job to 47 percent of potential productivity and vocational education at a post secondary institution raised it further to 52 percent. College graduates obtain jobs which typically require training investments during the first three months which are 54-56 percent of a much higher potential productivity (Bishop 1991).

When one looks across jobs and across individuals, we find that schooling and employer training are complements not substitutes. Those with stronger educational backgrounds and those with higher test scores tend to get jobs which offer more company training. The greatest amount of training is received by new hires between the ages of 25 and 29, with 20 to 24 year olds getting the next largest amount, then teenagers and then those over 30. Those with some but not a lot of relevant work experience prior to starting at the firm also get the most training (Bishop 1991).

Variations in Training When the Job is Fixed

When one fixes the job, however, employers react to high initial skills levels by providing less GJT. Analysis of EOPP data indicates that new hires with 5 years of relevant work experience got one-third less training than new hires for the same job with no relevant work experience. In the NFIB survey of small and medium size firms, relevant formal on-site training at a previous job reduced initial training requirements by 17 percent. Years of schooling, however, had no effect on training time. Relevant vocational training had inconsistent effects on time devoted to training (Bishop 1994).

Table 3
Training and Productivity Growth of Typical Employees by Schooling

Typical New Employees	HS Dropout Voc Ed	HS Dropout No Voc Ed	High Sch. Grad Voc Ed	High Sch. Grad No Voc Ed	Some College Voc Ed	Some College No Voc Ed	College Grad Voc Ed	College Grad No Voc Ed
Hours Spent In Training in First 3 Months								
Watching others do the job	30.2	25.6	56.4	45.6	61.3	49.0	84	67.1
Formal training programs	4.5	5.4	17.3	7.3	19.3	15.7	10.7	8.3
Informal training by management	40.0	31.6	53.4	54.0	62.4	51.7	68.7	68.9
Informal training by co-workers	23.8	17.3	31.3	23.5	26.4	23.8	27.1	23.9
Investment in Training Time	158	116	246	199	269	226.5	293	279
Weeks to become fully trained if no previous experience	6.5	4.2	9.7	6.3	11.1	7.3	12.4	11.3
Increase in Resorted Productivity (%)								
Betw. first 2 wks. & next 10 wks.	33	24	28	35	34	38	35	37
Betw. first 3 mo. & end of year 2	33	17	28	24	28	30	33	41
Wage Rate								
Current wage	$ 4.20	4.26	5.68	5.16	6.19	5.35	7.65	5.37
Increase in real wage	17.1	9.2	11.3	8.7	10.6	13.6	8.9	7.9
Number of cases	46	154	284	823	134	205	47	105

Note: Tabulation of the EOPP Employer Survey. The sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

2.0 The Effect of Employer Training on Wages

2.1 Effects of Formal On-the-Job Training on Wages

It is well established that past receipt of employer provided training is associated with higher earnings and wage rates (Hollenbeck and Wilkie 1985, Lillard and Tan 1986, Mincer 1988, Holzer 1988, Brown 1988, Barron, Black and Lowenstein 1989, Lynch 1992, Flynn 1990). Mincer's review of the literature concluded:

> In sum, estimated effects in terms of earnings received of an additional year with training appear to range from 4.4 percent in the Panel Study of Income Dynamics (PSID) for all new hires, 9 percent for young workers in the PSID, 7 percent for the new youth cohort in the NLS, and 11 percent in the previous youth cohort in the NLS (1989, p. 8).

Bowers and Swaim (1992) analysis of CPS data found that the wage payoff to some forms of incumbent worker training rose between 1983 and 1991, while the returns to other forms of training fell. Table 4 summarizes the results. The return to qualifying training obtained from informal OJT fell from 11 to 6.5 percent, while the return to qualifying training at 2 and 4

year colleges rose. The return to formal company training from one's current employer rose from 11.6 percent to 14.4 percent. School based skill-improvement training paid for by the worker did not raise the individual's wage. The payoff to self-initiated school based skill-improvement training fell from 1.2 percent in 1983 to -2.8 percent (t=1.5) in 1991. The payoff to school-provided training paid for by one's employer was a statistically significant 8.4 percent in 1983 and 5 percent in 1991. Hollenbeck and Willke's (1985) analysis of the 1983 CPS data obtained similar results.

Table 4
Effect of Training on Hourly Wage Levels in 1983 and 1991

	Training Needed to Get Job		Training on Current Job to Upgrade Skills	
Source of Training	1983	1991	1983	1991
Formal Company Training (12.4)	.127 (10.1)	.132 (9.5)	.116 (10.1)	.144
Informal OJT or Exper	.108 (13.1)	.065 (7.0)	.022 (2.2)	.021 (2.0)
Military	.069 (2.6)	.079 (2.6)		
Correspondence Course	-.018 (.4)	-.050 (1.2)		
Friend	-.049 (2.1)	.037 (.5)		
Schools			.012 (.8)	-.028 (1.5)
Employer Paid for Schooling			.072 (3.3)	.078 (3.2)
High School Vocational Educ	.016 (1.0)	.024 (1.2)		
Other Vocational School	.121 (6.3)	.066 (2.6)		
Two-Year College	.092 (5.5)	.130 (8.6)		
Four-Year College	.202 (16.3)	.238 (18.4)		
Received Qualifying Training			.164 (20.3)	.161 (18.6)
R^2	.447	.492	.449	.194

Source: Bowers and Swaim (1992) analysis of CPS data. All models contained controls for years of schooling, potential experience and its square, tenure and its square, and dummy variables for gender, married, husband, race, veteran, metropolitan resident, region, part-time job and union membership.

Even participation in workplace literacy programs is sometimes positively associated with earnings. Analysis of 1991 data from the National Household Education Survey found that, holding occupation, industry and schooling constant, the less than one percent of workers who participated in such programs during 1991 earned 12.8 percent more than those who did

not (Hollenbeck 1993). Bowers and Swaim (1992) found, however, that, when the effects of four different types of training were estimated simultaneously, that reading/writing/mathematics training was associated with 5 percent lower wage rates while wages were 4.2 percent higher when computer training had been received, 5.9 percent higher when other occupational skill training had been received and 13 percent higher when supervisory training had been received.

These results are probably biased by the tendency of more talented workers to obtain jobs which offer occupational skill training. The causal effects of training, thus, need to be analyzed in models of wage growth, not models of wage levels. Lynch's (1992) study of the wage growth experienced by NLSY youth in their late teens and early 20s found that, controlling for job changes and changes in unionization, tenure and experience, that wage rates were increased 12 percent by apprenticeship training and increased 6 percent by off-the-job training, but were unaffected by formal company training programs lasting 4 weeks or more. Krueger and Rouse's (1994) study of training at a manufacturing company found that participants in training were more likely to bid for new jobs and to be upgraded but wage effects if any were very small and limited to those who obtained occupational training.

Other analyses of NLSY data on workers have obtained different results. Blanchflower and Lynch's (1994) study of wage growth of non-college graduates from age 20 to 25 found company training raised wages by 12 percent (t = 1.94), off-job training raised wages by 5 percent (t = 1.02) and apprenticeship raised wages by 38 percent (3.38). Veum's (1994) study of 1986-90 wage growth found that the receipt of company training had large effects on wage growth, but having a large rather than a small amount of training did not. The 18 percent who received company training during the four years obtained 9 percent larger wage increases (t-statistic = 2.3) while controlling for job change and change in firm size, unionization, SMSA residence, tenure and work experience. Lowenstein and Spletzer's (1994 , Table 4) study of newly hired workers in the NLSY found that a completed spell of company training during the previous year raised wage rates by 2.6 percent (t = 1.82). Off-job training did not raise wage rates when financed by the worker, but did raise wage rates when the employer financed it—particularly when the worker switched employers. Paul Lengermann's (1994) analysis of 1988 to 1992 NLSY data also found that employer sponsored training had very large effects, but spending additional time in training did not. Controlling for school attendance, current training participation, tenure, job changes and a host of other variables, training financed by one's employer during fiscal 1991 and 1992 raised wage rates by 4.2 percent for females (t= 1.9)

and by 6.4 percent for males (t=2.8). Depreciation rates are substantial, however, for employer sponsored training during fiscal 1989 and 1990 had substantially smaller effects. Training financed by the individual during fiscal 1989 and 1990, by contrast, was associated with wage reductions of 2.1 percent for females (t = .5) and 4.3 percent for males (t = .9). The findings of most of the wage growth studies imply that, at least in the short run, **training pays off in higher wages only when the employer sponsors it, not when the worker pays for it.** This suggests that employers are more effective trainers than schools and better able to pick effective school based training programs than individual workers.[6] Apparently the productivity benefits of the general training selected by the employer are so large that employers can afford to both pay much of its costs (see section 6) and to offer wage increases as well.

If these results reflect stable causal relationships, the policy implications are truly profound. Employers should be subsidized (or in some other way induced) to expand the training that they provide or subsidize. Public subsidies of school-based occupational training for adults (e.g. low tuition and Pell grants for adults) should be scaled back and new subsidies of school based vocational training initiated by adult workers (training IRAs, JTPA training vouchers) should be avoided.

2.2 Government Subsidized Occupational Training

Second Chance Training Programs: The best evidence on the impacts of government training programs comes from studies employing strong randomized designs. The latest findings from the Abt Associates evaluation of the Job Training Partnership Act are presented in Table 5. When labor market earnings are the evaluation criterion, JTPA classroom training works well for adult women and on-the-job training works well for both adult men and adult women. It does not work for disadvantaged youth, however. For example, young men under 22 years of age who were assigned to on-the-job training and actually enrolled in the program were earning $1936 less at an annual rate during the 12th through 18th months after random assignment than those who were denied JTPA services. Those assigned to the other services treatment—mainly basic education, JSA, job readiness training, vocational exploration and tryout employment—earned $1228 less at an annual rate 12 to 18 months after random assignment. The training had no effect on the earnings of young women (Bloom, Orr, Cave, Bell and Doolittle, 1992). Evaluations of Job Start came to similar conclusions (Cave, Bos, Doolittle and Toussaint, 1993). Of the various programs designed to serve disadvantaged youth, only the Job Corps, a considerably more costly program, appears to have significant positive impacts (Mailer, Kerachsky and Thornton 1982).

One possible explanation of the negative impacts of JTPA on youth earnings is stigma. Analysis of a recent survey of small and medium sized firms summarized in column 8 of Table 6 found that new hires with JTPA training were 15 percent more productive [after 6 months (P = .089) and at the time of the interview (P = .165)] than other new hires and had lower rates of turnover. Nevertheless, the JTPA trainees were paid 11 percent less than other workers hired for that job (P = .129) (Bishop 1994). Apparently, in this data set, JTPA training simultaneously raises productivity and lowers wage rates. Since JTPA training is given only to disadvantaged individuals, advertising oneself as a JTPA trainee may hurt the individual's marketability more than it helps. Studies have also found that the Targeted Jobs Tax Credit stigmatizes its participants (Burtless 1985) and that, consequently, they are paid less than other new hires for the same job even though they typically produce more than average (Bishop 1989b). These findings suggest that evaluations of CETA and JTPA programs which focus solely on wage and earnings outcomes are biased by the stigma generated by signaling the trainee's disadvantaged status and thus substantially understate the social benefits of such training.

Table 5
Impacts of Job Training Partnership Act Training on Earnings per Employee
(Annual Rate during 13th through 18th month after assignment)

	Adult Men	Adult Women	Young Men	Young Women
Classroom Training	$ 378 (4.1%)	$ 914 (18.4%)	--$ 152 (--2.0%)	--$ 52 (--1.2%)
On-Job-Training	$1214 (13.9%)	$1010 (16.2%)	--$1936 (--20.3%)	--$ 154 (--2.6%)
Other Services	-- $20 (--.2%)	$ 140 (2.3%)	--$1228 (--16.8%)	$ 30 (.7%)

Source: Howard Bloom et al. The National JTPA Study, Washington D.C.: Abt Associates, 1992, Exhibits 4-12, 5-11, 6-7, 6-12. The effects of enrollment in JTPA were calculated by dividing the effects per assignee by the proportion of assignees -.ho enrolled in at least one kind of JTPA training. Many assignees participated in more than one form of training. Job Search Assistance (JSA) was often a part of the package of services given. For adults the proportion of enrollees that received JSA was 20 percent for classroom training, 51 percent for on-the-job training and 40 percent for other services. For youth the proportion of enrollees getting JSA was 41 percent for classroom training, 52 percent for on-the-job training and 18 percent for other services. Forty-three percent of youth enrollees in other services received basic education.

Military Training: Military training also appears to have substantial positive effects on the wages and productivity of those exiting the armed forces. Mangum and Ball (1986)

estimate that about 48 percent of those trained by the military get civilian jobs in that same field. The analysis reported in column 7 of Table 6 indicates that, when the training is relevant to the job obtained, workers with that background receive extra training in the first six months and become 10 percent more productive than other employees in the job once that training is completed. Their success on the job appears to surprise their employer and, consequently, they are not paid the higher wage rates their high productivity would seem to justify. Thus, military training benefits the future employers of former soldiers in much the same way that JTPA training does.

Publicly Funded Vocational Schooling: About 56 percent of those trained at vocational-technical institutes get jobs in the field they studied and about 46 percent of those studying at business colleges get training related jobs (Mangum and Ball 1986). Nevertheless, studies typically find that vocational training at two-year colleges and technical institutes has positive effects on earnings and that the effects of training are generally more positive for blacks and women than for white males (Freeman 1974). Controlling on ability, family SES and other demographic characteristics (but not work experience), Kane and Rouse's (1993b) analysis of the NLS72 found that one year of study at a community college raised earnings of 32-33 year old males by about a $1000 and an associates degree raised them by $1500. In NLSY data the effect were even larger (Kane and Rouse 1993a). Vocational schools had non-significantly negative effects on earnings. For women the credits and degrees awarded by community colleges and vocational schools all had large effects. Vocational school certificates and associates degrees in vocational fields from community colleges both added about $2800. to earnings. An academic associates degree added about $2260 to earnings. Grubb's analysis of the NLS72 data suggests, however, that post-secondary education obtained after age 25 had much smaller often negative effects on wage rates and earnings of 32-33 year olds.[7]

Recent studies have also found that for those who do not attend college, students who took vocational courses in high school are more likely to be employed and receive higher wages in the yearn immediately following high school than high school graduates who pursued a purely academic course of study (Campbell et al 1986, 19876; Kang and Bishop 1989).

School based vocational training is well signaled to the labor market by diplomas and school reputations, so one would expect productivity benefits of training to accrue to the trainee in the form of less unemployment, better jobs and higher earnings. One would not expect employers to be able to recruit significantly more productive workers from such sources and not pay them for their greater productivity. This appears to be the case for the training

provided by public institutions (see column 5 of Table 6). Such training helps the student get a better job, but given the job obtained it does not appear to be associated with workers being more productive than others hired for that job.

Private vocational-technical institutions, on the other hand, appear to place their graduates at jobs where they turn out to be decidedly better than other new hires and, as a result, they receive somewhat higher initial wages and are less likely to be discharged (see column 6 of Table 6). While sample sizes are too small to provide powerful tests of the differential impact of private vocational colleges, Kane and Rouse's (1993b) point estimates imply that private 2 year colleges had larger effects on wages than public 2 year colleges.

Table 6
The Impact of Previous Training on the Productivity of New Hires
(in percent)

	10 Yrs Irrelevant Exper.	10 Yrs Rel Exp Replaces Irrelevant Exper.	Formal Training On Job	Formal Training Off Job	Relevant School Based Training Vocat School	Relevant School Based Training Private School	Relevant School Based Training Military Training	Relevant School Based Training JTPA Training
Productivity								
End of First Week	-2.7	32.7***	9.5***	.3	2.0	10.0**	-3.2	8.0
End of 6 Months	-6.9*	20.3***	-.9	6.6	-3.1	12.3***	10.6**	15.7*
Current	-3.5	13.3***	.3	15.9**	4.5	10.3**	9.8	15.4
Ideas	-1.7	45.2***	13.6	37.3**	2 7	2.3	10.1	-6.0
Required Training	2.4	-30.7***	-17.3***	7.2	6.5	-4.0	24.4**	11.1
Wage Rates								
Starting	7.6***	22.1***	1.9	.1	1.5	7.1***	-0.4	0.0
Current/Most Rec	8.0***	24.6***	-1.3	-.2	1.4	4.8	-6.6*	-10.6
Expected Productivity	-.5	10.2***	4.2***	2.5	-1.4	4.4**	3.9	7.7*
Surprise	-6.6**	7.2**	-4.6	4.2	-1.1	8.0*	9.6*	8.9
Profitability								
End of First Week	-10.3*	32.8***	6.7	15.2	3.2	-0.9	2.6	-12.7
End of 6 Months	-15.5***	3.2*	-1.1	13.8*	0.8	-0.1	-0.6	12.8
Current/Most Rec	-6.5	-6.6	2.0	18.6*	5.3	-7.6	11.8	1.7
Turnover								
Leave	-4.5	-11.1	-8.4	-31.0	-11.8	-11.9	5.8	-40.5
Quit	-22.2	-27.2	-8.9	-.4	-30.6	17.2	20.0	-8.1
Discharge/Layoff	20.0	11.6	-5.9	-68.8	17.5	-54.0*	-4.3	-90.4

Source: Analysis of a survey of a stratified random sample of the members of the National Federation of Independent Business (Bishop 1994). Larger firms had a significantly higher probability of being selected for the study. The response rate to the mail survey was 20 percent and the number of usable responses was 2014. The estimated models compared two workers in the same job while controlling for schooling, gender, ethnicity, marital status and whether the job was temporary.
Column 1 presents the effect of increasing total experience by ten years while holding relevant experience constant.
Column 2 presents the estimated effect of ten years of relevant experience while holding total experience constant.
Column 3 is the effect of having received on-the-job formal training from a previous employer.
Column 4 is the effect of having received off-job formal training arranged by previous employer.
Column 5 is the estimated effect of relevant vocational training obtained at a public institution.
Column 6 presents the additional effect of obtaining training at a private voc/tech institution.
Column 7 presents the additional effect of receiving relevant training from the military.
Column 8 presents the additional effect training obtained through the Job Training Partnership Act.
Percentage effects for required training and wage rates are anti logs of ten years effects calculated from logarithmic models for training and wage rates. The suggestions index ranges from 0 to 3 and has a mean of 1.027.

Table 7
Impacts of Formal Training on Learning and Behavior of Managers
(Burke and Day's 1986 Meta Analysis)

	Objective Learning Criteria				Subjective Behavior Criteria				Objective Results Criteria			
Training Method	True Mean Effect	90% Lower Bound	# of Ef Sz & Studies	Total # of Obs.	True Mean Effect	90% Lower Bound	# of Ef Sz & Studies	Total # of Obs.	True Mean Effect	90% Lower Bound	# of Ef Sz & Studies	Total # of Obs.
Lecture	.37	-.03	20 (5)	1708	.46	.13	12 (3)	1055	.82	-.04	15 (3)	520
Lecture/Discussion	.23	-.06	24 (4)	4782	.11	.03	11 (4)	5102	--	--	---	--
Lecture/Disc + Role Play or Practice	.93	.46	8 (3)	267	.34	.07	21 (4)	1117	--	--	--	--
Leader Match	--	--	----	---	.40	.40	69 (5)	3081	--	--	---	--
Sensitivity Training	--	--	----	---	.73	-.13	49 (8)	7153	--	--	---	--
Behavioral Modeling	--	--	----	---	.78	.78	17 (5)	446	--	--	---	--
Multitechnique	.81	.01	13 (6)	607	.51	-.48	76 (:1)	5169	.52	.52	13 (5)	634
All Types of Training	.38	-.37	77 (22)	8280	.49	-.26	277 (39)	26025	.60	-.06	60 (11)	2298

Source: Burke and Day (1986). Objective Learning Criteria are generally paper and pencil tests assessing knowledge of what is taught by the training program. Subjective Behavior Criteria are generally supervisory ratings of trained and untrained managers' performance (sometimes a global performance rating but more commonly a behavior that was the target of the training program). Objective Results Criteria are objective measures of various output elements. Half of the data on objective results criteria come from three studies of training programs designed to reduce bias and error in the rating of subordinates. Effect sizes were calculated for each study by dividing the difference between the trained and the untrained comparison group by the within group standard deviation. The ‘true’ effect size was estimated by dividing by the square root of criterion reliability. Then weighted averages were calculated using the number of observations in each study as weights. Some of the variance in effect sizes across studies and criterion measures is due to sampling error and variations in criterion reliability. The effects of these two artifacts were estimated and subtracted from the observed variance of effect sizes to estimate the ‘true’ effect size error variance. The 90% lower bound 'credibility value is an estimate of the ‘true’ effect size above which 90 percent of the true training impacts should lie. It is calculated by subtracting (1.285*the square root of the 'true' effect size error variance) from the estimate of the ‘true’ mean effect size.

3. THE EFFECTS OF EMPLOYER TRAINING ON WORKER PRODUCTIVITY

3.1 Studies by Industrial Psychologists

Industrial psychologists have conducted many studies of the effects of formal training on job knowledge and job performance. A recent meta-analysis of the literature on management training by Burke and Day (1986) found 22 studies of the effects of training on objective learning criteria (generally scores on paper and pencil tests), 39 studies of the effects of training on subjective behavior criteria (generally performance appraisals) and 11 studies of effects on objective results criteria. Table 7 provides a summary of Burke and Day's findings. Burke and Day calculated a standardized effect size for each training program and for each criterion by dividing the difference between trainees and an untrained comparison group by the within-group standard deviation of the criterion. This result was then adjusted for criterion unreliability by dividing by the square root of criterion reliability. Mean effect sizes varied with the criterion and the type and method of training, but in each of the categories examined mean effect sizes were positive and significantly greater than zero. A number of studies compared the efficacy of lecture presentations, lecture plus discussion and lecture/discussion plus role playing or practice. The mean 'true' effect sizes were respectively .37, .23 and .93 for objective learning criteria and .46, .11 and .34 for subjective behavior criteria.[8] These findings provide some support for the conventional wisdom that learning is enhanced when trainees get to practice the skills they are being taught.

On the other hand, a number of studies obtained point estimates of training effects that were negative. Sample sizes are typically small, so sampling error could be the cause of these results. When, however, artifacts like sampling error and criterion unreliability were corrected for by Burke and Day (1986), 90 percent "credibility' values (the effect size which 90 percent of true effect sizes should lie above) sometimes fell below zero. This finding suggests that, while most formal training programs achieve their objectives of significantly improving job knowledge and job performance, a significant minority do not.

While cumulative reviews of the training literature by Burke and Day and others provide suggestive evidence about which training methods are more effective, the generalizations that can confidently be drawn from this literature are few. Any one issue is addressed by only a few studies, sample sizes are small (most studies compare treatment groups that contain fewer than 40 people), criterions are often of doubtful relevance to establishment profitability and designs are often flawed (random assignment is often absent). The great variability across studies in the estimates of the magnitude of training effects is further evidence of our

ignorance. When one considers that probably more than $20 billion dollars is spent annually on the formal training of managers and supervisors, it is quite remarkable that Burke and Day were able to find only 70 studies (with a cumulative sample size of only 7178 individuals) that met their acceptance criteria. Clearly, a great deal more systematic field research is required.

3.2 Productivity Effects of Prior Training

Most training is informal not formal. What are the productivity effects of informal training? One way to address this question is to hold the job constant and then compare the productivity of incumbents who have different amounts of tenure and prior relevant work experience. Analyses of the U.S. Employment Service's GATB Revalidation data on 31,399 workers in 159 different occupations at 3052 different firms indicates that both have substantial effects on job performance. This analysis is summarized in Table 8.

Findings from Analysis of USES Data: Relative to someone with no relevant work experience, a worker with 10 year of relevant work experience is predicted to be 28 percent more productive during the first couple of years in technical, craft and service jobs and 12 to 15 percent more productive in clerical and operative jobs. The effects diminish as experience increases, but they do not reach zero until 37 years for operatives, 55+ years for craft workers and high skill clerical workers and 19-31 years for other occupations.

Productivity rises even more rapidly as tenure at the job increases. After ten years on the job, productivity had risen 84 percent in technical jobs, 68 percent in high skill clerical jobs, 62 percent in craft jobs, 45-47 percent in operative and service jobs and 32 percent in low skill service jobs.[9] The effect of tenure on job performance stops rising and starts to decline at somewhere between 16 and 24 years of tenure.

Except for technicians, age (interpreted as general experience) has large effects on job performance as well. Holding tenure and occupational experience constant, being ten years older (28 rather than 18) raised productivity 8 percent in low skill clerical jobs, 17-18 percent in operative and service jobs, 23 percent in high skill clerical jobs and 33 percent in craft jobs.

Findings from Analysis of NFIB data: A survey of a stratified random sample of the 700,000 member National Federation of Independent Business (NFIB) during the first half of 1987 provides another source of information on the productivity payoffs to training. About 1400 firms provided information on the training received and the productivity of two recently hired workers occupying the same job. By analyzing the determinants of the differences in productivity and wage outcomes for these two workers, one can assess the impacts of training received on previous jobs and in schools on productivity and wage rates (Bishop 1994).

An examination of column 2 of Table 6 reveals that relevant work experience significantly increased the productivity of new hires and significantly reduced the time required to train them. Holding total experience constant, new hires with ten years of relevant experience required less training, higher productivity (20 percent at the end of six months and 13 percent at the time of the interview), made more suggestions for improving productivity and were paid 22 to 25 percent more.

Total work experience was defined as the total number of years since completing school or reaching age 16 whichever is smaller. In the NFIB data, experience that was not relevant to the job did not have positive effects on productivity and retention. Ten years of irrelevant experience, in fact, reduced productivity at 6 months of tenure by a statistically significant 7 percent. Even though it is associated with lower productivity, irrelevant experience is associated with higher wage rates relative to coworkers. The effect of irrelevant experience on the wage is about one-third of the size of the effect of relevant experience on wage rates.

Table 8

Within-Job Productivity Effects of Previous Work Experience

	Occupation					
	Technician Service	Craft	Operative	High Skill Clerical	Low Skill Clerical	
10 Yrs Exp in Occ (at another establishment)	29%	28%	12%	12%	15%	28%
10 Yrs Tenure in Occ (at current establishment)	55%	34%	23%	56%	17%	19%
Age 28 rather than 18 (Sch. & Occ. Exper. held constant)	-3%	33%	17%	23%	8%	18%
Compensation in 1985	$26,649	$29,655	$23,828	$23,065	$19,472	$15,496
Output Standard Dev	$13,668	$12,399	$ 5,062	$ 3,925	$ 4,934	$ 4,068

Table entries are estimates of effects of a particular form of experience while holding other forms of experience, schooling, test scores, gender and ethnicity constant. The productivity effects are expressed as a percentage of the mean level of compensation in that occupation. Estimates of productivity effects in 1985 dollars may be obtained by multiplying the percentage reported in rows 1 to 3 by the mean compensation in row 4. These estimates hold the employer and the job constant and thus capture only a portion of the benefits of on-the-job learning. Learning also helps the individual enter higher paying occupations and obtain jobs at better paying companies and these effects are best measured by regressions predicting wages in representative samples of the population.

Sources for Table 8: Derived from an analysis of the U.S. Employment Services Individual Data File developed for revalidating the General Aptitude Test Battery. Deviations from the mean performance rating for the job were regressed on deviations from the mean values (for the job) of schooling, test scores, gender, race, Hispanic and tenure, total occupational experience, and age and their squares. Details are available in Appendix C of Bishop (1994). The higher rates of turnover of unsuccessful employees cause selectivity bias which was corrected for by multiplying the coefficient in table C1 of Bishop 1994 by 1.76 (Goldberger 1981). The result was then multiplied by estimates of the standard deviation of output across workers taken from Bishop 1991. True effects are probably larger because both independent and dependent variables are measured with error and this causes our estimates to be biased toward zero. No correction was made for measurement error bias.

Employers were pleasantly surprised by the productivity of workers with relevant work experience and unpleasantly surprised by the productivity of those with irrelevant work experience. These findings suggest that many employers were not aware of the relevance of the new hire's previous work experience until long after the hiring decision.

Formal training received on-the-job from a previous employer increased initial productivity by 9.5 percent of the wage and reduced training requirements by 17 percent. It had no effect, however, at the time of the interview. Formal training received off-the-job, on the other hand, had no effects during the first few months at the firm, but it increased the index of suggestions by 37 percent and productivity at the time of the interview by 15.9 percent. Formal off-the-job training does not increase current wage rates, however, so profitability increased by 13.8 percent of the wage at six months of tenure and by 18.E percent of the wage at the time of the interview.

These results suggest that on-the-job training sponsored by firm A not only benefits the employee and employer (as implied by Becker's theory of OJT), but also sometimes benefits other employers in the industry who hire workers who quit or are laid off by firm A. Formal off-the-job training generates substantial long lasting externalities (benefits received by the worker's future employer: and by consumers). The informal training proxied by the relevant experience variable appears to generate externalities only in the first year or so of a worker's tenure at a firm.

3.3 The Impact of Training on the Productivity of New Hires at the Training Firm

The big improvements in productivity during the first year on a job reported in Tables 1-3 suggest that the total rates of return (combining both worker and employer benefits and costs) are likely to be very high during the first months of employment. For clerical workers, for example, the total costs of training during the first 3 months were 235 hours or .113 of a year's output by a worker whose skill level was equal to that of a new employee. Since this figure is an upper bound on the investment that contributed to the 40 percent gain during the first months on the job, the average rate of return must have been above 354% per year (.40/.113). Since the intensity of training investment falls with tenure at the firm, the cost of training investment during the next 21 months cannot have exceeded .7875 (i.e. 1.75*235/520) of a year's productivity by a newly hired worker. This implies that the average rate of return to training investments during this 21 month period exceeds 40% per year (.32/.7875).

However, marginal rates of return to training investment are lower than average rates of return and some of the gain in productivity results from learning by doing and not from

training. Multivariate cross section models of productivity growth are necessary to tackle the issue of the marginal productivity of on-the-job training. Multivariate analyses of the effects of training on rates of improvement in productivity of new hires (Bishop 1991) have found that:

* Hours devoted to each type of training had very similar effects on productivity growth during the first year or so on the job. This implies that lower cost forms of training-- informal training by coworkers and training by watching others do the job-- had higher benefit cost ratios than informal training by management and formal training.

* Formal training had significantly larger effects on wage growth than informal training. Formal training's tendency to have larger effects on wage growth and quit rates than informal training probably result from the fact that formal training is better signaled to the labor market.

* The productivity growth effects of formal training were bigger at large establishments.

* The reported generality of on-the-job training had no significant effects on its marginal productivity.

* When training was reported to be highly general, training had a larger effect on wage growth than when training was reported to be specific. Nevertheless, training that was reported to be entirely general had much larger effects on productivity growth than wage growth implying that the labor market treats this training as if it were at least partly specific to the firm.

The multivariate analysis of EOPP data presented in Bishop (1991) generated tentative estimates of both the opportunity costs and the productivity effects of training (general and specific, worker and firm financed combined). These estimates allow a calculation of the marginal gross rates of return (for general and specific training combined) necessary to cover the cost of capital, losses due to turnover and obsolescence. The data were not collected for this purpose, however, so there were gaps that could only be filled by some judicious assumptions.[10] Consequently, the estimates of marginal gross rates of return (Marginal GROR) for each form of training that are reported in Table 9 must be viewed as very tentative results which will hopefully be displaced when better data sets become available. Marginal GRORs are the ratio of the increment to yearly productivity generated by a small increase in training divided by the cost of increased training (A detailed description is in the notes of the table).

The estimated marginal gross rates of return diminish as the intensity of training increases. The mean training intensity for the first 3 months expressed in units of the time of trained workers is 148 hours. As intensity during the first 3 months rises from 100 hours to 300 hours (double the mean), the marginal gross rate of return for informal OJT by co-workers drops from 43-45 percent to 25-32 percent in the two linear models for typical new hires

presented in Table 7 of Bishop 1991. The linear model's GROR drops from 38-43 percent to 25 percent for watching others and from 17-23 percent to -1 to 10 percent for training by supervisors. The marginal GROR of formal OJT is estimated to drop from 11-15 percent at 100 hours to -3 percent at 300 hours. Estimated gross rates of return calculated from models based on logarithmic specifications are considerably higher than those based on linear specifications of productivity growth. Gross rates of return are also typically higher for the models using the logarithm of training intensity and the square of this logarithm presented in Bishop (1991 Table 8). At the training intensities that typically prevail during the first quarter, marginal gross rates of return are often above 40 percent.

It must be remembered, however, that these marginal GRORs include cash flows necessary to compensate for turnover and obsolescence and are, therefore, not directly comparable to the real rates of return

Table 9

Estimates of Marginal Gross Rates of Return Estimates

	Formal Training		Training by Supervisors		Training by Co-Workers		Watching Others	
	100 hrs	300 hrs	100 hrs	300 hrs	100 hrs	300 hrs	100 hrs	300 hrs
Table 4								
Typical Individual								
Linear	11%	- 3%	23%	10%	45%	32%	38%	25%
Logarithmic	38%	15%	46%	24%	85%	63%	113%	90%
Particular Individual								
Linear	15%	- 3%	17%	- 1%	43%	25%	43%	25%
Table 5								
Typical Individual								
Logarithmic	118%	54%	99%	48%	112%	53%	128%	58%
Linear	43%	16%	41%	16%	48%	18%	50%	18%
Particular Individual								
Logarithmic	156%	68%	109%	52%	130%	59%	146%	64%
Linear	46%	16%	38%	13%	47%	16%	46%	16%

Estimates of the marginal gross rates of return to increases in the intensity of training at two different levels of training intensity: a 100 hour investment during the first quarter of the job and a 300 hour investment during the first quarter on the job. Hourly cost factors are assumed to be 1.8 for formal training, 1.5 for training by supervisors, 1.0 for training by coworkers, and 0.8 for watching others. When productivity growth over 2 years for the typical individual is being modeled, duration adjusted cost factor is calculated by multiplying by the hourly cost factor by 3 for the reasons given in the text. When productivity growth of a particular individual during the first 14 months is modeled, the duration adjusted cost factor is calculated by multiplying the hourly cost factor by 2.2. The results presented in the first panel are calculated by taking the derivative of the estimated regression equations reported in tables 4 with respect to hours of the specified kind of training, then multiplying by 2000, the assumed number of hours worked in a year, and then dividing by the duration adjusted cost factor. As an example of the calculation, the formula for formal OJT using the coefficients from the linear model in table 4 for training intensity (T) equal to 300 hours was as follows:
[(.00046 - .00000049*T*2*1.8)*2000] / [3*1.8] = -.0256 and the coworker training formula is:
[(.00077 - .00000049*T*2)-2000]/[3] = .3173. {Note that the coefficients must be divided by 100 and 10000 in order to scale them in hours of training}. The GROR estimates presented in the second panel assume that the firm has 18.5 employees (this zeros out the 5th and 7th terms of equation 3) and that all of the training received is of the type indicated. For informal training by supervisors, the formula is: $(b_2 + b_3 * ln T*2)*2000/(T*\text{duration factor})$ which is [(.003 +.0064*4.605*2)*2000] / (100*3) =.4176 at T=100 for the linear productivity growth model for typical workers. For training by watching others, the formula is $(b_2 + b_{5F} + b_3 * ln T*2)*2000/(T*\text{duration factor})$ which is $[(.003 + .013*S_w + .0064*4.605*2)*2000] / (100*3)$ = .504. Obsolescence of skills and turnover mean that these cash flows do not have art infinite duration and should therefore be compared to the sum of the interest rate, the obsolescence rate and the turnover rate times the proportion of skills that are effectively specific to the firm.

to schooling and financial assets that typically lie in the range from 5 to 10 percent. If all training investments are specific to the firm and must, therefore, be written off if workers leave and rates of turnover are high, first year GRORs of 30 percent or more will be required to induce the firm to invest in specific training. Lillard and Tan (1986) have estimated that the wage effects of formal training depreciate (either due to obsolescence or changing jobs) at 15 to 20 percent per year. This also would imply that equilibrium in the training market would likely yield marginal GRORs of 30 percent or more. Tan et. al. (1991), however, estimates a much lower depreciation rate for wage rate effects of company training--6 to 7 percent per year. With all the uncertainties regarding the best specification of the productivity growth model, measurement error in the training variables, the specificity of the training, turnover rates, and the obsolescence rates, robust estimates of net rates of return to on-the-job training comparable to rates of return on financial assets and physical capital are not now feasible and will not become feasible until much better data sets become available.

3.4 Organizational Effects of On-the-Job Training

For most kinds of training, outcomes are as much organizational as individual. After reviewing studies of the effect of OJT on organizational productivity, Kochan and Osterman (1991) concluded that:

> These studies provide consistent and convincing evidence that (1) education and training are associated with significant productivity increases when their impact is examined in a production function context; and (2) training and associated flexible human resource systems are associated with higher levels of productivity and quality in matched comparisons. (pp. 16-17).

The number of studies is quite limited, however. Summarizing his study of flexible manufacturing in Japan and the United States, Ramchandran Jaikumar's (1986) concluded that:

> The heart of this new [flexible] manufacturing landscape is the management of manufacturing projects: selecting them, creating teams to work on them, and **managing workers' intellectual development.** (p. 75)

Marcie Tyre's (1990) examination of several plants in a single mufti-national corporation found that the American plants took longer to start up and had flatter learning curves than plants in Italy and Germany. She attributed this in part to less development and cross-training of workers. A study of hot-roll steel facilities by Ichniowski, Shaw and Prennushi (1993) found that plants using high performance work systems had less down time and produced higher quality output. Higher levels of training were one of the components of the high performance work

systems that generated these positive outcomes. Studies of the auto industry by MacDuffie, Krafcik and their colleagues (Krafcik 1990, Krafcik and MacDuffie 1989, Shimada and MacDuffie 1986; MacDuffie and Krafcik 1989, forthcoming; MacDuffie and Kochan 1988, 1993) came to similar conclusions. Case studies of plant level productivity in five industries-- clothing, kitchen cabinet making, biscuit manufacturing, tool making and hotels-- conducted by researchers associated with the National Institute of Economic and Social Research found that the British companies were less productive than their German and Dutch counterparts and concluded that the quantity and quality of occupational training received by young workers entering the industry were one of the causes of the differentials (Daly et al 1985 ; Prais et al 1989; Steedman and Wagner 1987, 1989; Mason et al 1990). **In none of these studies, however, were the data sets large enough to allow econometric estimation of the unique causal effects of training holding other elements of the human resource system constant.**

The studies cited above establish an association between training, high performance work systems and greater productivity. They **are consistent** with the proposition that modernization and training are complementary-4. training is often critical to the implementation of new technology or a reorganization and, therefore, companies that are modernizing are more likely to be investing heavily in training. This research does **not** imply that modernization is the **only** occasion where training is worthwhile. Nevertheless, these studies are sometimes over interpreted as implying that: "Firms that are unwilling to upgrade production technologies and management methods <u>are not ready to train.</u>" (EQW Issues 1993). This statement is not justified by the evidence. Surely, old style construction contractors still need to train the inexperienced carpenters they employ? Surely, firms with a sexual harassment problem need to train supervisors about company policies in this area?

The studies reviewed in section 3.1 through 3.3 have established that traditional employer provided training raises individual productivity and wage rates. Most of the training incidents in these studies were not occasioned by modernization or a TQM reorganization. Taken altogether the economic literature on training suggests that, as long as the company is initiating and paying for training, one can be pretty confident that most of these investments are profitable both for the worker and the firm.

On-the-job training subsidized by the government has a somewhat more spotty record. Programs which arrange and subsidize OJT for disadvantaged workers raise the wages of adults who participate, but appear to lower the wages of youth (under age 22) who participate.

On the other hand, analysis of a very small sample of JTPA trainees in the NFIB data suggests that stigma may be biasing these evaluations and that firms that hire JTPA trainees may be getting better employees than expected and paying them lower wages than is typical for the job.

Occupational training of youth in high schools and community colleges and vocational-technical institutes does raise earnings particularly of women. Adults and incumbent workers, however, do not benefit from the occupational training they get at schools when their employer does not contribute to its costs.

4. WHY DO GERMAN AND JAPANESE WORKERS RECEIVE MORE TRAINING THAN AMERICAN WORKERS?

American employers appear to devote less time and resources to the training of entry level blue collar, clerical and service employees than employers in Germany and Japan (Limprecht and Hayes 1982, Mincer and Higuchi 1988, Koike 1984, Noll et al 1984, Wiederhold-Fritz 1985). In the automobile industry , for example, newly hired assembly workers receive 310 hours of training in Japan and 280 hours of training in Japanese managed plants located in the US, but only 48 hours of training at US owned plants in the US (Krafcik 1990). Averaged over all auto assembly workers, annual training time is nearly three times greater in plants located in Japan and about 80 percent greater at Japanese plants located in the US. These differentials in training are one of the reasons why Japanese plants are more productive than American plants and Japanese built cars have such a reputation for quality. German employers train their youthful apprentices much more thoroughly than American employers train their teenage workers. One visible manifestation of this is the sales personnel one encounters in Germany. They are generally much more knowledgeable about the products they are selling than American sales clerks.

The Japanese and German economies apparently generate a significantly larger number of jobs which offer substantial training on-the-job. Why does this occur? This section of the report reviews the evidence on the culpability of six prime suspects: high turnover, high costs of capital, loose labor markets, lower trainability of American workers, lower rates of technological progress, and the absence of government sponsored signals of skills obtained from training on-the-job.

4.1 Turnover

If American employers were asked why they do not provide more intensive training to young workers, they would probably point to the high turnover rates of youth as the primary

reason. And indeed, while some American workers stay at their employer for many years, most workers change employers very frequently. Table 10 presents data on how the distribution of job tenure varies across nations. In the 1980s and early 1990s, only 38.3 to 40.5 percent of American workers had been on their current job for more than 5 years. With the exception of Australia and the Netherlands, no other nation had such a low proportion of long tenure employees. The comparable proportions were 63-67 percent for Japan, 59-63 percent for Germany, 58 percent for France, 45 percent for Canada and 45-50 percent for the United Kingdom. For American workers with less than one year of tenure, the probability of a separation in the next 12 months is 59 percent. Since comparably defined turnover is only 32 percent in France, 20 percent in Germany and 24 percent in Japan, national differences in turnover could be a major reason for the low levels of training investment in the US, if the employer's explanation is right (OECD 1984, 1993).

Turnover effects the stock of trained workers in three ways. First, high turnover necessarily implies that a given rate of investment in firm specific skills yields a smaller stock of workers with firm specific skills. Many of those trained have moved on to other firms where the firm specific components of training yield no benefits.

Second, turnover has a powerful effect on employer decisions to provide training to employees. Employers, not workers, finance most of the training that is undertaken in U.S. firms (see section 4.6). Employers will not invest in training unless they believe it will generate a monthly return that exceeds the sum of the monthly turnover rate (generally above 2% per month in the US and sometimes greater than 8%/mo.) and the cost of capital (which is about 1.5 percent per month or 18% per year). Monthly turnover rates are typically much larger than the cost of capital and are also more variable. If turnover is 5% per month and the cost of capital is 1.5% per month, the cash flow yield of the training investment rate of return must exceed

TABLE 10

INTERNATIONAL DIFFERENCES IN THE DISTRIBUTION OF JOB TENURE

	Date	Under One Yr.	Under Two Yrs	Over 5 Yrs	Over 10 Yrs
United States	**(1983)**	**27.3**	**38.5**	**39.6**	**27.2**
	(1987)	**28.8**	**40.1**	**40.5**	**26.7**
	(1991)	**28.8**	**40.4**	**38.3**	**26.6**
Australia	(1981)	25.0	38.8	37.2	19.4
	(1991)	21.4	34.6	39.4	23.3
Belgium	(1972)	--	24.8	51.1	31.4
Canada	(1983)	22.7	33.1	45.3	26.6
	(1991)	23.5	--	44.6	29.4
France	(1978)	--	17.8	62.5	35.1
	(1991)	15.7	26.4	58.0	41.4
Germany	(1985)	--	18.6	63.0	42.1
	(1990)	12.8	23.1	59.0	41.2
Italy	(1972)	--	20.0	49.7	28.0
Japan	**(1982)**	**9.8**	**21.2**	**66.8**	**48.0**
	(1990)	**9.8**	**--**	**62.6**	**42.9**
Luxembourg	(1972)	--	22.6	58.1	41.6
Netherlands	(1972)	--	25.2	50.3	32.1
	(1990)	24.0	39.5	37.6	26.2
Spain	(1992)	23.9	31.6	53.6	39.7
Switzerland	(1991)	17.6	29.3	50.5	32.6
United Kingdom	(1979)	13.8	24.4	52.4	30.5
	(1984)	--	--	51.8	29.8
	(1991)	18.6	31.0	45.2	28.9

Source: OECD 1984, Table 32; OECD 1993 Table 4.1; Buechtemann 1992; BLS Jan 1987)

78 percent per year if the investment is to make economic sense. Even when turnover is a very low 2 percent per month, the required cash flow yield is still quite high: 42 percent per year. Training, thus becomes a sensible investment for an American employer only when it yields very rapid and very large returns. The amount of training employers are willing to finance is negatively related to the projected turnover rate of the trainees.

The third reason why turnover is so critical is its impact on the process of teaching and learning. Turnover disrupts learning regardless of whether the skills being learned are generic or firm specific. Schools teach general skills and follow a common curriculum, yet have great difficult:, when students transfer from one school to another during the school year. Teaching must be adjusted to the special needs of the learner, and it takes time for the teacher to learn of those special needs. Learning occurs best when instructor and learner have a close personal relationship and it takes time to build such relationships. Turnover is thus one of the determinants of the efficiency of the learning production function.

The high rates of turnover in America, then, help explain why investments in on-the-job training are lower in this country than in Japan and Germany.

Why Is Turnover so High in the United States?

One important reason why turnover is high in the U.S. youth labor market is job shopping and tryout hiring. When the match is first arranged, both the employer and the job seeker are poorly informed about each other, so they spend the first months learning about each other and, if they do not like what they discover, they terminate the relationship. If they knew more about each other prior to the hiring and acceptance decision, there would be fewer surprises, fewer quits and fewer dismissals. There are good reasons why try out hiring is so prevalent in the U.S. There are major institutional barriers to the free flow of information about job applicants-- such as EEO testing guidelines, the failure of high schools to send out transcripts and the threat of law suits if bad recommendations are given-- that do not exist in other countries. German and Japanese employers are much more careful in their selection of blue collar and clerical employees than American employers (Rosenbaum and Kariya 1987; Koenig 1987).

A second reason why turnover is higher in the U.S. is that there are fewer legal and contractual obstacles to layoffs and dismissals in the US (Sengenberger 1985; Flanagan 1986; OECD 1993, 105-115). Thirdly, turnover appears to be less costly for young American workers than for young German and young Japanese workers. Spells of unemployment are shorter in the United States. Specific training is more extensive in Japan, and the loss of these

investments is a disincentive to turnover. Transition costs also discourage turnover (Bishop and Kang 1988, 1990) and there is reason to believe that there may be differences across countries in the magnitude of these transition costs. In some countries, quitting or being laid off does serious damage to the worker's reputation and the likelihood of finding another good job. The best Japanese employers hire straight out of high school and are reported to discriminate against those with work experience. The reverse appears to prevail in the US. Quitting appears to be much less stigmatizing in the US than in Japan particularly for young workers.

In Germany, apprenticeships have a three month probationary period during which either party may opt out of the contract without serious consequences. Nevertheless, only 5 percent of apprentices change employers during this period. An apprentice who quits after the probationary period finds it difficult to get another apprenticeship. As a result, nearly 90 percent of those who start an apprenticeship stick with it for the full three years. Those trained at large firms tend to stay with the training firm for many years. Fifty-two percent of those trained by industrial firms with more than 1000 employees are still at the firm five years after completing their apprenticeship. The small (under SO employees) craft oriented firms which provide a disproportionate share of apprenticeship training retain about 28 percent of their trainees five years after the apprenticeship is completed (Haroff and Kane 1993).

When economic conditions force a firm to contract, selection of who to lay of is often based on job performance. This makes a lay off more stigmatizing in Germany than in the US. To protect themselves from this stigma, German workers bargain for employment contracts which reduce the probability of layoffs by front loading compensation and mandating severance pay.

This raises the payoff to employer investments in specific and general training, and the result is greater training investment and higher productivity.

4.2 Cost of Capital

The benefits of training often take a while to be realized. Companies are less willing to make long term investments of all kinds when the cost of capital is high. Because of the large budget deficit and low savings rate, costs of capital are particularly high in the US, so long term training investments are discouraged. German and Japanese corporations face lower costs of capital (OTA 1990a), and this is one of the reasons why they invest so heavily in training. When they move production abroad they take this practice with them. Japanese corporations operating in the US spend a good deal more on training than American companies in the same industry provide (Mincer and Higuchi 1988).

4.3 Loose Labor Markets

High wage American employers have historically found it easy to recruit workers who have already been trained elsewhere. They have not been forced to train their own skilled workers as employers in Germany and Japan have. The greater availability of skilled and semi-skilled workers on the outside labor market has five causes:

* Higher average unemployment rates during the postwar period than in Germany and Japan.

* Higher turnover rates and the short term character of unemployment in the U.S. means that at any given unemployment rate an American firm will receive more applications from trained and qualified workers during a month than a comparable German or Japanese firm. These applicants are not lemons as they tend to be in Japan and Germany. Since layoffs are common and are generally based on seniority in the U.S., there is less stigma to being laid off or being unemployed than there is in Japan and Germany.

* Large wage differentials between firms in the same or closely related industries allow high wage firms to raid the work force of their lower wage competitors. This strategy is available because most industrial unions have not organized their entire industry and because contract provisions are not extended to non-union firms by government edict as occurs in Germany (Soskice 1991, 1993). Wage differentials between different industries and between employers of different size are, consequently, larger in the U.S. than in Germany or Japan (OECD 1985).

* American secondary schools, community colleges and universities began providing occupation specific training to youth and adults many decades before German and Japanese schools and colleges entered this market. The early availability of school based occupational training in the U.S. helped cause the decline of apprenticeship training.

* Licensing restrictions on who can do particular jobs are less prevalent in the U.S., so there are fewer artificial restrictions on who can be hired for a particular job. If already trained workers are not available, American employers can engage in **just-in-time training**. The result is a bias toward an under-trained workforce rather than an over-trained one.

German and Japanese training practices evolved in an era of tight labor markets. Older workers who had been laid off by other employers were too few and were viewed as lemons, so firms sought talented trainees in graduating classes of local schools. American training institutions developed in a very different environment-relatively high unemployment, high turnover, large immigration flows, large numbers of graduates from school based occupational training programs and a free and highly flexible labor market.

4.4 Trainability of Workers

According to the National Assessment of Education (1988b) 93 percent of American 17 year olds do not have "the capacity to apply mathematical operations in a variety of problem settings (p. 42)." Young school leavers in Germany and Japan have a considerably better general education than their American counterparts. This means that they do not require remedial instruction in reading and mathematics, learn new skills more rapidly, and require less instruction to achieve a given level of competence. They are more likely to be able to learn by doing or by reading. With a less capable work force, employers feel they are less able to introduce technologies and methods of operation (e.g. small-lot production, flexible manufacturing systems and high performance work systems) which require that workers be both highly trained and cross trained in a variety of skills (Weiss 1984, Prais 1989, Jaikumar 1986). While basic skills have stagnated in the U.S. since 1965, they have been improving in Europe and East Asia. As the learning ability and technical and mathematical background of a workforce increases, technological progress becomes more rapid and optimal level of investment in equipment and training increase as well.

4.5 Lower Rates of Technological Progress

Studies by Mincer and Higuchi (1988), Bartel and Sicherman (1993) and Tan et al (1991` have found that workers in industries experiencing high rates of technological progress receive me-a training than workers in industries with low rates of technological progress. This finding is consistent with a view that heavy investments in training cause increases in productivity, but it is also consistent with a view that causation also runs in the opposite direction-- high rates of investment and technological progress increase the demand for and the profitability of training. Because the U.S. had such a large productivity lead at the end of the Second World War, American productivity growth in the postwar period has necessarily been below that of Germany and Japan. This has no doubt contributed to the lower level of training investment in the US.

4.6 Transmitting Information about a Worker's General Skills

In the U.S. labor market, hiring decision makers have a very difficult time assessing the quality of the general human capital obtained from on-the-job training at previous jobs. This fact increases turnover, lowers wages, and lowers productivity. Since part of the reason for getting general training is to improve the worker's marketability with other employers, not recognizing the benefits of this training reduces the incentive to invest in general on-the-job training.[11] Doing an especially good job of training employees will benefit the trained workers when they leave the firm only if the firm develops a reputation for being a good trainer.[12] Past

experience with the former employees of a firm is probably the primary determinant of a firm's reputation as a trainer. Large firms that turn over a reasonable share of their trainees are likely to develop a reputation (good or bad) for the training that they provide. A positive reputation for providing good training helps their separating employees find better jobs, and this in turn helps the firm recruit the best possible candidates when it is hiring. The armed forces are aware of this, and consequently spend millions of dollars advertising the quality and civilian usefulness of their training.

Most young workers without a baccalaureate degree, however, do not obtain jobs at the large firms with established training reputations. The smaller less well known firms where they find their first job are typically unknown quantities when it comes to the quality and general usefulness of their training.

The lack of full reward for improvements in general skills if one leaves one's current employer affects the incentives for the trainer and trainee to devote time and energy to learning general skills. The higher the worker's likelihood of leaving the firm, the lower is that worker's incentive to devote himself or herself to learning general (or specific) skills that are not immediately visible to other employers. This means that the under investment in general OJT is greatest for temporary and seasonal employees and for young people as a group (Bishop and Kang 1988).

The poor quality of the information about a job candidate's general skills and the resulting under investment in general training (both on the job and in schools) is a major institutional flaw of U.S. labor markets. Formal systems for certifying the competencies gained through on-the-job training exist in the United States, but they have not achieved the widespread usage they deserve (Wills 1993). The apprenticeship systems of Switzerland, Austria, and Germany are probably the best examples in the world of widespread and effective systems of on-the-job training and competency certification. One of the most important features of these apprenticeship systems is the requirement that the apprentice pass written and practical examinations covering the occupation's curriculum. If an employer cannot provide training in all the skills included in the curriculum, it is must arrange for their apprentices to receive instruction at another firm or at a special employer-run school. The examinations are set and scored by a local committee of masters (skilled workers) and employers so the quality of the training provided by the master and the firm is put to a public test. Passing this apprenticeship exam is of benefit not only to the trainee, it is important to the masters as well, for both their reputation amongst their peers and their ability to recruit high-quality apprentices

depends upon it. As a result, 90 percent of German apprentices remain at one employer for the full 3-year apprenticeship period, and 90 percent of these pass their test (on the first or second try). The apprenticeship systems of the English-speaking nations are based on time served rather than competencies achieved and are considerably less successful in standardizing and upgrading the training that occurs.

The examination at the end of the training process is the key to maintaining quality control. In the late 19th century, the Swiss educational/training system went through a period of crises and self-examination not unlike what is now happening in the United States and the United Kingdom. The nation had to export to survive but the quality of workmanship was low and deteriorating. The Swiss assigned blame to their apprenticeship system and proceeded to reform it by ending apprenticeship based on time served, establishing a standardized curriculum, and instituting written and practical examinations set by local committees of employers and workers. The high standards of workmanship for which Swiss workers are renowned are not an inherent trait of national character but rather are the consequence of the institutions that teach, test, certify, and publicize this workmanship.

The standardized curriculums and the proficiency exam at the end of the apprenticeship mean that the quality and nature of the training is well signaled to employers in Germany, Switzerland and Austria. The result is that the worker can count on benefiting from doing a good job in their apprenticeship even if the training employer does not keep them on. Since the future payoff is certain, German apprentices are willing to start out at a wage that is only about one-quarter of the wage they will be able to command at the end of the apprenticeship. If the apprentices were adults, they could not afford to accept so low a wage. Beginning apprentices, however, are generally teenagers who can save on living costs by living at home. Consequently, the liquidity constraints which are such a barrier to heavy investments in general training in the US are less of a problem in Germany.

In summary, there are a number of very good reasons why American employers invest less in training than employers in Japan and Germany. This does not necessarily imply, however, that the differential is caused by some failure of the American training market that requires remedy. It could be argued that the American just-in-time approach to on-the-job training is more efficient than the German broad apprenticeship strategy. The lower levels of training investment might be a necessary adaptation to the higher rates of turnover that result from the relative absence of government imposed barriers to dismissals and layoffs. Whether

or not the American training market is failing to provide the socially optimal level of training is a different issue; one to which we will now turn.

5. FROM SOCIETY'S POINT OF VIEW "DO MOST US EMPLOYERS AND WORKERS UNDER INVEST IN ON-THE-JOB TRAINING?"

This section of the paper reviews what is known about whether the training market in the United States provides a socially optimal quantity and quality of employer training. Six potential sources of market failure-wages and hours regulations, real externalities, network externalities, tax induced distortions, liquidity constraints and barriers to the flow of information about job applicants-- are examined. Each of them are found to operate to some degree in some training markets. Empirical evidence on the market failure issue is examined in section 6. There appears to be a good deal of evidence that employers are sharing the costs and benefits of general training with employees and are thereby effectively determining how much on-the-job training occurs. If so, the socially optimal level of training is likely to be greater than the level chosen by profit maximizing firms.

5.1 Wages and Hours Regulations

Maximum hours legislation presents employers with the following dilemma: either (a) don't provide training in general skills like reading or word processing that will improve a worker's productivity in "heir current job or (b) provide such training and pay all of its costs-- instructional costs and trainee time costs. No matter how general the skill nor how voluntary the decision to take training, if it raises productivity in one's current job and is provided by the employer, the worker must be paid while engaged in training. Workers and employers are prohibited from cutting the following deal-- the company will provide instructors, classrooms and certification, while the worker will commit uncompensated time to learning general skills that enhance productivity (Bureau of National Affairs 1993, 97:3208). Schools can offer such a deal, employers cannot. These regulations have two pernicious effects: they discourage employers from organizing formal training in general skills and they force workers who seek such training to get it at a school. Since school based training of adults not paid for by the employer has no effect on wage rates, the regulations effectively push many workers into a type of training that turns out not to benefit them. **This constraint on how workers and employers share the costs of general training provided at the workplace is probably a very important source of market failure in the training market.**

The other way workers can share the costs of general training is by accepting lower wage rates during the training period. Under current regulations this is not really possible for short intermittent spells of training voluntarily undertaken by individual workers. For new hires, however, flexibility is greater because wages customarily rise with tenure on the job. In some low wage jobs, however, the minimum wage constraint is binding. Young inexperienced workers are, in effect prevented from bidding for training opportunities by offering to work for a low wage. Employers can respond either by simplifying the job or asking schools to take over the responsibility for initial training.

Lacking the ability to get employees to pay a major share of the costs of general training (by accepting a low wage during the training period or doing the training on one's own time), employers will adopt production technologies that minimize the skill requirements of the job. The evolution of the diner and the small, family-operated restaurant into franchised fast food operations using specially designed machines and prepackaged food is an example of how this is accomplished. By reducing the skills required to do the job, the employer shortens the time it takes for new employees to reach maximum productivity. The same people may have the job but they are taught less, and what is taught is useful primarily at that firm-- not elsewhere. Opportunities for promotion are minimal and wage increases are small.

A second impact of the minimum wage and maximum hours legislation is that the forced increase in the wage during training is partially compensated for by a reduction in wage rates during the post-training period. This increases the quit rate, which in turn reduces the payoffs that employers receive from training and, therefore, their willingness to make such investments or to hire individuals who require substantial training investments. Empirical studies by Hashimoto (1982) and Leighton and Mincer (1981) provide support for this view. Maximum hours legislation is probably an even more significant barrier to general training, but there are no empirical studies of this issue. More on this in section 11.1.

5.2 Real Externalities

The primary justification for public control and subsidy of schooling and public involvement in other forms of education and training is the fact that the individual who gets the education and training receives only part of its benefits. When deciding on the type and amount of education and training to undertake and how hard to study while at school, most individuals are taking only private benefits into account. The private benefits of an educational experience are many: the enjoyment derived from being a student or pleasing mom and dad, the higher after-tax income, the prestige and consumption benefits of having an education (or

a job that requires heavy on-the-job training), the private benefits of improved health, and so forth. These private benefits account for only part of the total benefits to society of education and training, however. People who have received more or better education and training or who achieved more during the experience benefit others in society by paying higher taxes, by making discoveries or artistic contributions that benefit others in the society, by being more likely to give time and money to charity, by being less likely to experience long periods of hospitalization that are paid for by insurance or government, and in many other ways (Haveman and Wolfe 1983). Economists call social benefits such as these "spillovers" or "externalities." Private decisions will lead to an insufficient quantity and insufficient quality of education and training and insufficient achievement by students, unless public agencies intervene and partially subsidize the cost or add to the rewards. The appropriate amount of public subsidy is closely related to the size of the spillover or externality benefits of education and training. Training produces two kinds of real externalities:

Poor Signaling of General Skills to Other Employers: The training provided by one employer benefits other employers and consumers, not just the trainee and his/her employer (Bishop 1994). The worker is more productive in future jobs, but these employers do not perceive accurately the quality of the general OJT received by the worker and, as a result, do not fully compensate the trained worker for their higher productivity. Bishop's (1994) study of the relative productivity and the profitability of new hires obtained results that are consistent with this hypothesis. New hires who had received formal off-job training sponsored by a previous employer made significantly more suggestions designed to improve productivity were more productive and profitable and were less likely to be fired. If one accepts these findings as valid, the implication is a market failure which reduces the payoff to worker investments in OJT. The ultimate cause of this problem is the lack of effective signals of the quantity and quality of training.

Discoveries and Disasters Attributable to Training: High quality training benefits customers and the public as well as the trainer and the trainee. When, for example, the dancers of the New York City Ballet receive excellent training, the company benefits through greater ticket revenue but the audience benefits as well because they derive a larger consumer surplus from the performance. The COMSAT employee who figured out how to double the lifetime of communication satellites by judicious use of the rocket fuel remaining on board, benefited customers and competitors at least as much as he benefited COMSAT. The Aloha airlines pilot who landed his plane after an explosive decompression and the loss of a

major section of his plane, certainly raised the lifetime earnings of his passengers. On-the-job training and experience were critical to the COMSAT discovery and the safe landing of the Aloha plane.

When a worker screws up because of poor training, the customers and the general public often lose just as much as the worker and the company. Examples of disasters caused or contributed to by poor training are legion: Chernoble, Three Mile Island, Exxon Valdez, the shoot down of the Korean Airlines 747 (pilot error caused the plane to be off course), and Greyhound bus crashes in New York State. Tort law internalize some but not all of these costs. A study of egregious physician errors in New York State found that only one-eighth of them resulted in a malpractice claim. Damage awards are typically paid by insurance funds that are imperfectly experience rated. Where the public interest in insuring top quality training is manifest to all, training is often regulated or subsidized by government. The Federal Aviation Administration, the Department of Transportation and the Nuclear Regulatory Commission, for example, engage in such regulation.

However, for every big discovery or disaster that gets media attention and generates a political response, there are millions of little discoveries, unrewarded services, or unanticipated product failures that directly effect consumers that do not generate political responses. Since customers lack low cost access to accurate information on the quality of what they are buying, the prices paid do not fully reflect quality differentials between different providers. As a consequence, training which enhances quality and reliability often generates benefits for customers which are not recognized or rewarded by the market.

5.3 Information Asymmetries and Network Externalities

A third reason why workers and firms under invest in general training is network externalities. Many of the skills taught in company training programs are new methods of two-way communication or become the basis of new ways of interacting with customers, suppliers or other workers. Examples of the first are E mail, Internet protocols, programming languages and group problem solving strategies. Generic applications software used in many different companies—e.g. spread sheet, database, project scheduling, and CAD-CAM software-- are examples of the second phenomenon. E mail is a convenient way of scheduling meetings and communicating with suppliers if they are all regular E mail users. If, however, many recipients of an E mail message do not get it in a timely manner, E mail becomes an impediment to communication not a facilitator. Similarly, communication among the engineers designing an automobile is greatly facilitated by the use of the same CADCAM software.

Since applications software become a mode of communication among employees, the selection of which program to standardize on must be centralized. To keep up with the periodic upgrades of the program, training must be continuous. Employers will be better informed about the technological uncertainties and, therefore, better able to select which skills need to be learned and be more willing to bear the risk of the investment.

Furthermore, the marginal benefit of an additional worker learning an applications program increases as the share of employees at firm A who know and use the program approaches 100 percent. If the firm were to expect workers to pay some of the costs of learning the software application, it would not be able to demand that all workers learn it and the network benefits would not be realized. Since federal wage and hours regulations mandate that workers be paid during required training programs, a firm that wants everyone in a job category to develop a particular general skill must pay the full costs of the training.

An additional reason incumbent workers are reluctant to pay for training in these fast changing applications programs is their fear that they may be left stranded by a company decision to switch to another only partially compatible applications program. The way the firm assures its workers that it will be conservative about such switches is for it to offer to pay any training costs that result from a switch.

Since some trainees end up working elsewhere, other companies benefit from the training provided by firm A. Their cost of teaching the new applications software is reduced because some of their recent hires already know it and can help the novices learn it. Workers who learn generic applications software are more attractive on the outside labor market and, as a result, receive higher wage rates if they leave. Indeed the firm that provided the training may have to raise their wage to forestall such quits. Despite the fact that the worker benefits substantially from learning the skill, the employer pays the full costs of the training (both instruction and time costs) because the network benefits of facilitating communication within the company are so large. While some of the firm's employees would have been willing to share the costs or the training, the firm is not able to offer different cost sharing deals to different employees.

Now lets look at how decisions to introduce E-mail or standardize on a new applications software are made. The employer will decide to innovate and train if he expects the productivity increases at his firm will be larger than the sum of the training costs and the higher wages he will have to pay to retain his newly trained workers. Even though they count as social benefits, the higher wages he must pay to retain workers, the higher wages that

departing employees receive, and the savings in training costs at other firms are not a plus in the employer's eyes. Furthermore, a delay is likely to lower the cost of the investment because new employees who already have the skills needed for the innovation can be hired in the interim. Thus social benefits of innovation and its associated training are substantially larger than the private benefits, and particularly so when turnover rates are high. Under investment in this type of training is the result.

5.4 Tax Induced Distortions of the Training Market

The Non-Deductibility of Some Training Expenses-- The benefits of training are taxed, but not all of the costs are deductible.[13] Some of the time that trainees devote to employer sponsored training comes from reducing leisure time. Employees taking job related college courses typically attend classes on their own time and always do their homework on their own time. Japanese workers frequently take correspondence courses related to their job and, when rotated to a new job, they take home and study the meticulous description of how the job is done that was written by previous occupants. Japanese supervisors are expected to fill up slack time with training. When Ronald Dore presented his passport at an out of the way port of entry that seldom sees British passports, the supervisor called his younger colleagues over and taught them about its intricacies while Dore looked on. This little training session delayed passengers somewhat and necessitated a sacrifice of on-the job leisure but output-- the number of passengers processed-- did not change (Dore and Sako 1989). Incentives to undertake training are distorted if government does not share in the costs of training to the same degree it shares in its rewards. When training time displaces leisure time, that is what happens.

The Progressive Income Tax: The second tax induced distortion arises from the fact that investments in OJT are typically made at a time when the individual has no tax liability or a lower-teen-normal marginal tax rate and the benefits are received when earnings and marginal tax rates are higher. As a result, the after-tax benefits of an OJT investment are reduced more than the after-tax costs and such investments are discouraged. Firms, on the other hand, train continuously, so the marginal tax rates faced when the costs of training are incurred and deductible are no different from those faced during the payoff period.

5.5 High Borrowing Costs and Liquidity Constraints

The fifth reason why society subsidizes schooling is the failure of the free market (in the absence of publicly funded loan guarantee programs) to offer loans to young persons seeking to invest in their education. The government recognized long ago that people going to school needed access to low-interest, government guaranteed loans. Workers investing in general on-the-job training have a similar need but are not eligible for such loans unless they happen to be part of a training program run by an accredited educational institution.

Because of the fear of turnover, employers are reluctant to pay for general training that is visible and useful in other firms. If the employer is not willing to pay for general training, it will be offered only to those workers who pay for it by accepting a lower wage during the training period than could be obtained elsewhere. The more intensive the training, the greater the required reduction in wages will have to be. Many workers are unwilling to accept a large reduction in their current standard of living, and, since they are unable to borrow at reasonable interest rates, they forego the investments in general on-the-job training.[14] If they do fund such investments, they do so only if extremely high rates of return are obtained.

Most young workers are liquidity constrained-- that is they are unable to shift as much consumption from the future into the present as they would like because they have neither assets which can be depleted nor access to credit at reasonable terms. Half of households headed by someone under the age of 25 have less than $746 in financial assets and 19 percent have no financial assets at all. Half of households headed by someone between 25 and 34 have less than $1514 in financial assets and 13 percent have none (Survey of Consumer Finances 1984). Subsidized or guaranteed student loans are not available to finance on-the-job training and banks will not lend money for this purpose without collateral. Borrowing against the equity in one's home is a possibility for some but only 34 percent of households with heads under the age of 35 own a home and many of the houses have been owned for only a short while, so the equity that can be borrowed against is small. Even with collateral, the loans available to individuals usually carry higher interest rates than those charged businesses. Studies of the willingness of consumers to substitute consumption over time have all concluded that the intertemporal elasticity of substitution is no higher than one and most studies conclude it is .5 or below (Friend and Blume 1975; Hall 1988; Hubbard and Judd 1986). A substitution elasticity of .5 implies that reducing a liquidity constrained worker's wage by one half (in order to pay for general training) roughly quadruples the worker's marginal utility of consumption. Such a worker would be willing to give up four dollars of future

income in return for one dollar of current income. The liquidity constraint phenomenon has little effect on the wage profile of jobs requiring no general training and which, therefore, have a flat wage profile. Where significant general training is occurring, however, it comes into play and may result in an employment contract in which the employer shares the costs of general training (Glick and Feuer 1984; Feuer, Glick and Desai 1987).

Firms are thus more willing than workers to trade off future earnings for present earnings. The compensation packages that result from the asymmetric access to capital markets and the progressive tax structure reflect the worker's strong preference for compensation now rather than later. In fact, firms offer new hires a loan that will be canceled if a separation occurs. Firms do not require repayment of the loan when separations occur for the same reasons that banks do not offer large unsecured loans without a government guarantee of payment. The administrative costs of obtaining repayment are extremely high and bankruptcy is a real option for someone with zero assets. Firms, however, undertake to finance some of the costs of general OJT only when their investment yields a return that is sufficient to pay for both the cost of capital and the risk of turnover. This reduces employer investments in general on-the-job training below the level that would have prevailed if workers were able to borrow at the same interest rates as employers.

5.6 Barriers to Careful Selection of New Hires

Governmental institutions and regulations are an important reason why American employers do a poor job of selecting entry level workers and experience very high rates of turnover. American employers are not able to obtain good information on the skills and competencies of young job applicants largely because of barriers to the free flow of information about job applicants-- such as EEO testing guidelines, the failure of some high schools to send out transcripts, large variations in grading standards across schools and across courses within a school, and the threat of law suits if bad recommendations are given.

The worker trait that best predicts turnover is dependability and work habits (Hough 1988, Bishop 1993a). Reference checks (at both schools and former employers) are one way to assess this trait. However, the threat of lawsuits by former employees who have had difficulty finding a new job because of unfavorable references has made many employers reluctant to give honest references. Personnel offices are particularly sensitive to the legal dangers of giving references, so the information content of their references has deteriorated the most. Bishop (1993a) found that most of the references given by personnel offices were misleading. New hires who were vouched for by the personnel office at a previous job and for

whom no reference was obtained from a previous supervisor were 11 percent less productive than expected, 12 percent less productive at the time of the interview and considerably less profitable than other new hires.

Employers believe that school performance is a good predictor of job performance and turnover[15], but they have great difficulty getting such information. If a student or graduate has given written permission for a transcript to be sent to an employer, the Federal Education Rights and Privacy Act obligates the school to respond. Many high schools are not, however, responding to such requests. In Columbus Ohio, for example, Nationwide Insurance sent over 1,200 requests for transcript information signed by job applicants to high schools in 1982 and received only 93 responses.

An additional barrier to the use of high school transcripts in selecting new employees is that when high schools do respond, it takes a great deal of time. In most high schools, the system for responding to transcript requests has been designed to meet the needs of college-bound students rather than the students who seek jobs immediately after graduating. In 1987 only 14 percent of small and medium sized employers obtained transcripts prior to hiring high school graduates and only 15 percent asked about GPAs. The absence of questions about grades from most job applications reflects the low reliability of self reported data, the difficulties of verifying it, and the fear of EEO challenges to such questions.

Hiring on the basis of recommendations by high school teachers is also uncommon. In the NFIB survey, when a high school graduate was hired, the new hire had been referred or recommended by vocational teachers in only 5.2 percent of the cases and referred by someone else in the high school only 2.7 percent of the time.

Tests are available for measuring competency in reading, writing, mathematics, science, and problem solving, but, after the 1971 Griggs decision, most firms stopped employment testing because EEOC guidelines made it very costly to demonstrate the validity of tests assessing competence in English and mathematics.[16] Before such a test could be used, the firm had to conduct an expensive validity study of the proposed test and alternative tests at their own work sites (Friedman and Williams 1982). In 1987 only 3 percent of small and medium sized firms gave applicants a test of basic skills.

Other countries handle the signaling of high school accomplishments to prospective employers much more effectively and have lower turnover rates as a result.

5.7 Evidence of Under Investment from the High Rates of Return to OJT

If there is under investment in general OJT, we would expect to find private rates of return to OJT to be very high. The studies that have estimated the wage return to OJT investments by workers suggest that rates of return may be quite high. Rosen (1982) estimated that the real rate of return to worker investments in OJT was 12.6 percent per year for those who went to college and 19 percent for those who did not attend college. These rates of return are considerably higher than the real rates of return of about 4 percent on corporate bonds and of about 5-10 percent for schooling. Some estimates of rates of return to training are even higher (Mincer 1974, 1989). These efforts are fraught with difficulties, however, because it is very difficult (a) to measure what employees [as opposed to employers] invest in training and (b) to distinguish wage increases caused by training from wage increases caused by selective turnover or the need to discourage shirking by back-loading compensation packages.[17] Lack of data on the productivity effects of training has meant that the total returns to employer and employee investments (both general and firm specific) have not generally been evaluated.

6. DO EMPLOYERS SHARE THE COSTS OF GENERAL TRAINING?

An easier way to empirically examine the issue of the under provision of training is to study whether the training market indeed behaves in the way predicted by standard theory. The theory of on-the-job training says that the worker pays the full costs of general training by accepting a lower wage rate while. training is underway and then reaps the full benefits in the form of a higher wage rate regardless of whether there is subsequent turnover. Is this correct? Do workers pay <u>all</u> the costs of and receive <u>all</u> the benefits of training in skills that are useful at other firms? Do workers and employers share the costs and benefits of specific training? If these propositions are false and employers are being induced to share the costs of general training by the prospect of sharing its benefits, under provision of general training is probable. It probably means (a) that federal regulations which require employers to pay workers when they engage in training that improves productivity in one's current job have indeed prevented the cost sharing arrangements predicted by theory, (b) that network externalities are important, (c) that workers are liquidity constrained and/or (d) that general skills are poorly signaled to the labor market. **If employers are paying some of the costs of general training, they are not doing it for altruistic reasons. They are comparing the training costs incurred to the expected productivity benefits the firm will receive from the workers who stay at the firm. Benefits received by other employers and by the trainee will have zero weight in their**

calculation. Turnover, thus, causes the firm to take only a portion of the true social benefits of general training into account and under provision results. Therefore, it is important to determine whether employers are sharing the costs of general training. What do we now know about this issue?

6.1 Cross-section Studies of Starting Wage Rates

Standard theory predicts that workers who find jobs which offer extensive general OJT will receive substantially lower initial wages than workers who take jobs which do not offer general training. The problem with this prediction is that analyses of large representative data sets generally fail to confirm it. In Parson's (1985, table 7.6) study, when a youth reported that it was "very true" that "the skills [I am] learning would be valuable in getting a better job", his job paid on average 2.4 to 14 percent more than when the above statement was "not at all true" even with an extensive set of controls for schooling and academic achievement included in the model (Parsons 1990).

Bishop and Kang (1988) have conducted another test of this hypothesis in the 1984 follow up of the High School and Beyond seniors by regressing the log of the deflated starting wage of the current or most recent job on indicators of the receipt of employer sponsored training. Here again, the jobs offering some training rather than none or which offer greater amounts of training paid higher starting wage rates even when a whole array of human capital characteristics were controlled. For females the positive effect of receiving training on the starting wage was statistically significant. Adding dummies for occupation and industry did not change the results appreciably.

Lynch's (1992) analysis of 1983 NLSY data on workers with less than a bachelors degree found that, controlling on occupation, industry, tenure, experience, schooling and background characteristics, workers who were in the 20th week of an incomplete spell of on-the-job training were paid a significant 5.2 percent extra on average. Dissaggregating by worker education revealed that it was workers with 12 to 15 years of schooling who were paid more when they were being trained. Workers with less than a high school degree, on the other hand, were paid less (though non-significantly so) when they were receiving training.

Patrice Flynn's (1990) analysis of monthly earnings data in the Survey of Income and Program Participation found, that controlling for size of establishment, tenure, experience, schooling, previous training and demographic background (but not occupation), those currently receiving employer provided training earned a statistically significant 5.7 percent less on average. Lillard and Tan's (1986, Table 4.3-4.5) analysis of NLS Young Mens data and Barron,

Black and Loewenstein (1989, Table 2) analysis of EOPP data found no significant tendency for wages to be lower while training is underway. Point estimates were negative, but so small they might as well be zero from a substantive point of view. Barron, Berger and Black's (1993, Table 1) cross section analysis of the SBA financed survey found that doubling on-the-job training intensity lowered the starting wage rate by a significant 2 to 4 percent. Doubling the off-site training intensity, however, was associated with a 4 percent higher wage. Even where training is associated with lower wage rates, the magnitude of the effect appears to be much too small to be consistent with standard theory.

It can be argued, however, that these findings do not constitute a decisive refutation of the proposition that workers pay all of the costs of general training and share the costs of specific training. Maybe the anomalous findings are caused by unobserved heterogeneity. The argument is that hiring decision makers are better at assessing the ability of job candidates than econometricians with access to NLS or HSB data files and the positive association between wages and training arises because workers who are highly able (in ways not observed by the econometrician) are both paid more and also recruited for jobs that are more complex and that consequently require large amounts of training.

Unobserved heterogeneity no doubt has the effect of contributing to the positive association between training and starting wage rates, but to transform a large negative structural relationship into either zero impacts or statistically significant positive relationships, sorting of more able job applicants into high training jobs would have to be very powerful indeed. If such a selection process were operating, access to training should depend on ability factors that are visible to the analyst as well as on factors that are not visible to the analyst. Yet models predicting training participation shortly after leaving school estimated by Parsons (1985) and by Bishop and Kang (1988) failed to find large effects of ability proxies such as test scores, grades, and being a disciplined student on the probability of receiving training. On the other hand, Bartel and Sicherman (1993) and Veum's (1993) analysis of 1986 to 1990 NLSY data found that, once the youth had been out of school for many years, workers with high 1980 test scores were considerably more likely to receive company training and to be sent to seminars. Unfortunately, these analyses do not control for occupation and industry, so some of the positive relationship uncovered is probably due to occupational selection.

Another way to control for heterogeneity is to follow workers over time and assess whether entering a training program lowers wage growth. Lowenstein and Spletzer's (1993 Table 4) study provides separate estimates of the effect of complete and incomplete training

spells on wage growth. They found that those in the midst of incomplete spells of training did not suffer wage declines relative to those who received no training during the previous year. Paul Langermann's (1994) study of NLSY data also found no statistically significant reductions in wage rates for those receiving training.

Another possible explanation of these anomalous findings is that almost all training is specific and employers finance all of its costs. But standard models of the sharing of the costs of specific training do not predict that employers pay all of its costs and some of the revisionist theories [e.g. Salop and Salop's (1976) adverse selection theory] predict that employers pay none of the costs of specific training. A specific training explanation of these findings is particularly perplexing when to all outward appearances the training is largely general.

Further evidence that unobserved heterogeneity and highly specific training can not explain these anomalous findings comes from five types of studies which avoid the unobserved heterogeneity problem by holding the job or the individual being trained constant: (a) comparisons of new hires who require large and small amounts of training (b) evidence that some employers pay for training, in completely general skills such as mathematics and problem solving, (c) detailed studies of the costs of apprenticeship training and who pays these costs, (d) comparisons of the productivity growth and wage growth of new hires, and (e) econometric analyses which compare the productivity growth and wage growth impacts of general training received by the individual.

6.2 Impact of Training Requirement Differentials on Relative Wage Rates

One way to deal with the unobserved heterogeneity problem, is to pick a particular job and compare individuals hired for that job while holding job performance realizations constant. Workers hired for the same job often have different amounts of relevant work experience and so require different amounts of training. Who pays for the additional costs of training an inexperienced worker? Are workers who require extra training forced to accept much reduced starting wage rates? Or does the employer bear most of the additional costs, haling to recoup these costs by limiting the wage increase after the completion of training? Bishop (1987) presents an empirical analysis of EOPP data which addresses this question. He regressed the difference between the starting wage rates of two new hires for the same job on differences in their productivity and training time requirements. Workers who required extra training time were offered lower starting wage rates, but the effect was small. Holding productivity outcomes constant, workers who received 100 extra hours of training during the first 3 months on the job were paid 3.3 percent less both at the start and after one year or so on the job. Barron, Berger

and Black (1993 Table 4) analysis of SBA data obtained similar results. Even though about a third of the new hires received more or less training than was typical for the job, wage rates differed from the typical level only 6 percent of the time.

6.3 Employer Sponsored Workplace Literacy Programs

While the number is currently small, a growing number of firms are training their workers in completely general skills such as mathematics, reading, writing, problem solving and interpersonal skills. Based on a telephone survey that achieved a remarkably good 66 percent response rate, Laurie Bassi (1992) has estimated that 10 percent of manufacturing firms with fewer than 500 employees and 8 percent of similarly sized nonmanufacturing firms offered such training at the work site and provided at least partial release time for participation. Hollenbeck and Anderson's (1992) survey of Michigan firms with workplace literacy programs also found that most (81 percent) gave their workers released time when they participated in the training. The National Household Education Survey found that less than one percent of all workers had participated in a workplace literacy program in 1991, but those that did participate spent an average of 80 hours in the program. One-third of participants said it was required by their employer, 54 percent said they were given time off to attend and 49 percent said the costs of the training were paid by their company (Hollenbeck 1993).

The fact that many companies required worker participation indicates that literacy training is not a new form of untaxed compensation. Indeed one of the reasons why some companies do not offer such training is a concern that workers will feel demeaned by a suggestion that they need to improve their reading and arithmetic skills. To avoid such a reaction, the basic skills training is often integrated with workplace technical training. The word literacy is never used (Mikulecky 1989). Companies with such programs believe the training has raised morale, company loyalty, communication on the job, teamwork, quality of output, productivity and customer satisfaction (Bassi 1992 Table 11A). Clearly, some companies feel strongly enough about the need for their workers to improve these general skills, they were willing to pick up most of the costs of developing skills which are highly useful at other companies and in everyday life.

6.4 Employer Sponsored Computer Training at Temporary Help Agencies

Even temporary help agencies provide general training to their workers. Alan Krueger's (1993) survey of 83 temporary employment agencies found that 59 percent of them provided free up-front computer training for the workers they place. Training costs were shared: the worker committed her time and the agency provided an instructor and training facilities. The

agencies were willing to share general training costs because secretaries proficient in word processing generated substantially higher weekly fees when placed and the worker received only half of the increment.

6.5 Studies of the Sharing of Apprenticeship Costs

Studies of who pays the costs of apprenticeship training have been conducted in Germany, Great Britain, and the United States (Noll et al 1984; Ryan 1980; Jones 1985; Weiderhold-Fritz 1985). Despite the transferable character of the training and significant turnover, these studies concluded that employers made large investments in general training that were not recovered during the apprenticeship. A welding apprenticeship program at a major U.S. shipyard was the subject of the first of these studies (Ryan 1980). The wage profile was quite flat-starting at $3.99 and topping out at $5.26 after about two years on the job-- even though the investments in general training were very considerable. Inexperienced new hires spent 36 days in vestibule training before beginning work. During the first week following vestibule training, the trainee's output net of repair requirements was less than 10 percent of an experienced worker's output. Thirty-seven weeks after being hired it reached a level of 55 percent and at 60 weeks a level of 80 percent of an experienced worker's output. Despite the fact that the local economy was in deep recession, separation rates were extremely high: 10.8 percent per month for beginners and 6.3 percent per month for those with 12 to 24 months of tenure. The shipyard accounted for about one-fifth of the welding jobs in the area. When trained welders left the shipyard, they typically found better paying welding jobs at other local employers. This evidence clearly establishes that the shipbuilding company was contributing to the costs of general training.

The study of German apprenticeship training by the Bundersinstitut fur Berufsforschung found that in 1980 training costs ranged from a high of 25,200 DM per year for telecommunications technician apprentices to 2400 DM for apprentice gardeners and averaged 10,300 DM or $5668 per year at 1980 exchange rates. The apprentice's contribution to output, which was netted out to arrive at the above figure, averaged 6700 DM per year (Weiderhold-Fritz 1985).

Jones' (1985) study of apprentice training in the engineering industry in Great Britain found that the employer's training costs were 1.31 times the annual payroll costs of a skilled worker and the apprentice's contribution to output (which was netted out in calculating the estimate of employer costs) was 1.26 times the payroll costs of a skilled worker. Thus even

major upward revisions of these estimates of the apprentice's contribution to output would not change the basic conclusion that employers appear to be sharing the costs of general training.

6.6 Comparisons of Wage Growth and Productivity Growth

In EOPP data, newly hired workers in jobs which provide training in skills which were useful at other firms received real wage increases of only 5 to 6 percent in the first year and 2 to 6 percent in the second year on the job. The gain in productivity was 26 to 30 percent during the first three months (between an initial average for the first two weeks and an average for weeks 3 through 13) and another 19 to 25 percent by the end of the second year at the job. The productivity gains were largest in jobs with training that developed skills of some generality. The increase in the worker's reported productivity was significantly greater than the 8 to 12 percent increase in the worker's real hourly compensation during the first two years at these jobs (Bishop and Kang 1990). This occurs even at the jobs in which training was reported to be almost entirely general and for which there are many local firms that also need the skills in question.

6.7 Econometric Studies of the Productivity and Wage Growth Effects of Training

Becker's theory predicts that **when training is general, its impact on wage growth should equal or exceed its impact on productivity growth.** Bishop's (1991) cross section analysis of EOPP data discussed in section 3.3 contradicts this prediction. When proportionate rates of wage and productivity growth during the first year or two of tenure on a job were regressed on time spent training the individual, productivity effects are many multiples larger that wage effects. Barron, Berger and Black (1993) came to a similar conclusion: "Using both the EOPP and SBA data, however, we find little evidence that workers bear a substantial portion of the costs and benefits of training." How can these puzzling results be explained?

One explanation that doesn't fit is that the training is specific to the employer and the employer is financing all of its costs. There is direct evidence that most of the training is general. Employers in the EOPP survey were asked, "How many of the skills learned by new employees in this job are useful outside this company?" Fifty-nine percent responded "almost all," 13 percent responded "most." Only 7.5 percent answered "almost none:' When managers provided training in almost completely general skills, doubling training intensity raised productivity by 6.7 percent but wages by only 0.8 percent in a logarithmic model and raised productivity by 3 percent while increasing wage growth by only 0.96 percent in a linear model (Bishop 1991).

7. WHY DO EMPLOYERS SHARE THE COSTS OF GENERAL TRAINING?

Why might it be rational for employers to partially finance training in skills that they describe as useful at other firms?

Probably the most important reason why firms pay for general training is federal regulations which require firms to pay their workers while they receive employer sponsored training that increases productivity on their current job (even when the training is voluntary and the skill is useful at other firms). Given this regulation, the only way workers can pay for general training (as predicted by theory) is for them to receive a reduced wage rate during the training period. This is feasible for entry level training, if the minimum wage constraint is not binding. However, for more senior workers, a wage reduction during voluntary training in new computer applications programs or other general skills would probably be forbidden by federal wage and hour:, regulations. Wage structures reflect a host of efficiency and equity considerations. Even in non-unioir settings, changing them is very costly--particularly if compensation is being lowered. Hence when technological change makes a new general skill valuable, the firm must decide whether to provide the training in that skill under the constraint of its predetermined wage structure. By prohibiting the firm from asking workers to take training during uncompensated time, federal wage and hours regulations effectively prevent the firm from inducing its workers to share the costs of training in this general skill.

In the absence of such regulation, would employers voluntarily offer to share the costs of training in general skills? Maybe.

Different firms require different mixes of general skills. The firm that does the training concentrates on those skills it needs the most, some of which may not be as highly valued by alternative employers. Skills that would be highly valued by an alternative employer may not be taught because others on the staff already fulfill that function. A particular employer may expect its employees to use Word Perfect for word processing, Lotus 1-2-3 for spreadsheets and Harvard Graphics for presentations. Other firms in the area may have selected a different mix of software packages for their firm, so while familiarity with each of these packages is a general skill, there may be no (or only a few) other firms which use exactly the same mix of software applications. As a result, the package of general skills workers develop are almost always more valuable at the training firm than at other firms even when each individual skill is correctly perceived to be useful elsewhere.

A second reason why the market behaves as if general skills are effectively specific to the firm is that other employers will generally be ignorant of the character of a new hire's general skills and, consequently, may not assign the worker to a job that puts the skills to work.

Indeed when an employer has been forced by federal regulations to pay for all the costs of training in technically general skills, it will not want to advertise these skills to other firms for fear of losing the now skilled worker to a higher paying employer. Even when a worker's next job makes use of the general skills learned, there is no guarantee that new hires with better than average skills will be offered comparably higher starting wage rates. **These phenomena have the effect of transforming some skills which are technically general into skills which, when it comes to wage setting, are effectively specific to the firm.** To the extent training is effectively specific, wages will rise more slowly than productivity net of training cost and wage offers from other employers will not reflect the general skills learned at the initial job (Bishop and Kang 1984, 1988).

Support for this signaling/visibility explanation of the gap between productivity and wage rate effects of training comes from comparing the gaps between wage growth and productivity growth effects of training, for specific types of training. In Bishop's analysis of EOPP data (1991 Table 7), all forms of training had roughly equal effects (per hour devoted to training) on productivity growth. For wage growth, however, formal training had much larger effects than other forms of training and OJT by co-workers had no effect. Apparently, formal training is either less specific to the job or more visible to the employee and other employers, and thus has larger impacts on wage growth. Analyses of household data sets take this signaling point one step further. Lynch (1992) fixed effect estimation found that apprenticeship and off-job training had more positive wage effects than the less visible formal company on-the-job training programs. Lowenstein and Spletzer (1993 Table 4) also found that off-site training paid for by the employer had bigger effects on wages than on-the-job company training.

The third reason why employers might voluntarily pay for general training is the inability/unwillingness of most young workers (those with the greatest need for general training) to finance large amounts of general training. As discussed earlier, when workers face liquidity constraints, firms will often find that ii is optimal to induce workers to undertake general training by offering to share the costs and benefits of the training.

A fourth reason why employers may be willing to pay for general training is network externalities. Many of the skills taught in company training programs are modes of internal communication—e.g. software application programs-- that everyone must adopt if they are to be fully effective. If the firm were to expect workers to pay the full cost of learning such software applications, it would not be able to demand that all workers learn it and the network

benefits would not be realized. Consequently, it tries to get as close as possible to 100 percent usage by requiring and paying for training in a skill that is useful at other firms.

A fifth reason why employers may voluntarily provide and partially finance general training is their greater access to information on the likely payoffs to different types of general training. Worker uncertainty about whether the particular skill taught at their company is also useful in other jobs may make them unwilling to pay for the training even when the skill is in fact general. Employers will be better informed about the technological uncertainties and, therefore, better able to decide which particular skills should be taught and be more willing to bear the risk of the investment. In many cases, the employer controls how useful general training is on the job over the long term. Having invested in learning a skill at the behest of their employer, workers quite sensibly want to be assured that the company will not shortly be switching to a different E mail system or applications program which is difficult to learn. Firm assure their workers that they will be conservative about such switches by offering to pay any training costs that result.

A sixth reason is worker risk aversion and the resulting implicit contracts in which many of the risks of the employment relationship are born by the firm not the worker. Worker risk aversion results in labor contracts in which worker compensation does not rise and fall proportionately with actual productivity on-the-job (Stiglitz 1974). Bishop (1987) showed that, holding the job constant, that less than 20 percent of the differences in realized productivity between workers was reflected in their relative wages. Firms are held liable when a mistake by one of their employees damages or kills others. Such implicit contracts weaken worker rewards for better performance, so workers have a reduced incentive to engage in on-the-job training. To avoid this problem, labor contracts can be written which reward workers for participation in well signaled (e.g. formal) general training. When, however, the success of that training is not reliably measured, there will only be limited rewards for doing well in the training.

If, as argued above, employers are sharing the costs and benefits of training that develops skills that are useful at other firms, under provision of such training is going to result if turnover rates are non trivial.

Part B

POLICY CONCLUSIONS AND OPTIONS

Should government subsidize schools which offer occupation specific education and training? Some have expressed doubts. Some have argued that government should force employers to do more training by scaling back government subsidies of school-based occupationally specific education and training. The Economist (March 12 1994), for example, recently claimed that:

> Economists have long argued that the returns on general education are higher than those on specific training, because education is transferable whereas many skills tend to be job-specific. Today this case is becoming more compelling still as jobs become less secure, the service sector expands and the life-cycle of vocational skills diminishes and the market puts an even greater premium on the ability to deal with people and process information.

Instead, students should be taught generic skills such as reading, writing, mathematics and computers that are useful in all or almost all work places. **These policy recommendations are, however, based on two premises--**

*** generic skills are good substitutes for occupation specific skills and**

*** the return to occupation specific training by schools has declined**-which are false. The next two sections of the paper look at the evidence on these two issues.

8. COMPETENCE IN COMMUNICATION AND MATHEMATICS IS NOT SUFFICIENT: BASIC SKILLS CANNOT SUBSTITUTE FOR OCCUPATIONAL SKILLS

In most jobs productivity derives directly from social abilities (such as good work habits, people skills and leadership) and cognitive skills that are specific to the job, the occupation and the occupational cluster: **not from reading, writing and mathematics skills**. When employers are asked which skills they look for when hiring for a specific job, they almost always cite work habits and relevant work experience ahead of reading and mathematics skills. The applicants knowledge of history, geography and literature is seldom evaluated.

For example, when the NFIB employers were asked "which abilities influence hiring selections the most?", their rankings were;

1. "work habits and attitude"
2. "ability to learn new occupational and job skills"
3. "occupational/job skills (already has them)"
4. "people skills"
5. "reading, writing, math and reasoning ability"

6. "leadership ability"

Findings are almost identical when differences between two worker's global ratings of relative productivity at the time of the interview are regressed on supervisor rankings of which employee is most competent in each of the six skill areas while controlling on tenure. The results of such a regression are presented below:

(3) Productivity Differential = -.015(Basic Skills) + .063***(Occ Skills at hire) + .081***(Learning Ability)
betw. A & B at Interview (.015) (.013) (.016)

+ .104***(Work Habits) + .046***(People Skills) + .007(Leadership) R^2 = .504
(.014) (.015) (.018) Obs = 756

Occupational skills, learning ability, work habits and people skills rankings (and tenure and its square not shown) all had significant positive effects on relative global productivity ratings. Basic skills and leadership did not.

When paper and pencil tests of occupational knowledge appropriate for the job compete with reading and mathematics tests to predict supervisor ratings of job performance, the job knowledge tests carry all of the explanatory power, the reading and mathematics tests none. When judged performance on a sample of critical job tasks is the measure of job performance, the beta coefficient on the job knowledge test is 2 to 4 times larger than the beta coefficient on a basic skills composite (Hunter, 1983). Thus, **basic skills make little direct contribution to a worker's productivity**. Their contribution is to help the individual learn the occupation and job specific skills that are directly productive.[18] Since large improvements in job knowledge are easier to achieve than equivalent (in proportions of a standard deviation) improvements in verbal and mathematical skills, occupationally specific training would appear to be highly desirable **if the student is likely to put the knowledge to use by working in the occupation or a closely related one**.

9. IS OCCUPATIONALLY SPECIFIC TRAINING BECOMING LESS NECESSARY BECAUSE OF ESCALATING TURNOVER AND SKILL. OBSOLESCENCE?

Rates of turnover and skill obsolescence are now so high, The Economist argues, that occupationally specific skills are no longer good investments for young people. Let us break this argument down into its three parts and examine each one.

* Has turnover increased? What effect has changes in turnover had on the social payoff to occupation specific training and employer willingness to invest in training?

* Has skill obsolescence increased? What effect does high rates of skill obsolescence have on the social payoff to occupation specific training?

* Has the payoff to public investments in occupation specific skills declined in recent years? Are returns to school-based occupation specific training lower for incumbent workers and adults than for youth?

9.1 Turnover

Job turnover has indeed increased over the last 25 years. The proportion of the workforce with fewer than 25 months of tenure at their company rose from 28 percent in 1968 to 40 percent in 1978 and has remained high since then (see row 1 of Table 11). Tenure of male workers fell 5 percent between 1963 and 1981 (holding age composition constant) and then fell another 8 percent between 1983 and 1987.[19] The 1983 to 1987 decline in tenure was particularly pronounced for males working in clerical, retail sales and management related occupations (e.g. accountants, personnel, financial officers and management analysts). Tenure actually rose in only two industries-- professional services and public administration-- and one occupation-- technicians (BLS 1983, 1987). Even in high skill occupations, tenure now appears to be remarkably low: a median of 4.3 years for technicians and sales representatives in

Table 11
Trends in Job and Occupational Turnover
(holding age and gender constant)

	1951	1963	1966	1968	1973	1978	1981	1983	1987	1991
% with Tenure LT 25 mo	38.1%	33.2	25.4	28.2	37.8	39.9	39.3	38.5[a]	40.1[a]	40.4[a]
Median Job Tenure										
Men-avg. 20-64	5.1	7.6	7.9	7.3	7.4	7.2	7.2	8.4[a]	7. 7[a]	---
Women-avg 20-64	3.0	4.1	4.2	3.8	4.3	4.1	4.3	5.6[a]	5.4[a]	---
Occupational Turnover (annual)										
Men 20-65+	---	---	10.2%	---	8.6%	10.1%	8.9%	8.2%	8.2%	---
Women 20-65+	---	---	6.3%	___	7.2%	9.6%	9.3%	8.3%	8.4%	---

[a] The wording of the question changed in 1983, so there is a break in the series at that point. The first row is the share of all workers over age 16 with fewer than 25 months of tenure (OECD 1993 Table 4.1; Hamel 1963, 1967; Hayghe 1974; Horvath 1981; O'Boyle 1969; Sekscenski 1979; BLS Jan 1983, Jan 1987). For years 1951 through 1981, rows 2 and 3 are unweighted averages of the median tenure in January of the year indicated reported for five age groups: 20-24, 25-34, 35-44, 45-54 and 55-64. For 1983 and later, row 2 and 3 are mean tenure levels unadjusted for age. The fourth and fifth rows are unweighted averages of BLS occupational mobility rates for six age groups: 20-24, 25-34, 35-44, 45-54, 55-64 and 65 and over. These rates are the number of workers who were in a different occupation the prior year as a proportion of those employed in both years-January of the year indicated and the previous January (Markey and Parks, 1989 Table 1). They is based on the following sequence of questions. "Was ... working in January [one year previously]? ....If yes..."You told me that ...is now working as a ...[occupation reported for January 16, 19..]? Was ...doing the same kind of work a year ago, in January 19..?" As a result, occupational turnover estimates are not inflated by errors in measuring occupation.

wholesale and manufacturing, 5.5 years for craft workers, 5.7 years for professionals, 5.3 years for management related occupations, and 6.5 years for general managers outside of government (Maguire 1993).

While job turnover has increased for males, **occupational turnover has decreased**. When age and gender are held constant, rates of occupational mobility for men fell 20 percent between 1966 and 1987 (see row 4 and 5 of Table 11). The occupational mobility of women increased from 1966 to 1978 and then declined from 1978 to 1987. During 1986 over 90 percent of occupational changes by women (and 84.4 percent of the changes by men) were self initiated and not made necessary by a layoff, dismissal or plant closing (Markey and Parks 1989 Table 2). Thus the rise in occupational mobility of women is not bad news; it is the result of improved opportunities for advancement. The number of women with professional and managerial jobs has doubled since 1979. Current levels of occupational turnover are considerably lower that those experienced by the generation that lived through the depression, the mobilization for World War II and the rapid demobilization after the war. Occupational turnover is high in the United States, but it has always been high.

These two facts do not imply that schools should scale back occupational training, leaving this function to employers. Rather they imply exactly the reverse. Social returns to occupational training (and the worker's private returns) are influenced by occupational turnover, not job turnover. The decline in occupational turnover for men and more recently for women means the social returns to occupational skills training have increased. At the same time, the rise in job turnover has eroded incentives for employers to invest in this kind of training. Thus, forcing employers to take over more of the occupational skills training function by having schools withdraw from the market would significantly decrease the number of workers with high level occupational skills.

9.2 Skill Obsolescence

While rates of skill obsolescence have probably increased, there is no reason to expect a negative correlation between rates of skill obsolescence and the rate of return to an investment in a skill. Skill obsolescence is greatest in fast changing fields close to the frontier of knowledge. The labor market responds to high rates of skill obsolescence by paying a higher premium for the skill. The high starting salaries of engineers derive in part from the high rate of skill obsolescence in their profession.

Occupational knowledge is cumulative and hierarchical in much the same way that mathematics and science is cumulative and hierarchical. Everyone must start at the bottom of

the ladder of occupational knowledge and work their way up. The spread of information technology and of high performance work systems is making some old skills obsolete, but the new skills that must be learned are often additions to, not replacements for, old skills. While learning a new skill is easier when the worker has good basic skills, a foundation of job knowledge and occupational skills is generally even more essential.

9.3 Direct Evidence of Rising Returns to Skill

Other types of evidence also contradict the contention that returns to occupation specific skills have fallen. The wage premiums paid for technical and occupational skills developed in non-baccalaureate programs have been rising for the last decade. Male craft workers are now paid 35.3 percent more than operatives; in 1983 they were paid only 25.6 percent extra. Female clerical supervisors are now paid 37 percent more than other clerical workers; the premium used to be 29 percent. Secretaries are now paid 61.5 percent more than maids, a substantial increase from the 49 percent premium that prevailed in 1983.

What about job growth and availability? The popular press is filled with complaints that most new jobs are low skill jobs. This is a myth. The most rapidly growing occupations require more than average amounts of skill and training. Managerial, professional, technical and high level sales workers accounted for 71 percent of employment growth since 1979 and now account for 37.5 percent of all workers. Service occupations accounted for only 18.7 percent of job growth and sales workers in retailing and personal services accounted for only 7 percent. While managerial and professional employment grew 43 percent since 1982, food service jobs grew only 24 percent, janitorial jobs grew 8 percent and clerical jobs only 13 percent (BLS 1984 1994). Despite all the press coverage of laid off managers and professionals, the last five years has seen managerial jobs grow by 1,012,000 and professional jobs grow by 2,134,000 while total employment was growing 5.4 million. The unemployment rate of managers and professionals was 2.9 percent in January 1994.

The payoffs to occupationally specific education and training **of youth** have increased. The wage and earnings effects of high school vocational programs (relative to non-college bound high school graduates who studied academic courses only) grew over the course of the 1980s (Bishop, Blakemore and Low 1985; Campbell 1986, 19876; Bishop 1993b). During the late 1980s, college graduates who had majored in the more applied and mathematically oriented fields (such as engineering, business, mathematics and physical science) earned 46-95 percent more than those who majored in humanities (Kominski1992). Salary premiums for these fields were substantially lower in the late 1960s. Bowers and Swaim (1992) found

that between 1983 and 1991, the wage payoff increased for qualifying training from formal company training programs, military training, high school vocational education, 4 year colleges and public and private junior/community colleges and technical institutes. Payoffs declined only for qualifying training from informal OJT and for qualifying training from other post-secondary vocational training programs.

Incumbent worker training (i.e. skill improvement training) is a different story? **For incumbent worker training, wage payoffs have increased for formal company training but have declined for training provided by schools (Bowers and Swaim 1992). School-based training that was paid for by the individual (not the employer) lowered wages** (Hollenbeck and Willke 1985, Lowenstein and Spletzer 1994, Lengermann 1994).

10. ARE OCCUPATION SPECIFIC SKILLS BEST TAUGHT BY SCHOOLS OR BY EMPLOYERS?

Many societies have tried to deal with the tendency of employers and workers to under invest in skill training by providing free or heavily subsidized school based occupational training programs. Indeed in most countries many of the occupational training functions that were performed by parents, apprenticeships and employers during the 19th century have been transferred to schools. The switch of training functions to schools is a natural part of the life cycle of a technology and its associated skills. As a technology matures and its use grows, the technology and its associated skills become standardized (i.e. general rather than firm specific), the demand for formal training grows and schools enter the market as training providers (Flynn 1988).

10.1 Advantages of School Based Occupational Training

Once skills become standardized, schools have natural advantages as competitors in this market: (a) they offer students flexibility in scheduling and the choice of courses, (b) hourly costs of training are lower because teaching staff are specialized and economies result from spreading the cost of developing courses over many students, (c) school certification of skills makes them more portable, and (d) schools and students have access to public subsidies not available when training takes place at a firm. Another advantage of school based occupational training is that they allow individuals to select the occupation for which they will prepare. When firms provide occupational training, competition to enter an occupation occurs before training rather than after.

When trainers with the necessary expertise are scarce, schools are a way to get the maximum out of a limited supply of expert trainers. Frequent teaching of a course should

enable improvements to be made. Even very large enterprises often do not have a sufficient flow of trainees requiring instruction in a particular subject to warrant developing in house the expertise necessary to teach that subject. Many enterprises are too small to mount training by themselves and so are forced to rely on training programs organized by schools and trade associations.

When schools become major training providers, barriers to entry into the occupation and the industry fall, the supply of skilled workers grows, the costs of employing people with the skill fall, and expanded use of the technology is facilitated.

While high quality occupational training offered by schools ameliorates the problem of under provision of skill training, school based training cannot replace some kinds of employer training and is generally less effective than employer provided skill training of the same duration. :here are a number of advantages to locating skill training at firms rather than schools. Peter Elias, Erik Hernaes and Meridith Baker's (1994) examination of British and Norwegian data on returns to vocational education led them to conclude:

> Economic arguments would predict that a school based system for the provision of vocational skills, delinked from the demand for labor, would show a lower rate of return per unit of time spent acquiring skills than an employer based system, because the latter system could incorporate firm specific training and may obviate the difficulties of matching the supply of skilled labor to demand in the absence of market mechanisms (p. 296).

10.2 Advantages of Locating Occupational Training at the Work Site

Often, training in a skill can only be organized by the employer. This is obviously the case when skills are specific to the firm or partially specific to the firm, but is also sometimes the case for completely general skills as well. General skills are often easier to learn when they are integrated into a training program that is specific to the context of a particular firm. This is particularly true for adults being taught basic literacy skills (Mikulecky 1989). The need for particular general skills is often generated by the introduction of new technology and new equipment or a reorganization of the business. Since firms quite reasonably desire to have all employees use the same word processing and financial analysis programs, the selection of the applications programs must be centralized. IBM first developed the FORTRAN computer language and then taught it to its employees and customers. Colleges and universities eventually offered courses in FORTRAN, but it took many years for schools to take over the bulk of the teaching of this very general skill.

Even when the same skills are taught, employer provided training is generally more effective than school based training? Seven reasons appear to account for this. First, training obtained at a school is much less likely to be used on one's job than training received from an employer. For graduates of high school vocational training programs in the U.S., only 43 percent of the employed graduates in their early 20s had a training related job (broadly defined) in the 1985 National Longitudinal Survey of Youth (Campbell et al., 1987). Other studies of high school vocational education using the same methodology obtain similar results. Felstehausen's (1973) study of 1971 vocational graduates in Illinois found training related placement rates of 27 percent in business occupations, 17 percent in trade and industry, 52 percent in health, and 20 percent in agriculture. Conroy and Diamond's study (1976) of Massachusetts graduates obtained a training related placement rate of 29 percent for business and 37 percent for trades and industry. High school vocational education is not the only occupational skills training program with low training related placement rates. The proportion of Comprehensive Employment and Training Act program graduates whose occupational field 12 months after completion of classroom training matched their field of training was only 41 percent for clerical training, 39 percent for training in operative occupations and 29 to 32 percent for professional and craft training (Barnow 1985).

When, on the other hand, employers are heavily involved in providing occupational training, it is much more likely to be used. Mangum and Ball (1986) found in their analyses of NLS data that employer controlled training institutions have much higher training related placement rates. When training fields were matched to occupations, they found that the proportion of male graduates who had at least one job in a related field was 85 percent for company training and 71 percent for apprenticeship, but only 52 percent for vocational-technical institutes and 22 percent for proprietary business colleges. The rates for females were 82 percent for company training but only 59 percent for nursing schools, 61 percent for vocational-technical institutes and 55 percent for proprietary business colleges. Six months after passing a German apprenticeship examination, 68 percent of those with civilian jobs were employed in the occupation for which they were trained (much more narrowly defined) (Federal Institute for Vocational Training, 1986).[20]

The second reason for preferring on-the-job learning of skills is the fact that trainees are more motivated because the skills are almost certain to be used, and because promotions and pay increases go to those who do well. Third, the training is generally tutorial in nature and this is known to be an effective though costly teaching method. Fourth, training is generally

done by supervisors and coworkers who are aware of the trainee's progress and can give necessary corrective instruction. Fifth, the equipment and materials necessary to the training are generally readily available at the work site and time on the machine for the trainee can generally be arranged without disrupting production. When schools provide the training, equipment, must be specially purchased and keeping the equipment up-to-date is often prohibitively expensive. Sixth, !he trainer (not just the trainee) is held accountable for success since the training is designed to increase productivity and supervisor/trainers are held accountable for the productivity of the work group. Finally, when employers provide training the trainee's time tends to be used much more efficiently. Because they are paying for both the trainer and the trainee's time and receive most of the benefits, employers have much stronger incentives to select cost effective training strategies than schools which neither pay the time costs of the trainee nor receive any of the direct benefits of the skills that are developed.

The theoretical arguments just reviewed are supported by the findings of Chapters 2 and 3. Incumbent worker training that is organized by or paid for by employers raises wages and worker productivity. School-based training paid for by incumbent workers has no effect on wage rates. (Nothing can be said about the productivity effects of school-based training paid for by workers for studies have not examined the issue). On the other hand, school-based occupation specific education and training of youth prior to =try into full time employment clearly has significant payoffs.

10.3 Policy Implications Regarding Occupation Specific Education of Youth

Public subsidy of school-based occupation specific education **for youth** should continue. Since occupational skills are useful in a limited cluster of occupations, **it is essential** that occupationally specific training be conditioned on a reasonable prospect of soon working in that occupational cluster. There are three reason for this conclusion: (1) vocational education pays off **only** if the skills are used (Bishop 1989a); (2) motivation to learn is weak if there is little prospect of using what is learned and (3) skills deteriorate with lack of use.[21] Intensive occupationally specific training should begin after a student has made a reasonably well informed tentative career choice and be for occupations with good job prospects.

At some point every individual must start building his/her foundation of occupational skills. At the start, the period that might occur in school, youth should learn skills relevant to a cluster of occupations (e.g. office and management, construction occupations). The foundation building should begin at least two years before the individual plans to leave school and not foreclose a later decision to return to school in the field.

10.4 Policy Implications Regarding Incumbent Worker Training

Clearly, employers should do more training in house and send larger numbers of employees to off-site seminars for training. Employers also need to be encouraged to arrange for more employees to participate in school-provided training programs. However, there is no evidence that adults (people over age 25) who initiate occupational training without sponsorship of their employer benefit from such training. **This implies that efforts to stimulate incumbent worker training should focus on inducing employers to provide or sponsor more of it. If there are to be public subsidies of incumbent worker training, they should be funneled through firms not schools!** Options for accomplishing these goals are discussed in sections 11, 12 and 13.

Policy initiatives designed to increase the number of adults who initiate and pay for school-provided occupational training would be a mistake. Examples of policy initiatives which the research reviewed above indicates would <u>not</u> benefit trainees or improve competitiveness are:

- **lower tuition charges for education and training programs targeted on adults**
- **making more adults eligible for Pell grant aid or guaranteed student loans**
- **turning JTPA into a voucher for training**
- **allowing adults to use IRA savings to pay tuition costs of retraining**
- **offering training vouchers to displaced workers or welfare recipients**
- **allowing adults to deduct or receive tax credits for tuition charges paid for self-initiated training**

I would be cautious, however, about recommending major reduction in public support of community colleges and Pell grants for adult students at the present time. The finding that school-based occupational training paid for by adults has no effect on wages is based on only five studies analyzing three independent data sets.[22] Additional studies of the wage growth effects of school provided training not subsidized by an employer using NLS, PSID, HSB and NLS72 data are needed before we can be really certain that school-based adult education not paid for by employers fails to raise the wages of the adults who undertake it.

11. POLICIES TO ENCOURAGE ON-THE-JOB TRAINING

Evidence has been presented that on-the-job training produces spillover benefits just as schooling does. When an individual receives extensive, high-quality on-the-job training, they also benefit others in the society by paying higher taxes, by being less likely to require welfare and unemployment insurance, by being more likely to make scientific and technological advances, and by being more productive on their job (and not being

compensated for it). In addition, labor market distortions, such as the minimum wage, lack of access to loans, and lack of certification of OJT, cause individuals and firms to choose less OJT and lower quality OJT than is desirable from society's point of view. There would appear to be a need for the government to promote increases in on-the-job training.

How might government induce firms and workers to increase investments in general on-the-job training? Table 12 provides a checklist of factors which influence employer and employee decisions regarding the type and extent of on-the-job training. Many of the factors which influence the profitability of training investments are not under the control of government. Others are influenced by government actions. Since the returns to training cannot be distinguished administratively from other labor earnings and profits, lowering the rates of taxation on these returns is not a feasible policy option. Feasible policies promoting general on-the-job training either remove government initiated barriers to training or remedy labor market failures. Eight options are reviewed in this section. They are presented in order of their cost and intrusiveness.

Improving the Incentives for Private Investments in Training

* Allow jobs that offer considerable general training to pay wage rates below the legal minimum.

* Allow firms to provide general training that improves productivity on one's current job during uncompensated time.

* Improve training practice by funding a systematic program of research on employer provided training including randomized field trials of alternative ways of delivering training.

* Establish an industry based system for publicly recognizing excellence in training

* Lower turnover by improving matching of workers to jobs by removing barriers that prevent them from signaling their competencies to employers.

* Improve systems of certifying skill development.

* Make workers who are undergoing a significant amount of general on-the-job training eligible for low interest guaranteed student loans.

* Partially guaranteed loans to firms for training

Table 12

WHAT DETERMINES TRAINING INVESTMENT BY FIRMS

Employers will increase their investment in training when:

Marginal Value Product of > an Extra Hour of Training	The Marginal Cost of Training	*	Rental Cost of Training

FACTORS INFLUENCING TRAINING'S IMPACT ON PRODUCTIVITY

1. THE TIME SPENT IN A TRAINING ACTIVITY. There will be diminishing returns to devoting extra time to training. That is the marginal benefit of an extra hour of training is likely to become smaller as time devoted to training increases.

FACTORS WHICH INCREASE THE DOLLAR VALUE OF A SKILL

2. HIGH VALUE ADDED PER WORKER. The firm's product or service generates high profit margin or is in short supply possibly do to economic boom or the firm's monopoly power or technological lead on rivals.

3. THE SKILL BEING TAUGHT IS VERY SCARCE-- possibly due to a long training period, high demand for the skill from competing firms and/or an unwillingness (or inability) of other firms, schools and colleges to invest in the training that develops this skill.

4. INNOVATION-- The skill is essential to run a new machine, introduce a new, product, or Implement a work reorganization at the company. Since the skill is by assumption essential the value of the benefits to training derive from the increased cash flows generated by the innovation. Since there is no way to substitute for the skill, the payoffs to training associated with an innovation are often quite high. They are also likely to be quite uncertain because the success of the innovation is not assured.

5. THE EXTENT TO WHICH THE SKILL WILL BE USED. This depends on:
   * Is the work site organized such that the skill will be put to use once learned? This is an absolutely critical consideration. Since the employer controls the organization of work, the employer must generally initiate and design the training program even when most of the skills being taught are general. For example, skill with a specific word processing program is useful at many firms, yet the employer must choose which specific word processing program to standardize on and what features of the package should be taught and in what sequence.
   * How frequently will the skill be used?
   * How many hours a month is the worker likely to be working in the future?

FACTORS WHICH INFLUENCE LEARNING EFFICIENCY (gain in skill/ hour learning).

6. QUALITY OF THE TRAINER/S-- their knowledge of the subject and ability to teach it. The motivation of the Trainers.

7. AVAILABILITY OF THE EQUIPMENT AND MATERIALS necessary to learn the skill. Hands on learning is more efficient than theoretical learning. For example, learning a program like Word Perfect necessitates that one have a computer and a copy of the program.

8. THE MOTIVATION OF THE TRAINEES TO LEARN THE SKILL-- Are they going to be rewarded if they learn the skill well? Is it possible to assess how well they have learned the skill? Is their social support from peers and immediate supervisors for learning the skill?

9. THE QUALITY OF THE TRAINING PROTOCOL.

10. THE LEARNING ABILITY OF THE TRAINEES-- This can be predicted by performance in school, by scores on cognitive tests, by past performance on similar tasks and/or by observing people in a situation where they must learn something new.

11. INITIAL SKILLS AND KNOWLEDGE OF TRAINEES. Does the Trainee read technical manuals well? Do they have the mathematics background necessary to understand and use statistical process control?

FACTORS WHICH INFLUENCE THE MARGINAL COSTS OF AN HOUR OF TRAINING

1. OPPORTUNITY COST OF THE TRAINER'S TIME-- This is influenced by:
   * Whether the trainer is a supervisor or a coworker
   * Whether the work group members who know the skill are willing to share their knowledge. In order for them to be willing to do this, experienced workers must be confident that training a new worker in their unique skill will not lower their chance of being promoted or increase their chance of being laid off.
   * Whether a normal work day has free time that can be used for training. An example of work sites where such free time exists is retail stores staffed by both an experienced worker and a trainee which sometimes have only one customer or no customer.
   * Whether the company is under heavy pressure to increase output because of high demand and long order backlogs.

2. ECONOMIES OF SCALE when the training is provided formally in a classroom or when training packages must be devised for specific jobs.

3. CAN THE EMPLOYEE LEARN THE SKILL ON THEIR OWN?
   * Using a self-paced instructional mechanism (e.g. tutorials for learning computer programs),
   * By reading a manual or careful description of how to do the task (Kaizen results in the preparation and updating of such manuals),
   * By trial and error (e.g. an Icon based computer program is easier to learn than programs which require typing commands.)

4. ARE TRAINEES WILLING TO LEARN THE SKILL ON THEIR OWN? This depends on the incentives offered for learning the skill and the norms of the work group.

5. OPPORTUNITY COST OF THE TRAINEE'S TIME.
   * Will the trainee learn the skill on his own time at home?
   * Whether the skill can be learned while the worker is producing revenue for the company.

Is learning by doing sufficient?

6. HOW LOW A WAGE THE TRAINEE IS WILLING TO ACCEPT while learning the skill. This depends on:
   * The worker's alternatives at other firms
   * The prospect of getting a promotion or wage increase once the training is completed.
   * The likelihood that the training will enable the worker to get a better job at another firm. This depends upon:
     -- Whether the skills learned are useful at other local firms
     -- Whether the skills learned are VISIBLE to other employers

7. UNION SUPPORT. In a unionized setting, the cost of training to an employer depends on whether the Union is willing to offer concessions in other areas in order to get a better training program.

8. TAX TREATMENT OF INVESTMENTS IN TRAINING.

9. THE PROBABILITY AND COST OF TRAINEE ERRORS DURING TRAINING.

FACTORS WHICH INFLUENCE THE FIRM'S RENTAL COSTS OF TRAINING

Rental Cost of Training = [r + d + (1-g)q]

COST OF CAPITAL OR REQUIRED RATE OF RETURN-- r = the firm's real ROR expressed as a monthly rate.

RATE OF OBSOLESCENCE OF THE SKILL-- d = monthly rate of obsolescence

RATE OF TURNOVER-- q = monthly separation rate. This averages about 3 to 4 percent per month in US manufacturing as a whole, about 1% at IBM and only about 0.5 % at large Japanese firms.

DEGREE OF EFFECTIVE SPECIFICITY OF THE SKILL--(1-g) A high degree of specificity tends to lower turnover and this makes a firm more willing to finance it. On the other hand, it reduces the worker's willingness to finance the costs of the training. If a worker is liquidity constrained and unwilling to accept an even lower wage during the training period, it the firms optimal strategy may be to try to transform general training into specific training.

Options involving employer mandates are evaluated in Section 12 and options involving subsidies are evaluated in section 13.

Training Mandates

* Mandate that firms invest at least X percent of their wage bill in training if they are to avoid paying a tax.

Subsidizing Employer Training

* State run subsidies of customized training.

* Subsidize a firm's training expenditures above a certain threshold
* Outcome-based payments to firms for training employees for industry recognized credentials in occupations that are currently in shortage.

11.1 Exemptions from the Minimum Wage

The minimum wage reduces on-the-job training in certain jobs (Hashimoto 1982, Leighton and Mincer 1981). Exemption of jobs that offer considerable general on-the-job training would tend to remove this barrier to greater OJT. At present jobs and internships that are part of an occupational training program run by an educational institution can be exempted from the minimum wage and often pay no wages for up to a year. Consideration might be given to extending this exemption to apprenticeships and other jobs that offer considerable training. Such exemptions, however, would be difficult to administer and would probably not significantly increase general OJT. The minimum wage is a binding constraint for only a small minority of jobs and most employers fail to take advantage of the exemptions to the minimum wage that are already available to them.

11.2 Allow Firms to Offer Employees General Training during non-work time.

A more effective way of lowering the share of general training costs that are borne by employers (and thereby stimulating them to provide more of it) is to schedule a larger share of it outside of normal paid work hours. Employees would thus be contributing to the costs of training by giving up leisure time. Since the time costs of trainees account for about one-half of the total costs of formal training, this would involve a roughly 50-50 sharing of the costs of general training (Castles 1994). However, federal wages and hours regulations effectively prevent employers and employees from agreeing to share the cysts of many kinds of general training. They currently specify that:

> Sec. 785.27---Attendance at ...training programs ...need not be counted as working hours if the following four conditions are met:
> a) Attendance is outside the employee's regular working hours;
> b) Attendance is in fact voluntary;
> c) The course, lecture or meeting is not directly related to the employee's job; and
> d) The employee does not perform any productive work during such attendance....
>
> Sec. 785.28---Attendance is not voluntary if the employee is given to understand or led to believe that his present working conditions or continuance of employment would be adversely affected by nonattendance.
>
> Sec. 785.29---The training is directly related to the employee's job if it is designed to make the employee handle his job more effectively as distinguished

> from training him for another job, or to a new or additional skill. For example, a stenographer who is given a course in stenography is engaged in an activity to make her a better stenographer. Time spent in such a course given by the employer or under his auspices is hours worked... Where a training course is instituted for the bona fide purpose of preparing for advancement to a higher skill and is not intended to make the employee more efficient in his present job, the training is not considered directly related to the employee's job even though the course incidentally improves his skill in doing his regular work.
>
> Sec. 785.30--...if an employee on his own initiative attends an independent school, college or trade school after hours, the time is not hours worked for his employers even if the courses are related to his job.
>
> Sec. 785.31--...an employer may establish for the benefit of his employees a program of instruction which corresponds to courses offered by independent bona fide institution; of learning. Voluntary attendance ...at such courses outside working hours would not be hours worked even if they are directly related to his job, or paid for by the employer (Bureau of National Affairs, Wages and Hours, p. 97:3208).

These regulations allow old style firms with hundreds of job classifications to ask employees to share the costs of formal training designed to prepare for promotions and job transfers. Firms implementing lean production or high performance work systems with limited numbers of job classifications are, by contrast, required to pay all of the costs of the training necessary to develop flexible multi-skilled employees. The regulations allow unpaid time to be used for training directly related to one's job, if it occurs at a school and is initiated by the employee. This, however, is the type of training that often does **not** raise worker wages (Lowenstein and Spletzer 1994; Lengermann 1994; Bowers and Swaim 1992). The type of training that does raise wages-- training relevant to one's current job which is sponsored or paid for by the employer-- is discouraged by the requirement that the employer pay all of its costs. No cost sharing is allowed except in highly restricted circumstances-- registered apprenticeships and courses patterned after school based training. These regulations make it very difficult for workers and employers to share the costs of general training that is directly relevant to one's current job. These constraints on cost sharing arrangements are probably one of the reasons why there is so much evidence of failure in the training market.

The Department of Labor should consider modifying its regulations to allow unions and workers to agree to undertake employer provided training in general skills such as word processing, spread sheets and blueprint reading during their free time rather than during paid time. I propose two modest changes in the regulations.

1. Section 785.31 should be modified to read: "An employer may establish for the benefit of his employees a program of instruction which ***develops general skills useful at other firms (e.g. word processing, generic computer applications programs like Lotus, Paradox, Harvard Graphics, etc., mathematics, business writing, blueprint reading, statistical process control, group problem solving) and then certifies their presence in a way that is credible to other employers or which*** corresponds to courses offered by independent bona fide institutions of learning. Voluntary attendance ...at such courses outside working hours would not be hours worked even if they are directly related to his job, or paid for by the employer. ***Required training and training which develops firm-specific skills (such as the history and philosophy of the firm, a manufacturing scheduling system for the plant, how to run the cash register) would have to occur during compensated time. "*** The standard for allowing workers to share the costs of training by doing it in uncompensated time should be the generality of the skills developed and their certification, not correspondence to school based programs.

2. The requirement that training that is not counted as work time cannot occur during normal work hours should be dropped. If training facilities and staff are to be used efficiently, they need to operate all day not just at 4:30 PM when most workers quit for the day. In an era of flex time, there is no reason why workers who engage in training on their own time should not be allowed to arrange with their employer for their eight hour work day to surround a one hour training session that happens to occur at noon or 10:00 AM. The key requirement is that the training is voluntary, not when it occurs.

Whether the general training received by workers should occur on company time or on the workers' time should be made by workers, unions and employers (i.e. specified in the collective bargaining contract in unionized settings or described in the employee manual in non-union environments), not by federal bureaucrats or administrative law judges. Furthermore, employers should not be banned from encouraging workers to undertake general training on their own time by offering merit pay increases or bonuses to workers who develop their own skills subject of course to the provisions of collective bargaining contracts.

11.3 Invest in Research and Dissemination

The Department of Labor should undertake a long term program of research into how work place skill development is best accomplished. A variety of disciplines should be recruited to the task: anthropology, industrial psychology, cognitive psychology, economics, and policy evaluation. The medical research model of large scale randomized field trials of ideas first developed in laboratory settings should be employed. In some cases the government would pick the innovation to be studied and issue an RFP seeking a contractor who can recruit the firms to provide settings in which to do the study. These projects will need to be generously funded because the firms are going to want to have most of the costs of their participation reimbursed. In other cases, DOL would entertain proposals for research from researcher/employer collaborations on issues selected by the proposer. Preference should be given to studies that employ random assignment and which measure productivity outcomes of skill development not just paper and pencil tests of knowledge gained during training. Robert Bretz and Robert Thompsett's (1992) study of integrative learning is a good example of what is needed. Studies should not focus solely on formal training programs. High priority should be given to learning how to facilitate learning by doing and the development of tacit skills (i.e. skills which cannot be articulated but nevertheless are critical to expert performance) (Myers and Davids 1993).

Even though a great deal of time and resources are now devoted to formal and informal training and on-the-job learning, research into how best to arrange skill development is in its infancy. The knowledge base is currently quite limited and growing at a very slow rate. The number of researchers working on this topic needs to be doubled and doubled again. DOL should undertake to fund an expansion of the skill base of on-the-job learning/training researchers and expert practitioners. The large scale randomized field trials are a good place for some of this training to take place. Consequently, one of the requirements I would place on the contracts for the randomized field trials would be a collaboration with a university department providing quality training in this field and an agreement to provide practical experience in research and curriculum development to masters and Ph.D. students preparing to enter the field.

11.4 Prizes for Training Excellence

Prizes and awards for excellence in training are a low cost way of enhancing the visibility of employer provided training. I propose involving as many trade associations and professional organizations as possible by offering them small grants for setting up nomination

and evaluation mechanisms for their constituency. Outcomes not process should be the primary evaluation criteria. Each industry or association would establish a great variety of award categories. Examples might include: best training program delivered by video, best train-the-trainer program, best computerized instruction program, best math skills program, etc. Awards would go to training programs, to individual trainers and to trainees who put what was taught to particularly effective use. Training programs which pass initial screens would be asked to provide a detailed description of the program, the process by which it was developed and evidence of impact. These descriptions might form the basis for developing cases for use in courses teaching prospective training developers. Top programs, teachers, and trainees nominated by their industry or professional associations would be recognized by the President and the Secretary of Labor much the same way the Teacher of the Year is recognized.

11.5 Lowering Turnover

If rates of turnover were lower, the rate of return to specific training (and employer rates of return to their investments in general training) would rise and the amount of such investments would increase. Particular efforts should be made to lower turnover in jobs that offer considerable training. This can be done by being more careful in hiring selections and by designing compensation schemes that reduce quits and attract those with low quit propensities to apply for a job. The analysis of the time and ;.are employers invest in making and selecting new employees found that they are more careful when filling jobs that offer or require considerable on-the-job training. When OJT was considerable and job security provisions substantial, more people were interviewed, references were more likely to be checked, and more time was spent per applicant (Barron and Bishop 1985). Nevertheless the total amount of time that American employers devote to selecting blue collar and administrative support workers-- about 10 hours per position filled-- is very low and the crucial interview stage has been shown to have low validity.

Hiring selections would be improved if less emphasis were placed on the interview and more emphasis placed on references obtained from previous supervisors and credentials and tests assessing the individual's occupational skills and verbal and math ability. Bishop (1993a) found that employees who were hired after speaking with a previous supervisor are 7 percent more productive one year after being hired than other workers hired for the same job without obtaining a reference from a previous supervisor. Those hired after making such a check were also significantly more likely to be willing to stay late to finish work and to suggest ways of improving productivity or sales. Despite this fully 60 percent of hiring decisions by small and

medium size employers were made without checking with the new hires' previous supervisor (Bishop 1993). Government is partly responsible for this, for a number of firms have been successfully sued by past employees who were getting a bad reference from a supervisor. Fear of such litigation has caused many companies to adopt a policy of referring all requests for references to the personnel office and of providing only minimal information about the previous employee. When references were provided by a personnel office, not a supervisor, the new hire was 12 percent less productive, less likely to suggest ways to improve productivity and considerably less profitable overall (Bishop 1993a).

Tests assessing basic verbal and mathematics skills such as the General Aptitude Test Battery and the Armed Services Vocational Aptitude Battery are valid predictors of success in on-the-job training and later job performance (Hunter, Crossen and Friedman 1985). The primary reason these tests are good predictors of job performance is that they measure the capacity and speed of learning new things. Job knowledge tests should also be used to make hiring selections both because they are good predictors of job performance and because they can be used to identify the skills and competencies the job candidate already has, so that the firm's training does not repeat material already known. Another approach to making better hiring selections is developing referral relationships with vocational teachers at local high schools, technical institutes, and colleges and giving preference to young people coming directly from a school experience over young workers who have been out of school a while and have been hopping from job to job.

Another way to reduce turnover in jobs which offer training is to structure compensation so as to (1) induce those who have high quit propensities to look elsewhere and (2) make it attractive to stay with the firm. This can be accomplished by lowering compensation during the training period and promising rapid increases in compensation and greater job security when training is completed. Despite the fact that during the training period new hires are often less than half as productive as experienced workers, the entry wage in many American jobs is not far below the top wage for that job. The starting wage for apprentices in Switzerland and Germany is almost always less than half and sometimes only one-fifth of the wage that will be received after the 3-year training period is completed. New employees at Japanese firms start at a low wage but their wages increase rapidly with tenure at the firm. The U.S. labor market would be more efficient and total investments in OJT would be greater if firms competed for new hires by advertising the training that will be offered and the high wage rates that can be had in the future rather than by offering high wage rates for entry-level jobs. Increased

conditioning of wage increases on training success and job performance should also reduce turnover. Skill based pay is one way of accomplishing this.

Government policies such as the minimum wage and mandated benefits tend to prevent companies from adopting the steeply rising compensation structures which minimize turnover. Many companies provide health insurance, retirement plan participation, paid sick leave and paid vacation only to employees who have been at the firm for a year or more. In the SBA survey, 47 percent of the companies that provided group health insurance to employees with two years of tenure did not cover new hires during their first few months of employment (Black, Barron and Berger 1993). Mandates that all employees, regardless of tenure, receive the same benefit package (as is proposed in the Clinton Health Care proposal) would effectively force an increase compensation during the training period that would flatten the compensation profile, reduce the penalty for quitting and increase turnover. Requirements for early vesting of pensions can have similar effects.

Turnover could be reduced by restricting the employment at will doctrine and/or mandating severance pay. This, however, would probably have some unfortunate side effects: fewer jobs and higher unemployment that would particularly hurt minorities and youth (OECD 1993).

11.6 Certification of On-Job-Training Accomplishments

Incentives to offer more and better OJT would be strengthened if employers advertised the training opportunities available at their firm, discussed the training to be received with the new hire on the first day, and awarded certificates for completion of formal training programs or achieving competence in a specific line of work through informal OJT. Such a system would probably result in both the supervisor and the employee taking the training function more seriously. The certificate and the recognition it signified would be a source of pride to the worker and his family. The certificates would also signal to other employers what has been learned on the job and improve the worker's marketability if he or she should leave the firm.[23] The amount and quality of OJT would be better recognized by the labor market, resulting in better matches and more effective use of people's skills and stronger incentives to provide broader and higher quality training.

An industry wide system with common standards across firms would, of course, be the preferred way of certifying training experiences. Trade associations in banking and construction and a variety of other industries have sponsored the development and dissemination of competency tests that are necessary to create a truly uniform system of

certification. Although most occupational competency tests have been designed for certifying the vocational training provided by schools, they could be adapted for use in certifying apprenticeships and other forms of on-the-job training. The federal government is now encouraging the development of these competency certification schemes by awarding development contracts to trade associations (Wills 1993).

Subsidizing the use of Industry Skill Certification Systems: Once skill certification systems have been developed in a couple of industries, the Department of Labor should explore the feasibility of encouraging training by making the number of workers obtaining skill certification a target of subsidy. Incentives to engage in self study could be enhanced by requiring companies receiving such subsidies to share them with the trained worker through wage increases or bonus awards.

A by product of targeting subsidies in this way would be to encourage employers to use the certification system. Without such a system of incentives to attract workers and firms into the skill certification process, it is uncertain whether the skill certification system will gain the scale necessary for survivability. On the other hand, there are potential drawbacks to government financial inducements to use an occupational credentialing system. When there are no such inducements, a credentialing system that does not add value will not be used by employers and will therefore not distort the labor market. Little will be lost. If companies are being subsidized to participate in a credentialing system and it is poorly designed, the labor market might become more distorted than it was before the system was created.

11.7 Low-Interest Loans to Workers for General OJT

Since lack of access to loans at reasonable interest rates is one of the reasons for worker under investment in OJT, solving this problem would stimulate investment in general OJT. If there were an administratively practical way of defining groups of workers who are heavily investing in general OJT, such individuals could be made eligible for guaranteed student loans. I doubt, however, there is a politically acceptable and administratively practical way of identifying and certifying eligible employer training programs. It has turned out to be impossible to police guaranteed student loan eligibility of just a few thousand proprietary colleges. Major abuse of the federal loan program has resulted. Policing the quality of training at 4 million firms is clearly beyond the government's capability. Most firms would probably not view the prospect of loans to their workers by the government a sufficient incentive to warrant the intrusion that would be involved.

11.8 Partially Guaranteed Loans to Firms for Training

The State of Connecticut is about to launch a program to encourage banks to lend money to small and medium sized business located in the state to pay the costs of formal training programs. Current plans are for the loans to be at the prime rate and to have a maximum payback period of 3 years. Eligible expenditures include trainee wages, trainer wages, curriculum development and payments to outside contractors. The state will provide two incentives to banks and companies to participate-- a guarantee of 25 percent of the value of the loan and a forgiveness of 25 percent of the loan if one year later the money is determined to have been spent in the ways promised in the loan application. The Student Loan Marketing Association (Sallie Mae) is planning to generate a secondary market for these obligations by pooling these loans and marketing them to other investors. Two levels of approval will be required. The training plan must be described on a two page application form. This application must be approved by one of the state's program agents: the Connecticut Business and Industry Association (the state affiliate of the NAM), the Connecticut Manufacturers Alliance, the Business and Industry Services Network of the State Community College system, or the State Department of Labor. The lending bank, which services the loan and must retain at least 15 percent of the loan's value, must also approve the loan (Canute 1994).

This program has many attractive features. Other states should be encouraged to undertake similar programs and possibly the federal government could provide some seed money or other kinds of encouragement.

12. THE TRAINING MANDATE OPTION

Although the adoption of all eight of these proposals would increase OJT, each proposal addressed only one of the causes of the under investment in training. A more direct approach is to require companies to spend at least X percent on training or else pay a tax.

12.1 The French Mandate to Spend on Training

Legislated mandates to spend on formal training are a central component of the French system of continuing training. Beginning in 1972, every French employer with 10 or more employees was obligated to spend .8 percent of its wage bill on continuing education and training of its employees or pay a tax equal to the difference between its obligated and actual training expenditure. The mandated training tax for continuing training has since been raised many times and is now 1.4 percent. In addition, every employer regardless of size is required

to spend .5 percent of its wage bill on apprenticeship training or pay a tax equal to the difference between its obligated and actual training expenditure (Berton and Podevin 1991).

Firms are required to develop a training plan and present it to the firm's labor management committee (these committees were already required by French industrial relations legislation). This committee's role is advisory only, however. Management generally decides which skills are to be taught, who is to be trained, and when. Other times employees take the initiative. The government is not involved in these decisions and bureaucracy has been kept to a minimum. The auditing of company reports of training expenditure requires a staff of only 120 controllers for the entire nation.

Eligible expenditures: The obligation to invest in continuing education and training can be fulfilled by five different types of expenditure:

* the firm's own formal training programs (These must have a curriculum, develop a skill that is useful at more than one firm and be located away from the trainee's normal work station.),

* external training (often cooperative programs organized by groups of employers),

* training insurance funds agreed to by management and labor,

* government approved training programs for unemployed youth who have no qualifications (Within the overall 1.4 percent mandate, firms are required to spend at least 0.3 percent of their wage bill on these programs or be subject to the tax),

* wages and tuition of employees taking courses at schools and colleges. (Firms are required to spend at least 0.15 percent of their wage bill on in-school training of employees or be subject to tax. This is the only mandate that firms with fewer than 10 employees are subject to)

Impacts: Since the initiation of the French training mandate, the. share of company wage bills spent on formal training has risen substantially, from 1.35 percent in 1972 to 3.14 in 1990. French leaders believe the training mandate stimulated this growth, encouraged institutional change supportive of training, helped professionalize employer training and has aided French competitiveness. Field research on the productivity and skills of French workers has also convinced Hilary Steedman and Geoff Mason of London's National Institute of Economic and Social Research that the mandate has stimulated investment in training and improved worker skills. The two human resource executives of American multi-national corporations operating in France I have interviewed about the mandate also praised the system.

Studies have found that individuals receiving training are significantly more likely to receive internal promotions and 2 to 3 times more likely to transition from unskilled to skilled

occupations. This is just as true for training initiated by the worker as for training initiated by the employer. For those who were in unskilled jobs in 1980, individuals who initiated their own training in the next 5 years had a 58 percent probability of being in a skilled job in 1985 and those who took training at the behest of their employer had a 55 percent chance of being in a skilled job. Those who received no formal training between 1980 and 1985, by contrast, had only a 20 percent chance of moving up to a skilled job by 1985 (Berton and Podevin 1901). Perhaps the most remarkable aspect of the French experience with the mandate is the social consensus surrounding the scheme and the lack of vocal employer opposition.

Disadvantages: The French system also has some important disadvantages:

- Six-million of the 9 million French workers employed by firms subject to the training tax are at firms which regularly exceed the mandated amount. The training mandate clearly has no effect on the incentive to train these 6 million workers. Since 1984, firms which increase their training budget from one year to the next are eligible for a tax credit equal to 25 percent of the increase in training expenditure (Luttringer 1991). For firms already spending more than the mandated 1.4 percent of wage bill, the tax credit, not the mandate, is probably the primary inducement for expanding training.
- Another 27 percent of workers are employed at firms which report spending exactly 1.2 percent (the mandate that applied in 1990) of wage bill on training. While some of these firms increased their training expenditure to the required minimum because of the mandate, program administrators report that many smaller companies simply stop keeping track of their training expenditure once they reach the tax threshold. It is not clear, how much of the response to the mandate is creative accounting and how much is real behavioral change.
- Firms whose expenditures on formal training would have been below 1.4 percent of payroll in the absence of the mandate, save in taxes the full amount of any increase in expenditures on training. Some administrators of the French program fear that this has induced a careless attitude toward costs and reduced the efficiency of training.
- Expenditures on formal training reduce the firm's tax liability; but the costs of informal training do not. In the United States formal training accounts for less than 15 percent of the time that new employees at small and medium size companies spend learning their job; informal training and learning by watching others accounts for the rest. This feature of the mandate generates a strong incentive to substitute formal training for informal training despite the fact that there is no evidence (either of an empirical or theoretical variety) establishing that formal training is more cost effective than informal training (Bishop 1991).
- Formal training is subject to substantial economies of scale, so small firms are put at a disadvantage. The kind of training which small companies excel at-- close supervision and informal training by the owner-- is not eligible for subsidy. Small firms must join together in cooperative efforts to achieve the scale necessary to make formal training feasible.

12.2 The Australian Training Levy

In 1990 Australia initiated a mandate to spend on training quite similar to the French program and consequently subject to the same technical criticisms. Firms with payrolls of more the $200,000 were required to spend 1 percent of their wage bill on structured training programs or pay a tax of an equivalent amount. To be considered "structured," programs had to: (a)"[be] designed or approved in advance by a person who is appropriately qualified or experienced to design a program of the relevant type, (b) skills to be acquired ...and means of imparting them...[must be] clearly identified before the program begins...[and] expected program outcomes are clearly formulated (Department of Labor: Australia, 1990, p. 18)." The tax rate was raised to 1.5 percent in 1992.

There is considerable evidence that the levy has increased expenditure on formal training. According to the federal government's white paper on the subject, half of Australian employers spent nothing at all on formal company training and 75 percent spent less than one percent of wage bill prior to the introduction of the training levy. "Now almost all eligible firms are complying with their obligation to train their employees (Keating 1994)". Between 1989 and 1993, training expenditure increased from .9 to 1.7 percent of wage bill -:: companies with fewer than 20 employees, from 1.2 to 2.8 percent of the wage bill at companies with 20 to 99 employees and from 2.4 to 3.0 percent at companies with more than 100 employees (Castles 1990, 1994). As in France, the rise in training expenditures was particularly rapid at companies that had been spending less than one percent of wage bill on training in 1989 (Bendick 1989). Formalization of previously informal training probably accounts for much of this growth, but some of it appears to have been real. Independent measures of change over time in training expenditure indicate substantial increases (Fitzgerald 1994).

The levy has not turned out to be popular, however. Even though few companies fail to meet or exceed the training target, employers dislike the paperwork and the threat of interference. A survey by Tim Henson of Monash University found that, while 27 percent of employers said the levy had brought about "increased commitment to training and planning" or "additional employment of apprentices & trainees," 32 percent cited "the increased paperwork, accounting and time," and 9 percent cited "unnecessary training to meet the requirements of the Act (Dwyer 1992)." Economists have criticized the levy as ill designed because it demands the same percentage level of spending from all industries and firms, even though socially optimal levels of formal training vary a great deal across firms and industries (Sweet 1994). Some have argued that the primary cause of low levels of training in Australia has been labor

contracts which have excessively flattened the wage structure, making it impossible for workers to pay for general training. They argue that lowered wage rates for trainees would be a more effective means of encouraging more training. Others argue that a partial subsidy of training is preferable to a mandate to spend a fixed percentage of the wage bill on training. The fact that training is in effect free on the margin for companies that would otherwise have spent less than 1.5 percent of payroll on training has also raised doubts about the general efficacy of training. Some have attacked conferences and external training seminars which are eligible for subsidy as little more than subsidized paid vacations. Some training professionals have criticized training programs that have not been developed using "best practice" methods.[24] Government interventions in training markets must make sure they leave incentives for efficiency and effectiveness in place. Training mandates with 100 percent rates of implicit subsidy fail to accomplish this goal.

In a few industries (e.g. tourism and metal working), the levy apparently stimulated institutional changes such as cooperative training efforts managed by groups of employers and restructured labor-management contracts but nothing on the scale experienced in France.

When the levy was first considered, labor unions were strong advocates because they hoped it would induce major improvements in the long term skill development of production workers. The legislation contains no rules mandating such a shift, however, so managers, professionals, technicians and supervisors have received a disproportionate share of training investments as they did prior to the levy. Unions consequently became disillusioned with the training levy (Fitzgerald 1994). Seeing that it was not getting what it wanted from the levy, the Labor government decided to suspend the levy for three years while research into its effects was undertaken.

Many of the problems with training mandates are technical in nature and can be ameliorated or eliminated by modifying their structure. However, systems like the mandate to spend have been tried twice in non-corporatist political environments similar to the United States and both times they failed to pass the test of survival. Australia suspended its training mandate after four years. Most of Great Britain's industry training boards were eliminated by Margaret Thatcher's government in the early 1980s. Britain may, however, be reconsidering the issue. The House of Commons Select Committee on Trade and Industry has just recommended a training mandate be instituted in the United Kingdom (The Economist, April 30, 1994, p.65)

12.3 How Would a U.S. Training Mandate Best be Structured?

If one were designing a training mandate for the U.S., how should it be structured? The source of most of the problems with the French and Australian training mandates is the 100 percent offset of training expenditure for tax obligation. It is this feature that results in a few firms (those spending below the mandated level) having little incentive to train efficiently and most other firms facing no incentive to increase training above the level they would have chosen in the absence of the program. An American training mandate can avoid these problems by offering only a 20 or 25 cents reduction in tax for every dollar of training expenditure. This generates strong incentives to use cost effective training techniques. It also means that the tax rate can be low and yet an incentive to expand training is generated even for companies that normally spend 4 percent of their wage bill on training.

All employers-- profit making, nonprofit, and governmental-- should be subject to the training tax. As an administrative convenience, the mandate should not apply to very small organizations. Furthermore, it should set proportionately higher training targets for larger firms. This can be accomplished by making the training tax progressive. For example, there might be no tax on the first $100,000 of the firm's wage bill, a 0.5 percent tax on the next $5,000,000 of the wage bill, a 0.75 percent tax on the next $5,000,000 of wage bill and 1.0 percent on all wages paid above that. Taxes paid would go into a dedicated training trust fund that would be a source of federal funding of technical assistance to firms considering expanding their training programs, JTPA, apprenticeship programs, school based vocational training and research and development into improved training techniques.

With a 25 cents on the dollar tax offset, a 1 percent tax rate implies that the very largest firms would not be released from paying tax until they were spending over 4 percent of their wage bill on formal training programs. Once accountants are given the task of identifying the full costs of their existing formal training programs (including the time of trainees), this will not be a difficult target for most companies to meet. The average French firm with more than 2000 employees and large unionized American firms in Katz's (19931 study currently spend this proportion of their payroll on formal training.

Quality control: As a quality control measure, firms would be required to give certificates describing the skills taught and competencies achieved to trainees at the completion of training.[25] These certificates would make the individual more marketable at other firms and strengthen worker incentives to engage in training Public companies would be expected to describe their investments in formal training in their annual report. In order to avoid

a conflict of interest in the allocation of training investments, tax offsets would not be available for training received by the owner and top managers.

Initially, the categories of training expenditures that could offset the tax would be similar to those in France: apprenticeship training programs, industry training funds, labor-management training funds, tuition reimbursements for job-related training, contributions of materials or staff time to vocational-technical institutions, the employer's share of JTPA OJT training expenses and the firm's formal training programs for new and continuing employees.[26] The costs of certain types of informal training (as specified in Department of Labor regulations) would also be used to offset the training tax. Apprenticeship programs for 16 to 21 year olds for high skill jobs generate particularly large externalities, so it might be desirable to structure the mandate to give special encouragement to this kind of training. This could be done by establishing a sul•-man0st° for apprenticeships or by offering a larger tax reduction (e.g. 40 cents per training dollar rattier than the 25 cents per training dollar) for expenditures on apprentice training programs that meet quality standards promulgated by industry associations and approved by the Department of Labor.[27] Other types of training (for example, training which awards industry recognized credentials or academic credit) might be similarly encouraged by offering a better tax offset ratio.

While the levy just described avoids many of the design flaws that have been major sources of criticism of the French and Australian training mandates, the political sustainability problem remains. If such a scheme were adopted in the U.S., I am doubtful it would survive a change of administration. Mandates do not create a constituency that will lobby for the program. They do not generate significant amounts of tax revenue, so repealing a mandate does not force legislators to find savings somewhere else in the budget. The group most directly affected-- employers-- will oppose renewal every time the issue comes up. Tax credits and subsidies by contrast, generate constituencies who lobby for and defend the tax expenditure. The TJTC is a case in point. Even though efficacy is problematic and many administrations have opposed its renewal, the tax credit has survived to this day. Therefore, let us examine some subsidy alternatives to the mandate.

13. SUBSIDIZING TRAINING

Stimulating training through a direct subsidy necessitates finding a practical administrative mechanism for defining what is to be subsidized. The problem of measurement is a difficult one, but reasonable solutions are feasible. Three options are examined in this

section of the paper: state subsidized customized training, a marginal subsidy of the firm's training expenditures and a shortage occupations on-the-job training subsidy.

13.1 State Training Subsidy Programs

Since general OJT typically gets mixed together with specific OJT and both occur simultaneously with actual production, the primary difficult in promoting general OJT is finding -a practical way of measuring it. One way to promote on-the-job skill training without having to solve the measurement problem is for community colleges (or some other public agency) to establish cooperative training ventures with specific local employers in which teachers on the college's payroll or trainers contracted by the public agency provide training that meets that employer's specifications but is also useful at other firms (Office of Technology Assessment 1990, 144-150; Creticos, Duscha and Sheets 1990). Typically state grants cover one-half of the costs of outside vendors or company training staff providing the training. The company pays the other half of instructional costs and all of trainee time costs. Many states and localities now offer this kind of aid to companies that are trying to become more competitive or plan to open or expand plants in the community. Some states give preference to firms where training is part of an effort to implement elements of the high performance work system model. The purpose of these cooperative efforts is not just to subsidize and promote on-the-job training. Proponents of customized training contend it serves as an inducement for new high-tech companies to locate in the state and as an aid to local firms struggling to keep up with fast-changing technology (New York State Education Department 1984). Another benefit of customized training is that the involvement of an educational institution facilitates the award of credentials that will make the skills gained more visible to other employers.

Publicly subsidized institutions are becoming increasingly important providers of skill training that is customized to a particular employer's needs. Not clear, however, is whether publicly controlled institutions are always the best providers of such training and whether, lacking the public subsidy, they would be effective competitors in this market. Often the best provider of specific types of customized training will be a private technical college or institute, an individual hired on a contract basis, or another firm (e.g., the maker of equipment that is being installed at a firm). If these alternative providers are to be given a chance, the public funds set aside for customized training should be administered by a public agency that can select the best local provider and contract for the training in an expeditious manner. The responsibility for administering such a program could be assigned to education agencies, as in New York; to the State Department of Labor, as in California; or councils representing the

social partners as occurs in the Job Training Partnership Act. Creticos and Sheets (1990) study of these programs concluded that improvements in business performance did result at the 24 companies studied.

> These improvements were due not to training alone: the training was part of a broader effort to improve productivity, quality and profitability. For example, Northwestern Steel and Wire Co. in Sterling Illinois, wanted to raise profits by bringing its costs down to meet those of other U.S. mini-mills. (An industry study had shown that Northwestern's maintenance costs were much higher than the industry average). The company used the state grant to cross-train its maintenance workers; at the same time, Northwestern changed its product mix and took other steps to reduce maintenance costs. Taken together, all of these actions, including the training, succeeded in reducing maintenance costs. The 24 case studies also showed that the State funds allowed the firms to train more workers more quickly than was possible using company funds and that top managers in all companies came to view training much more positively (OTA, p. 145)

The incumbent workers who entered customized retraining programs organized by their employer and funded by California's Employment Training Panel (ETP) Program experienced a modest 3 percent increase in real earnings.[28]

Cooperative arrangements of this type are desirable, but they will probably not become general enough to solve the general problem of under investment in OJT. Cooperative arrangements will probably never account for a large share of on-the-job training for two reasons: limited budgets and the high costs of customizing the training to the employer's needs, and difficulties inherent in determining who is to provide the training and how costs are to be shared. If customized training is to be attractive to firms, thus, costs-- staff time, paperwork, and delay-- must be kept to a minimum. State programs in California, Illinois and New York have demonstrated that it is possible to negotiate and contract for training quickly and at reasonably low cost. Since most of the administrative costs of participation are unrelated to the number of people trained, these costs are particularly significant for small firms and as a result they typically do not participate in such programs. Most of the establishments participating in these state programs have between 200 and 500 employees (OTA 1990, p. 144). Consequently, when firms have the option of using their own staff to do training, these costs will loom large and probably result in most firms choosing to do their own training. A federal program to encourage states to start or expand such programs is a modest step that should be considered.

13.2 Marginal Training Subsidy

A marginal training subsidy (NITS) would offer a partial subsidy of a firm's training expenditures (above a threshold level) designed to increase individual or firm productivity. The rate of subsidy or tax credit would be set between 10 and 30 percent. The training costs that would be eligible for subsidy would include payments to industry training funds, tuition reimbursements for job-related training, contributions of materials or staff time to vocational-technical institutions, the budgeted costs of the firm's formal training of new and continuing employees, and certain costs for informal training of new and upgraded employees. Trainees should be given a certificate describing the training that has been received.[29]

The objective of the NITS is a general expansion and intensification of employer provided training. All the really important decisions-- who is to be trained, what is to be taught, and how it is to be taught-- are made by the employer and to a lesser extent by the worker. Employers and workers invest considerably more than 100 billion dollars worth of time and resources in formal and informal on-the-job training each year. Consequently, covering all employers and all kinds of training means costs can be kept down only if the subsidy rate is set relatively low, the definition of subsidizable expenditure is restrictive, and the threshold is set relatively high.

The threshold above which the subsidy or tax credit would be paid might be equal to 2 percent of the firm's wage bill plus an additional 2 percent of wage payments in excess of $8,000,000, plus 6 percent of payments to employees with less than one year of tenure. The threshold is a smaller proportion of wages at small companies because most of their training is informal and consequently not generally eligible for subsidy. The threshold is higher for firms with many new employees because (1) new employees receive more training than continuing employees, and (2) the costs of informal training would be subsidized only during the first year on the job and for a short period after a promotion.

A subsidy above a threshold has some important advantages over an obligation to spend a minimum amount on training:

- There is no presumption that all firms should spend the same proportion of the wage bill on training. Industries where training needs are great and firms which specialize in training (probably because they are good at it) would always face an incentive to expand their training.
- A subsidy above a threshold faces every firm with an incentive to increase training, not just some firms as with the French and Australian training mandates.
- Paper work is greatly reduced because most firms would not apply for a subsidy in most years. Year-to-year variations in training expenditures are substantial at small and medium size firms.[30] Such firms would most likely spend above the threshold only

in year; in which there is a major expansion of employment, the installation of new equipment or a reorganization of the company.

- Employers who feel that the administrative burdens of the subsidy are too great would just choose not to participate.

All employers-- profit making, nonprofit, and governmental-- should be eligible for the marginal training subsidy if their training expenditures exceed the threshold defined for their organization. In order for incentive effects to be maximized, employers must feel they are assured a larger subsidy payment if they increase their training investment. Together these two considerations imply that the NITS should be administered as a subsidy entitlement, as a tax credit against a broad-based tax on the firm's wage bill like Federal Unemployment Insurance Tax or social security tax, or as a tax credit against income taxes that can be carried over into future years. The MTS would be financed either out of general revenue or a 2pecial training tax on the wage bill of all employers. In order to give firms time to set up the accounting procedures to record training expenditures, it would be phased in at least a year after the legislation is passed. The NITS has a number of advantages.

- Since the employer pays 70-90 percent of the cost, there is always an incentive to be efficient.
- The choice of which jobs to train for and how to do the training is made by the employer, the person best able to project the firm's future need for skilled workers and to select the best method of training for those skills.

Costs: Because of the high thresholds, tax expenditures generated by the scheme just described will be rather low. Assuming that half the nation's 3 trillion dollar wage bill is at large firms in the 4 percent range and that 20 percent is paid to workers with less than one year of tenure, the cumulated threshold total is 126 billion dollars. Assuming that companies accounting for one-third of the nation's payroll (and threshold total) do not apply for subsidy, expenditure on eligible training of 100 billion dollars (5 percent of wage bill) at the remaining companies will yield only 16 billion dollars of above threshold training expenditures. If participating companies spend 150 billion dollars (7.5 percent of wage bill, training expenditure above the threshold is 66 billion dollars. Subsidy payments would count as income and therefore be taxed at approximately a 33 percent rate. This implies that tax expenditure will range between 1.07 and 4.4 billion dollars for a 10 percent rate of subsidy and between 3.2 and 13.2 billion dollars for the 30 percent rate of subsidy.

Benefits: Bishop (1991) has estimated that the price elasticity of training investment is equal to -.7[31] If that estimate is correct, the 10 percent tax credit raises training investment by 7

(10.5) billion dollars when the no subsidy baseline is 100 (150) billion dollars. This would imply a pretty good bang for the buck. The ratios of training stimulus to tax expenditure for the 10 percent subsidy would be 4.56 if the no-subsidy training expenditure baseline is 100 billion dollars and 2.06 if the baseline is 150 billion dollars. For the 30 percent subsidy, the bang-per-buck ratio is 6.56 if the baseline is 100 billion dollars and 2.39 if baseline spending is 150 billion dollars. The -.7 estimate of price elasticity is based on some strong assumptions, however, so these estimates of impact must be considered very tentative.

When designing a training subsidy there will be a temptation to become overly prescriptive about the type of training that is subsidized. The failure of prescriptive regulation of schooling inputs to produce quality outcomes is a lesson that the designers of a training subsidies or mandates need to take to heart. There is substantial evidence that employer training often yields very high returns, but the number of studies that have measured the productivity outcomes of training is very small. The research base is much too thin to form a basis for government picking and choosing among types of training or objects of training. The profit motive is probably what has insured training's cost effectiveness in the past. Too many regulations could get in the way of the profitability calculation and reduce training's effectiveness. For these reasons I do not recommend restricting the types of training eligible for subsidy. That, however, is an option that can be considered. For example, subsidies might be provided only for programs designed to develop certain specified skills: reading, writing, mathematics, group decision making skills, word processing, other computer skills, statistical process control, safety, etc or training that yields an industry recognized skill certification. An alternative approach would be rule out certain types of training such as history and philosophy of the company, the benefits packages offered by the firm, retirement planning, wellness, physical fitness, etc.

Influencing Who is Trained*:* The training subsidy outlined above will increase the incidence and intensity of employer training without changing its basic character or its distribution. Employers clearly believe that skilled workers need more formal training than unskilled workers (i.e. that profitable opportunities for training skilled workers are more numerous than for training unskilled workers). The result is that managers and skilled workers get more formal training than unskilled workers. Some analysts believe this is a problem that requires government intervention.

A training subsidy could be structured with a bias toward training those with less skill. Separate subsidy thresholds might be defined for exempt and non-exempt employees and the

subsidy could apply separately to each group of workers. Separate calculations might be made for training provided to workers with less than one year of tenure. Once the 8 or 10 percent threshold was exceeded, higher subsidy rates might apply to training received by this group. Separate calculations of payroll and training expenditure might be made for workers under a certain age and higher rates of subsidy might apply. These changes increase administrative burdens, however. Most important, however, is to avoid using stigmatizing criteria to define target groups. If the target group is defined by characteristics not immediately visible to employers which reflect individual need (e.g. low literacy, welfare recipient, or disadvantaged status), the result will be to stigmatize the individuals and the program. This might actually make the targeted group worse off.

Should profit and productivity calculations be the sole determinants of who gets trained? Or should a training subsidy favor the training of the firm's least skilled workers? The answer is not clear. While the absence of loan financing of general training and the turnover explanations of under investment in training apply most of all to young and disadvantaged workers, the externalities that training is thought to generate-- discoveries, artistic contributions, reduced risks of catastrophic errors-- appear to arise primarily in high level occupations. How should distributional issues be evaluated? Should the goal be equal opportunity to compete for jobs which offer training or equalizing training outcomes? While evidence about externalities can inform policy choices, the judgement is ultimately a political and moral one.

Discouraging Informal Training*:* The major drawback of the two subsidy schemes-MTS and customized training-- described above is their focus on inputs— spending on training-- rather than outputs-- skills developed. Inevitably they will promote formal training programs at the expense of job rotation, learning by doing, asking a co-worker and other more informal methods of learning and training on the job. Japanese workers are better trained than American workers not because they are more likely to take company sponsored courses (expenditure on such courses is in fact lower in Japan than in the US and France, Dore and Sako 1989), but because they receive continuous upgrading training through job rotation and the Kaizen process. It is very important for an American training mandate to promote informal learning on the job through job rotation, obtaining assistance from coworkers, self study and learning by doing. The Department of Labor should be tasked with the job of writing regulations which would accomplish this.[32]

13.3 Shortage Occupations On-the-Job Training Incentive (SOOJTI)

An alternative approach to promoting more private investment in on-the-job training is to subsidize outcomes (trainees who obtain industry recognized certification in shortage occupations) rather than inputs (expenditure on training). A subsidy would be offered for training newly hired and transferred employees in a few selected occupations that are in short supply.

Selecting skills for which to provide training incentive. Legislation would restrict the subsidy to a limited number of industries that currently export a major share of their output or are service firms that provide specialized high-tech services. To be eligible for a training subsidy, an occupation or skill would have to involve considerable initial on-the-job training, be required at many firms, and be in shortage. The determination of whether an occupation is in shortage would be based on current data on changes in relative wage rates, changes in vacancy rates or newspaper advertising if available, and recent and projected growth of demand for the skill[33] The Department of Labor would be given a fixed budget and would select a limited number of skilled jobs for which training subsidies would be available.

Once an occupation had been selected as a potential candidate for subsidy the Department of Labor would appoint an industry-labor committee to make recommendations regarding the definition of the critical skill, the competencies that a trained individual would be expected to have, and possible mechanisms to ensure that subsidized trainees achieve these standards. The Department of Labor would do a small survey of the costs of training and the length of the training period that would serve as a basis for calculations for median training cost and the payment made when workers become certified in the occupation would be set equal to 15 to 33 percent of that median.[34] The Secretary of Labor would be empowered to make competency certification (under the auspices of a multi-employer or union umbrella organization) a part of the mechanism for defining eligibility for a critical skills training subsidy.[35]

Administration of the training incentive. I would recommend that firms be required to initiate their subsidy application within one week of initiating training of one of their workers.[36] The requirement of immediate application for the training subsidy has three purposes: (1) the firm is forced to be aware of the subsidy when it begins the training, which maximizes the subsidy's incentive effect; (2) it allows the Department of Labor to monitor continuously the number of trainees it's program has stimulated and to project future costs and the fulfillment of its goals; and (3) for the firm, it locks in the terms and conditions of subsidy that prevail at the

date training was commenced. If the Department of Labor determines that more or less training is being undertaken than was needed or budgeted, it has the right to restrict or liberalize the definition of subsidizable jobs skills, lower or raise the training cost allowance, or end that occupation's eligibility. Rule changes would go into effect 1 week after the announcement of the change.

There would be no limit to the number of trainees for which an employer could be subsidized, and the firm would not have to obtain advance agreement from the department as to this number. The employer would only have to certify (1) that the training provided resulted in the worker's attaining the critical skill, and (2) that the trainees did not have that skill prior to the training. This certification would be audited on a random basis. Workers who complete training would be awarded a certificate attesting to the skills they have achieved.

The SOOJTI has a number of attractive features:

* The firm's administrative costs are kept low. The firm does not have to calculate and report how much it is spending on training.

* Eligibility for subsidy is a function of an output-- the number of people trained for certain specific jobs-- not a measure of input. This creates a strong incentive to be as efficient as possible in doing the training.

* It is limited in scope to occupations in critical shortage.

* Great flexibility is given to program administrators. (This is essential because the SOOJTI is a new concept that must respond quickly to the changing needs of the economy.)

* Workers who complete training are awarded a certificate that describes the skills gained.

* Firms always faces a marginal incentive to expand their training of targeted skills. They do not have to get prior agreement from Department of Labor about how many people to train (an administrative hassle that would be a major barrier to participation).

* Firms are given an incentive to retain the workers they train.

* While firms can be assured of receiving a subsidy when they begin training, total cost is capped by monitoring usage and the Department's ability to lower subsidy rates and tighten eligibility.

* Costs could be further reduced by requiring that firms already employing people in the targeted skilled occupations exceed a given level of training before being eligible for subsidy. It could be assumed that in the normal course of events such firms would have to replace 10 percent of their stock of workers with the targeted skills anyway. The subsidy could be paid for trainees above this threshold.

* A sunset provision automatically ends a skill's eligibility for subsidy.

* Eligibility for subsidy is a function of an output-- the number of people trained for certain specific jobs-- not a measure of input. This creates a strong incentive to be as efficient as possible in doing the training.

The Shortage Occupation On-the-Job Training Incentive has some important drawbacks, however. Its success depends upon the wisdom and timeliness of the selection of skills for which training subsidy is provided. Experience with federally funded graduate fellowships should remind us how difficult it is for government to forecast future demand for a specific skill and implement decisions to extend or withdraw training subsidies in a timely manner. Graduate fellowships were originally targeted to a few shortage fields thought to be critical to national defense. However, other fields campaigned to be included and new programs were started until almost every field of study was included in at least one agency's fellowship program. The fellowship program continued even after shortages of Ph.D.s gave way to surpluses. The SOOJTI has features-- the sunset provision, great administrative flexibility, and a fixed budget-- that are intended to prevent a recurrence of the poor timing that characterized the graduate fellowship programs. There is always the possibility, however, that the projections of future demand will be wrong or that politics will result in the wrong occupations being selected and that the selective nature of the training incentive would increase rather than decrease market distortions.

14. SUMMARY OF POLICY RECOMMENDATIONS

There is no evidence that adults (people over age 25) who initiate occupational training without sponsorship of their employer benefit from such training. This implies that efforts to stimulate incumbent worker training should focus on inducing employers to provide or sponsor more of it. If there are to be public subsidies of incumbent worker training, they should be funneled through firms not schools!!

Policy initiatives designed to increase the number of adults who initiate and pay for school-provided occupational training would be a mistake. Examples of policy initiatives which research reviewed in sections 2 and 3 indicates would not benefit trainees or improve competitiveness are:

* lower tuition charges for education and training programs targeted on adults
* making more adults eligible for Pell grant aid or guaranteed student loans
* allowing adults to use IRA savings to pay tuition costs of retraining
* offering training vouchers to displaced workers, welfare recipients or other JTPA

eligibles

* allowing adults to deduct or get tax credits for tuition charges paid for self-initiated training

Public subsidies of occupational training received at educational institutions are already substantial. Additional subsidies for incumbent workers initiating such training on their own are not needed.

Employer provided training produces externalities in many of the same ways that schooling does. Nevertheless, it receives no subsidy and government regulations often act as barriers to such investment. What is needed are mechanisms for stimulating improvements in the quality and quantity of the training sponsored by employers. The policy options (ranked from lest costly and least intrusive to most costly and intrusive) that appear to have promise are:

1) End regulatory barriers which prevent workers from voluntarily participating during uncompensated time in training programs that develop general skills useful on one's current job. Workers, unions and firms should have the option of arranging to share the costs of training programs. Federal regulations compel employers to pay all of the costs of training in skills useful on both one's current job and jobs at other firms, and as a result most companies provide little of such training.

2) Improve training practice by funding a systematic program of research on employer provided training including randomized field trials of alternative ways of delivering training.

3) Pursue policies designed to lower turnover such as improved signals of competencies developed in school and on previous jobs.

4) Expand and improve systems of certifying skill development.

5) Establish industry based systems for publicly recognizing excellence in training.

6) Partially guaranteed loans to firms for training.

7) State run partial subsidies of customized training.

8) Subsidize a firm's training expenditures above a threshold percentage of payroll that rises with firm size and turnover.

The first seven of these policy options are quite inexpensive. Most are actually in operation or under development in some states or some industries. Consequently, they do not appear to be very controversial and are, therefore, good candidates for a federal initiative to stimulate incumbent worker training. With the exception of the research initiative which might discover

something of truly great significance, impacts on aggregate training investment are likely to be modest during this century.[37] Even though the benefit-cost ratios of each initiative are almost certainly very high, federal investment in stimulating training is so low one cannot legitimately expect competitiveness and real wage growth to be perceptibly affected. In my judgement, only option # 8, the Marginal Training Subsidy, has the potential of having an immediate and large impact on training investment by employers. Once in place, some form of it would be likely to become a permanent part of the tax code. Its cost is larger and more uncertain, however, and it is likely to generate considerable controversy if it is proposed.

A number of other policy options were examined and were found to be either ineffective, difficult to administer, distorting, or politically infeasible. Exemptions of jobs with high training content from the minimum wage would be difficult to administer, not very effective in stimulating training and politically difficult to sell. Making workers who are undergoing a significant amount of general on-the-job training eligible for low-interest guaranteed student loans would be extremely difficult to administer and have minimal effects because firms not workers decide when training is to occur. An outcome based subsidy of on-the-job training which prepares workers for occupations experiencing a shortage of skilled workers is rejected because of doubts about the government's ability to pick occupations that are truly in shortage and to close down the subsidy when the shortage disappears. Ways of improving the structure of a training mandate are suggested, but even the improved mandate is more distorting and less effective than a tax credit for training above a high threshold. If a training mandate were implemented in the U.S., it would be unlikely to survive a change of administrations.

References

Barnow, Burt S. Government Training as a Means of Reducing Unemployment. ICF Incorporated, August, 1985.

Barron, John M., Black, Dan A. and Loewenstein, Mark A. "Employer size: The Implications for Search, Training, Capital Investment, Starting Wages and Wage Growth," Journal of Labor Economics, (January 1987), Vol. 7, No. 1, 76-89.

Barron, John M., Black, Dan A. and Loewenstein, Mark A. "Job Matching and On-the-Job Training," Journal of Labor Economics, (January 1989), 1-19.

Barron, John M., Black, Dan A. and Loewenstein, Mark A. (1992) "Gender Differences in Training, Capital and Wages, Bureau of Labor Statistics Working Paper 224, U.S. Department of Labor, April, 1-38.

Barron, John M.; Berger, Mark C. and Black, Dan A. (1993a) "Do workers pay for On-The-Job Training?" Center for Business and Economic Research Working Paper #E-169-93, University of Kentucky, June, 1-28.

Barron, John M.; Berger, Mark C. and Black, Dan A. (1993b) "Access to On-the-Job Training: The Role of Education, Gender, Race and Affirmative Action" Center for Business and Economic Research, University of Kentucky, July, 1-25.

Barron, John M.; Berger, Mark C. and Black, Dan A. (1993c) "Employer Search, Belated Information, and Training" Center for Business and Economic Research Discussion Paper #E-171-93, University of Kentucky, June, 1-28.

Barron, John M. and Bishop, John. (1985) "Extensive Search, Intensive Search, and Hiring Costs: New Evidence on Employers' Hiring Activity" Economic Inquiry, July 1985 p. 303-382.

Bartel, Ann P. and Frank R. Lichtenberg. "The Comparative Advantage of Educated Workers in Implementing New Technology." The Review of Economics and Statistics, February 1987, 1-11.

Bartel, Ann P. and Sicherman, Nachum (1993) "Technological change and the on-the-job training of young workers." Paper presented at the NBER Summer Institute in Labor Studies, July 26-30, 1993, Columbia University, 1-50.

Bassi, Laurie. (1992) Smart Workers, Smart Work. Washington, D.C.: The Southport Institute for Policy Analysis, 1-58.

Becker, Gary. "Investment in Human Capital: A Theoretical Analysis." Journal of Political Economy, Vol. 70, No. 5 pt.2, October 1962, 9-50.

Berton, Fabienne & Podevin, Gerard. (1991) "Vingt Ans de Formation Professionnelle Continue: De la Promotion Sociale a la Gestion de L'Emploi," Formation Emploi, No. 34, Avril-Juin 1991, 14-30

Bishop, John. "The Recognition and Reward of Employee Performance." Journal of Labor Economics, Vol. 5, No. 4, pt 2, October 1987a, pp. S36-S56.

Bishop, John H. "The Economics of Employment Testing" Center for Advanced Human Resource Research Discussion Paper # 88-14, Cornell Univ. 1988c,

Bishop, John. "Toward More Valid Evaluations of Training Programs Serving the Disadvantaged" Journal of Policy Analysis and Management, Vol. 8, No. 2, Spring 1989a, pp. 209-229.

Bishop, John. "Job Performance, Turnover and Wage Growth." Journal of Labor Economics, Vol. 8, No. 3, September 1990, pp. 363-386.

Bishop, John. (1991) "On-the-Job Training of New Hires," Market Failure in Training, edited by David Stern and Josef Ritzen, New York, Springer Verlag, 61-96.

Bishop, John. (1993a) "Improving Job-Worker Matching in the Labor Market: What is the Role of the Employment Service?" Brookings Papers on Economic Activity: Microeconomics. 1993, Washington, DC: The Brookings Institution, 335-400.

Bishop, John. (1994) "The Impact of Previous Training in Schools and on Jobs on Productivity, Required OJT, and Turnover of New Hires," Private Sector and Skill Formation: International Comparisons, edited by Lisa Lynch, National Bureau of Economic Research, Chicago: Univ. of Chicago Press, 161-200.

Bishop, John. (1993b) "Technical Education and Education Reform" Center for Advanced Human Resources Research Discussion Paper 93-06.

Bishop, John and Carter, Shani. "The Worsening Shortage of College Graduate Workers" Educational Evaluation and Policy Analysis, Fall 1991.

Bishop, John and Kang, Suk. "On-the-Job Training/ Sorting: Theory and Evidence" National Center for Research in Vocational Education, Ohio State University, 1984.

Bishop, John and Kang, Suk. "A Signaling/Bonding Model of Employer Finance of General Training." Center for Advanced Human Resource Studies, Cornell University, Ithaca, New York, 1988.

Bishop, John and Kang, Suk. (1990) "Why are Wage Profiles so Flat During the First Year on the Job?" Center for Advanced Human Resource Studies Working Paper 89-18, Cornell University, Ithaca, New York.

Bishop, John; Hollenbeck, Kevin; Kang, Suk and Willke, Richard. Training and Human Capital Formation. Columbus: The National Center for Research in Vocational Education, The Ohio State, University, 1985.

Black, Dan, Berger, Mark and Barron, John. (1993) Job Training Approaches and Costs in Small and Large Firms. Report to the Small Business Administration, Department of Economics, University of Kentucky.

Blanchflower, David and Lynch, Lisa, (1994) "Training at Work: A Comparison of U.S. and British Youths." Private Sector and Skill Formation: International Comparisons, edited by Lisa Lynch, National Bureau of Economic Research, Chicago: Univ. of Chicago Press, 233-260.

Bloch, Farrell E. "Labor Turnover in U. S. Manufacturing Industries." Journal of Human Resources, Vol. 14, No. 2, Spring 1979, pp.236-46

Bloom, Howard S.; Orr, Larry; Cave, George; Bell, Stephen; Doolittle, Fred. The National JTPA Study: Title 11 A Impacts on Earnings and Employment at 18 Months. Executive Summary. Bethesda, Md.: Abt Associates, May 1992.

Bowers, Norman and Swaim, Paul. (1992) "Probing (Some of) the Issues of employment related Training: Evidence from the CPS." Washington D.C.: Economic Research Service, U.S. Department of Agriculture, 1-36.

Bretz, Robert D. and Thompsett, Robert. (1992) "Comparing Traditional and Integrative Learning methods in Organizational Training Programs." Journal of Applied Psychology, Vol. 77, no. 6, 941-951.

Brown, Charles. "Empirical Evidence on Private Training," Background Papers for Investing in People, pp. 331387.

Buechtemann, Christoph, Schupp, Jurgen and Soloff, Dana. (1993) "Roads to Work: school-to-work transition patterns in Germany and the United States." Industrial Relations Journal, Vol. 24, no 2, 97-111.

Buechtemann, Christoph. "Introduction: Employment Security and Labor Markets." ed. C. Buechtmann, Employment Security and Labor Market Behavior: Interdisciplinary Approaches and International Evidence. Ithaca, N.Y.: I.L.R. Press, 1993, 3-68.

Bureau of National Affairs, (1993) "Text of Rules and Regulations", Wages and Hours. New York, Bureau of National Affairs.

Burke, M.J. and Day, R.R. (1986) "A Cumulative Study of the Effectiveness of Managerial Training." Journal of Applied Psychology, Vol. 71, 232-245.

Campbell, Paul B.; Elliot, Jack; Hotchkiss, Larry; Laughlin, Suzanne and Seusy, Ellen. "Antecedents of Training Related Placement." Columbus: The National Center for Research in Vocational Education, The Ohio State University, 1987a.

Campbell, Paul B.; Elliot, Jack; Laughlin, Suzanne and Seusy, Ellen. "The Dynamics of Vocational Education Effects on Labor Market Outcomes." Columbus: The National Center for Research in Vocational Education, The Ohio State University, 1987b.

Campbell, Paul B.; Basinger, Karen S.; Dauner, Mary Beth; and Parks, Marie A. "Outcomes of Vocational Education for Women, Minorities, the Handicapped, and the Poor." Columbus: The National Center for Research in Vocational Education, The Ohio State University, 1986.

Canute, Patricia Gorman. Director of Strategic Planning, Student Loan Marketing Association, telephone interview on June 15 ,1994.

Cascio, Wayne F. (1993) "Documenting Training Effectiveness in Terms of Worker Performance and Adaptability." Draft of EQW Working Paper, University of Colorado at Denver.

Cascio, Wayne F. (1993) "Public Investments in Training: Perspectives on Macro-Level Structural Change and Micro-level Delivery Systems." Draft of EQW Working Paper, University of Colorado at Denver.

Castles, Ian. (1990) Employer Training Expenditure-- Australia: July-September 1989. Canberra: Australian Bureau of Statistics.

Castles, Ian. (1994) Employer Training Expenditure-- Australia: July-September 1993. Canberra: Australian Bureau of Statistics.

Cave, George; Bos, Hans; Doolittle, Fred and Toussaint, Cyril. (1993) Job Start: Final Report on a Program for School Dropouts. New York: Manpower Development Research Corporation, 1-319.

Commission on Workforce Quality and Labor Market Efficiency, Investing in People: A Strategy to Address America's Workforce Crisis. Wash, DC: Department of Labor, 1989.

Commission on the Skills of the American Workforce. America's Choice: High Skills or Low Wages! National Center on Education and the Economy, Rochester, New York, June 1990.

Conroy, William G., Jr., and Diamond, Daniel E. The Impact of Secondary School Occupational Education in Massachusetts. Lowell, MA: University of Lowell, College of Management S-.fence, Sprint 1976. ED 122 095.

Creticos, Peter; Duscha, Steve and Sheets, Robert. "State Financed Customized Training Programs: A Comparative State Survey." report prepared for the Office of Technology Assessment under contract L3-3810, Feb. 1990.

Daly, A., Hitchens, D.M.W.N., and Wagner, K., "Productivity, Machinery and Skills in a Sample of British and German Manufacturing Plants", National Institute Economic Review, February 1985, pgs. 48-60.

Department of Labor, Training Guarantee (Administration) Act 1990. Canberra, Australia: Australian Government, 1991.

Dertouzos, Michael; Richard Lester & Robert Solow. Made in America, Cambridge, Mass: MIT Press,1989, 1-340.

Dore, Ronald and Sako, Mari. How Japanese Learn to Work. New York, Routledge, 1989. 1-150.

Dwyer, Michael. "Levy has little effect on skills, say businesses." Australian Financial Review, Oct. 22, 1992.

Dwyer, Michael. "Training: an exercise under fire." Australian Financial Review, ..., 1994.

Eck, Alan. (1993) "Job-related education and Training: Their Impact on Earnings." Monthly Labor Review, October, 21-38.

Economist, "Hooray for Intervention," April 30, 1994, p. 64.

Elias, Peter, Hernaes, Erik and Baker, Meredith. (1994) "Vocational Education and Training in Britain and Norway." Private Sector and Skill Formation: International Comparisons, edited by Lisa Lynch, National Bureau of Economic Research, Chicago: Univ. of Chicago Press, 283-298.

EQW (Center for the Educational Quality of the Workforce). (1993) "Statistical Companions to the Crosswalk of National Data Sets Focusing on Worker Training:" EQW Databook, Volume 1, 1-39.

Federal Institute for Vocational Training. "The Transition of Young People into Employment after Completion of Apprenticeship in the 'Dual System':' West Germany: The Federal Institute for Vocational Training, 1986.

Felstehausen, Joyce L., et al. Follow-Up Report on Illinois "Class of 71" Occupational Program Alumni, Final Report. Charleston: Eastern Illinois University, Center for Educational Studies, June 1973. ED 087 866.

Feuer, M., Glick, H., and Desai, A. "Is Firm-Sponsored Education Viable?" Journal of Economic Behavior and Organization, March 1987, Vol. 8, No. 1.

Fitzgerald, Vince; Schofield, Kaye; Brady, Jack; Curtin, Richard; Lorndahl, Rob and Eisenbrand, Lynn. (1994) Successful Reform: Competitive Skills for Australians and Australian Enterprises. Canberra: Australian National Training Authority.

Fitzgerald, Vince. Allen Consulting Group, telephone interview June 9, 1994.

Flanagan, Robert. "Labor Market Behavior and European Economic Growth." paper prepared for Conference on Impediments to European Economic Growth, The Brookings Institution, 1986

Flynn, Patricia (1988) Facilitating Technological Change: The Human Resource Challenge. Cambridge, Mass.: Ballinger

Flynn, Patrice. (1990) "Does Employer-Provided Training Pay Off?" Department of Economics, University of Texas Austin, November, 1-34.

Frank, Robert. "Are Workers Paid Their Marginal Product?" American Economic Review, Vol. 74:4, September 1984, 549-571.

Friend, Irwin and Blume, Marshal. "The Demand for Risky Assets." American Economic Review, Vol. 65, December 1975, pp. 900-922.

Friedman, Toby and Williams, E. Belvin. "Current Use of Tests for Employment." Ability Testing: Uses, Consequences, and Controversies, Part II: Documentation Section, edited by Alexandra K. Wigdor and Wendell R. Gardner. Washington, DC: National Academy Press, 1982, pg. 999-169.

Gold, Michael. "Griggs' Folly: An Essay on the Theory, Problems and Origin of the Adverse Impact Definition of Employment Discrimination and a Recommendation for Reform." Industrial Relations Law Journal, Vol. 7, 1985, pp. 429-598.

Garen, John. "Empirical Studies of the Job Matching Hypothesis," in Ron Ehrenberg ed., Research in Labor Economics, Vol. 9, Greenwich, Conn.: JAI Press, 1988.

Glick, Henry A. and Feuer, Michael J. "Employer-Sponsored Training and the Governance of Specific Human Capital Investments." Quarterly Review of Economics and Business, Vol. 24, No. 2, Summer 1984.

Goldberger, Arthur S. "Linear Regression after Selection." Journal of Econometrics. Vol.15, 1981, pp. 357-366.

Griggs vs. Duke Power Company, 3 FEP 175 (1971).

Grubb, Norton. "The Varied Economic Returns to Postsecondary Education: New Evidence from the National Longitudinal Study of the Class of 1972." Journal of Human Resources, Vol. 28, No. 2, Spring 1993, 365-382.

Haber, S., J. Cordes. and J. Barth. "Employment and Training Opportunities in Small and Large Firms." U.S. Small Business Administration, June 1988.

Hall, Robert. "Intertemporal Substitution in Consumption." Journal of Political Economy, Vol. 96, NO. 2, April 1988, pp. 339-357.

Hamel, Harvey R., "Job Tenure of American Workers, January 1963", Monthly Labor Review, October 1963, Reprint No. 2426, pgs. 1145-1163.

Hamel, Harvey R., "Job Tenure of Workers, January 1966", Monthly Labor Review, January 1967, pgs. 31-45.

Harhoff, Dietmar and Kane, Thomas J. (1993) "Financing Apprenticeship Training: Evidence From Germany." Working Paper No. 4557, National Bureau of Economic Research, Cambridge Mass. 1-44.

Hashimoto, M. "Firm-Specific Human Capital as a Shared-Investment." American Economic Review, 71, no. 3, March 1981, pp. 475-482.

Hashimoto, M., and Yu, B. "Specific Capital, Employment and Wage Rigidity." Bell Journal of Economics, 11, no. 2, 1980: 536-549.

Hashimoto, M. "Minimum Wage Effects on Training on the Job." American Economic Review, Vol. 72, No. 5, December 1982, pp. 1070-1087.

Hashimoto, Masanori, "Employment-Based Training in Japanese Firms in Japan and in the United States", Ohio State University, August 2, 1991.

Haveman, Robert and Wolfe, Barbara. (1984) "Education and Economic Well-Being: The Role of Non-Market Effects." in Dean, Edward (ed.) Education and Economic Productivity, Cambridge, Mass: Ballinger.

Hayghe, Howard, "Job Tenure of Workers January 1973", Monthly Labor Review, December 1974, Vol. 97, pgs. 53-73.

Hersch, Joni, "Equal Employment Opportunity Law and Firm Profitability", Journal of Human Resources, Winter 1991, pgs. 139-153.

Hollenbeck, Kevin. (1993) "The Economic Payoffs to Workplace Literacy." Staff Working Paper # 93-21, Kalamazoo, Mich.: W.E. Upjohn Institute, 1-32.

Hollenbeck, Kevin and Anderson, William. (1992) "Workplace Education Programs in Small and Medium-Sized Michigan Firms." Staff Working Paper # 92-13, Kalamazoo, Mich.: W.E. Upjohn Institute, 1-32.

Hollenbeck, Kevin. Classrooms in the Workplace. Kalamazoo, Mich: W. E. Upjohn Institute for Employment Research, 1993, 1-137

Hollenbeck, K., and Smith B. The Influence of Applicants' Education and Skills on Employability Assessments by Employers. Columbus: The National Center for Research in Vocational Education, The Ohio State University, 1984.

Hollenbeck, Kevin and Wilkie, Richard. "The Nature and Impact of Training: Evidence From The Current Population Survey." In Training and Human Capital Formation, edited by John Bishop et al., The National Center for Research in Vocational Education, The Ohio State University, July 1985.

Hollenstein, Heinz, "Economic Performance and the Vocational Qualifications of the Swiss Labour Force Compared with Britain and Germany", Institute of Economic and Social Research, London, February, 1983, pgs. 1-94.

Horvath, Francis W., "Job Tenure of Workers in January 1981", Monthly Labor Review, September 1982, pgs. 34-36.

Hubbard, R. Glenn and Judd, Kenneth L. "Liquidity Constraints, Fiscal Policy and Consumption" Brooking Papers on Economic Activity, 1986, #1, 1-60.

Hunter, John E.; Crosson, James J. and Friedman, David H. "The Validity of the Armed Services Vocational Aptitude Battery (ASVAB) For Civilian and Military Job Performance," Department of Defense, Washington, D.C., August, 1985.

Hunter, John E.; Schmidt, Frank L. and Judiesch, Michael K. "Individual Differences in Output as a Function of Job Complexity." Department of Industrial Relations and Human Resources, University of Iowa, June 1988.

Ichniowski, Casey; Shaw, Kathryn and Prennushi, Giovanna. (1993) "The Effects of Human Resource Management Practices on Productivity." Carnegie Mellon Univ, July, 1-62.

Idson, Tom and Holtman, A. G. "Employer Size, Training and Wage Growth." Working paper, August 1993.

International Association for the Evaluation of Educational Achievement (IAEEA) The Underachieving Curriculum, Assessing U.S. School Mathematics From an International Perspective. Champaign, IL: Stipes Publishing Company, 1987.

International Association for the Evaluation of Educational Achievement (IAEEA) Science Achievement in Seventeen Nations, New York, Pergammon Press, 1988.

Jaikumar, Ramchandran. "Postindustrial Manufacturing." Harvard Business Review, Nov-Dec, 1986, pp. 69-76.

Jaikumar, Ranchandran, "Flexible Manufacturing Systems: A Managerial Perspective", Harvard Business School, January 1984, pgs. 1-54.

Jarvis, Valerie and Prais, S.J., "Two Nations of Shopkeepers: Training for Retaining in France and Britain", National Institute Economic Review, May 1989, pgs. 58-74.

Jones, Ian. "Trainee Pay and the Costs of Vocational Training in Britain and West Germany." Social Forces Supplement on Youth Pay and Employers' Recruitment Practices for Young People in the Community, Commission of the European Communities, Directorate-Generale for Employment, Social Affairs and Education, 1985.

Kane, Thomas and Rouse, Cecilia. (1993a) "Labor Market Returns to Two- and Four-Year Colleges: Is a Credit a Credit, and Do Degrees Matter." NBER Working Paper # 4268, Cambridge Mass: National Bureau of Economic Research.

Kane, Thomas J. and Rouse, Cecilia Elena. (1993b) "Comment on W. Norton Grubb, "The Varied Economic Returns to Postsecondary Education: New Evidence from the Class of 1972." Working Paper No. 326, Industrial Relations Section, Princeton University, 1-19.

Kang, Suk and Bishop, John. "Vocational and Academic Education in High School: Complements or Substitutes." Economics of Education Review. Vol. 8, No. 2, 1989, pp. 133-148.

Katz, Harry and Keefe, Jeffrey. (1993) "Training and Restructuring of Work in Large Unionized Settings." Cornell Univ., Ithaca, N.Y.: Center for Advanced Human Resource Studies Working Paper 93-19, 1-32.

Keating, P.J. (1994) Working Nation: Policies and Programs. Vol. 2, Government White Paper, AGPS, Canberra.

Kochan, Thomas and Osterman, Paul. "Human Resource Development and Utilization: Is there too Little in the U.S." Cambridge, Ma: Sloan School of Management, Massachusetts Institute of Technology. 1991.

Kochan, Thomas; Joel Cutcher-Gershenfeld and John Paul MacDuffie, "Employee Participation, Work Redesign and New Technology: Implications for Public Policy in the 199C's," Background Payers for Investing in People, pp. 1833-1892.

Koenig, Richard. "Toyota takes Pains and Time, Filling Jobs at its Kentucky Plant." Wall Street Journal, December 1 1987, p. 1.

Koike, Kazuo. "Skill Formation Systems in the U.S. and Japan: A Comparative Study." The Economic Analysis of the Japanese Firm, edited by M. Aoki, New York: Elsevier Science Publishers B. V., 1984, pp. 47-75.

Kosai, Yutaka. "Japan's Economic System-- Will It Change?" seminar presentation, Department of East Asian Studies, Cornell University, April 26, 1989.

Krafcik, John F. Training and the Automobile Industry: International Comparisons. Contractor Report Prepared for the Office of Technology Assessment under contract N3-1910, Feb. 1990.

Krafcik, John F. and MacDuffie, John Paul "Flexible Production Systems and Manufacturing Performance: The Role of Human Resources and Technology." Presented at the Academy of Management Meetings August 16, 1989, Sloan School of Management, Massachusetts Institute of Technology, 1-32.

Krueger, Alan. "How Computers Have Changed the Wage Structure: Evidence from Micro Data, 1984-1989." Quarterly Journal of Economics, Feb. 1993, 33-60.

Krueger, Alan and Rouse, Cecilia. (1994) "New Evidence on Workplace Education." Working Paper # 329, Industrial Relations Section, Princeton University, May, 1-30.

Lazear, Edward P. "Agency, Earnings Profiles, Productivity and Hours Restrictions." American Economic Review, Vol. 71, September 1981, p. 606-620.

Lazear, E., and Moore, R. "Incentives, Productivity, and Labor Contracts." The Quarterly Journal of Economics, May 1984, pp. 275-296.

Lazear, Edward P. "Pay Equality and Industrial Politics." Journal of Political Economy, Vol. 97, June 1989, pp. 561-580.

Leighton, Linda and Mincer, Jacob. "Effects of Minimum Wages on Human Capital Formation." 'The Economics of Legal Minimum Wages, edited by Simon Rottenberg, Washington DC: American Enterprise Institute, 1981.

Lengermann, Paul. "The Wage Impact of Training: Employer vs. Government vs. Individual Sponsorship." New York State School of Industrial and Labor Relations, Cornell University, May 1994.

Lillard, L. and H. Tan. Private Sector Training: Who Gets it and What are Its Effects. Monograph, R-331CO1/RC, Santa Monica, Calif. Rand Corp, 1986.

Limprecht, Joseph H. and Hayes, Robert H. "Germany's World- Clan, Manufacturers." Harvard Business Review, November-December, 1982, pp. 137-145.

Lowenstein, Mark and Spletzer, James R. (1993) "Training, Tenure and Cost Sharing." Office of Research and Evaluation, Bureau of Labor Statistics, December draft, 1-50.

MacDuffie, John Paul and Krafcik, John F. "Integrating Technology and Human Resources for High Performance Manufacturing: Evidence from the International Auto Industry>" in Thomas Kochan and Michael Useem, gds. Transforming Organizations. New York: Oxford University Press, forthcoming.

MacDuffie, John Paul and Krafcik, John F. "Flexible Production Systems and Manufacturing Performance: The Role of Human Resources and Technology." Presented at the Academy of Management Meetings August 16, 1989, Sloan School of Management, Massachusetts Institute of Technology, 1-32.

MacDuffie, John Paul and Kochan, Thomas. "Human Resources, Technology, and Economic Performance: Evidence from the Automobile Industry." paper delivered at the Annual Meeting of the Industrial Relations Research Association, December 28 1988, New York.

MacDuffie, John Paul and Kochan, Thomas. (1993) "Do U.S. firms Underinvest in Human Resources? Determinants of Training in the World Auto Industry." Wharton School, University of Pennsylvania, September, 1-30.

Maller, Charles; Kerachsky, Stuart; and Thornton, Craig. Evaluation of the Economic Impact of the Job Corps Program. Third Follow-up Report. Princeton, New Jersey: Mathematics Policy Research Inc., 1982.

Mangum, Steve, and Ball, David. "Military Service, Occupational Training and Labor Market Outcomes: An Update." Columbus: Center for Human Resource Research, The Ohio State University, March 1986.

Mangum, Steve, "Evidence on Private Sector Training," Background Papers for Investing in People, pp. 331-387.

Markey, James and Parks, William. (1989) "Occupational Change: Pursuing a different kind of work." Monthly Labor Review, September, 3-12.

Mason, Geoff, Prais, S.J., & Van Ark, Bart, "Vocational Education and Productivity in the Netherlands and Britain", National Institute of Economic and Social Research, November 1990, pgs. 1-34.

Medoff, James L., and Abraham, Katharine, G. "Are Those Paid More Really More Productive? The Case of Experience." The Journal of Human Resources, XVI, 2, 1980.

Mikulecky, Larry. (1989) "Second Chance Basic Skills Programs." Investing in People; Background Papers. edited by David Crawford and Lauri Bassi, Vol. 1. 187-214.

Mincer, Jacob (1989a) "Human Capital and the Labor Market: A Review of Current Research." Educational researcher. May 1989, 27-34.

Mincer, Jacob (1989a) "Human Capital Responses to Technological Change in the Labor Market." Columbia University, Conference on Economic Growth at SUNY, Buffalo, New York, May 26-27, 1989, Aug 1989.

Mincer, Jacob. (1989c) "Labor Market Effects of Human Capital and of its Adjustment to Technological Change." Department of Economics, Columbia University, 1989.

Mincer, Jacob. (1989b) "Job Training: Costs, Returns and Wage Profiles.'" September 1989, Department of Economics, Columbia University, 1-23.

Mincer, Jacob and Higuchi, Yoshio. (1988) "Wage Structures and Labor Turnover in the U.S. and Japan." The Journal of the International and Japanese Economy, Kyoto and Stanford.

Moore, Richard and Blake, David. (1992) Does ETP Training Work? An Analysis of the Economic Outcomes of California Employment Training Panel Programs. Northridge, Calif. California State University.

Myers, Carole and Davids, Keith. (1993) "Tacit Skills and Performance at Work." Applied Psychology: An International Review, Vol. 42, No. 2, 117-137.

National Assessment of Educational Progress. The Mathematics Report Card. Princeton, New Jersey: Educational Testing Service, 1988b.

National Center for Educational Statistics. The Condition of Education: 1990. Vol. 1 & 2, Wash. D.C.: US Department of Education, 1990.

National Federation of Independent Business. [Survey of NFIB membership using a questionnaire designed by John Bishop], 1987.

Nickell, S. J. "Wage Structure and Quit Rates:" International Economic Review, Vol. 17, February 1976, p. 191203.

Niemiec, Richard; Sikorski, Melanie; Clark, Greg and Walberg, Herbert J. (1992) "Effects of Management Education: A Quantitative Synthesis." Evaluation and Program Planning, Vol. 15, 297-302.

Noll I., Beicht U., Boll G., Malcher W. and Wiederhold-Fritz S. Nettakosten der Betrieblichen Ber Ufsbildung Schriften Berufsbildungsforschung, Band 63. Beuth Verlag GMBH, Berlin, 1984.

O'Boyle, Edward, "Job Tenure: How it Relates to Race and Age", Monthly Labor Review, January 1968, pgs 16-33.

Office of Technology Assessment, Making Things Better: Competing in Manufacturing, (Washington, DC: U.S. Government Printing Office), February, 1990a, pgs. 1-241.

Office of Technology Assessment. Worker Training: Competing in the New International Economy. OTA-ITE457, (Washington, DC: U.S. Government Printing Office, September 1990b)

Organization of Economic Cooperation and Development Secretariat Working Party No. 1 of the Economic Policy Council. Labour Market Flexibility. Paris: OECD, January 1985.

Organization of Economic Cooperation and Development. Employment Outlook. Paris: OECD, September, 1984, Chapter 4.

Organization of Economic Cooperation and Development. Employment Outlook. Paris: OECD, September, 1993.

Parsons, Donald. "Specific Human Capital: An Application to Quit Rates and Layoff Rates." Journal of Political Economy, Vol. 80, No. 6, Nov/Dec 1972, pp. 1120-1141.

Parsons, Donald. "Wage Determination in the Post Training Period." Pathways to the Future, Vol. 7, Chapter 7, Center for Human Resource Research, Ohio State University, 1985.

Parsons, Donald. (1990) "The Firm's Decision to Train," Research in Labor Economics, Vol. 11, 53-76.

Prais, SJ., "Vocational Qualifications of the Labour Force in Britain and Germany", National Institute of Economic Review, November 1981, pgs. 47-59.

Prais, S.J., Karvis, Valerie, and Wagner, Karin, "Productivity and Vocational Skills Services in Britain and Germany: Hotels", National Institute Economic Review, November 1989, pgs. 52-74.

Prais, S.J. and Steedman, Hiliary, "Vocational Training in France and Britain: The Building Trades", National Institute Economic Review, May 1986, pgs. 45-55.

Prais, S.J, and Wagner, Karin, "Some Practical Aspects of Human Capital Investment: Training Standards in Five Occupations in Britain and Germany", National Institute Economic Review, August 1983, pgs. 4664.

Prais, S.J., "Educating for Productivity: Comparisons of Japanese and English Schooling and Vocational Preparation", National Institute Economic Review, 1986, pgs. 121-147.

Rosen, Harvey S. "Taxation and On-The -Job Training Decisions." The Review of Economics and St9tistics, Vol. LXIV, No. 3, August, 1982.

Rosenbaum, James E. and Kariya, Takehiko. "From High School to Work- Market. and Institutional Mechanisms in Japan." American Journal of Sociology, 94:6, May 1989, pp. 1334-1365.

Rosenbaum, James. "Do School Achievements Affect the Early Jobs of High School Graduates? Results from the High School and Beyond Surveys in the US and Japan." Northwestern University, Evanston, Illinois, 1990.

Rosenfeld, Carl. "Job Seeking Methods Used by American Workers." Monthly Labor Review 98, no. 8 (1975): 39-42.

Ryan, Paul. "The Costs of Job Training for a Transferable Skill." The British Journal of Industrial Relations, Vol. 18, # 3, 1980, pp. 334-352.

Salop, Joanne and Salop, Steven. "Self Selection and Turnover in the Labor Market." Quarterly Journal of Economics, Vol. 91, November 1976, p. 619-627.

Sengenberger, Werner. "Job Security-- Germany." unpublished paper, OECD,1985.

Sekscenski, Edward S., "Job Tenure Declines as Work Force Changes", Monthly Labor Review, December 1979, pgs. 48-69.

Shimada, Haruo & MacDuffie, John Paul. (1986) "Industrial Relations and "Humanware," Sloan School of Management, MIT, 1986, 1-90.

Soskice, David "The German Training System: Reconciling Markets and Institutions", Institute of Economic and Statistics, Oxford University, July 1991, pgs. 1-18.

Steedman, Hilary and Wagner, Karin, "Productivity, Machinery and Skills: Clothing Manufacture in Britain and Germany", National Institute Economic Review, May 1989, pgs. 40-57.

Steedman, Hilary, "Improvements in Workforce Qualifications: Britain a. !d France 1979-88", National Institute Economic Review, August 1990, pgs. 50-61.

Steedman, Hilary and Wagner, Karin, "A Second Look at Productivity, Machinery and Skills in Britain and Germany", National Institute Economic Review, November 1987, Pgs. 84-94.

Steedman, Hilary, "Vocational Training in France and Britain: Office Work", National Institute Economic Review, May 1987, pgs. 58-70.

"Survey of Consumer Finances, 1983." Federal Reserve Bulletin. Vol. 70, September 1984, p. 686 and December 1984, p. 863.

Sweet, Richard. Dusseldorp Skills Forum Inc., Sydney, Australia, telephone interview on June 9, 1994.

Tan, Hong; Chapman, Bruce; Peterson, Christine and Booth Alison. Youth Training in the United States. Britain and Australia. (RAND, 1700 Main Street, Santa Monica, Calif 1991), 1-47.

Tyre, Marcie. "Managing the Introduction of New Process Technology: International Differences in a Multi-Plant Network." Working Paper, Cambridge Mass: Massachusetts institute of Technology, 1990.

U.S. Department of Commerce, "Current Population Reports: Labor Force", September 1951, pgs. 1-11.

U.S. Bureau of Labor Statistics, "Sixty Percent of 1989 High School Graduates Enrolled in College", June 26, 1990.

U.S. Bureau of Labor Statistics, "Job Tenure", January 1987, pgs. 1-18.

U.S. Bureau of Labor Statistics, (1993) "Employer-Provided Training among Young Adults." Work and Family, February 1993, Report 838, 1-5.

Veum, Jonathan R. (1993a) "Training among Young Adults: Who, What Kind and for. How Long?" Monthly Labor Review, August 1993, 27-32.

Veum, Jonathan R. (1993b) "Sources of Training and their Impact on Wages." Washington D.C.: U.S. Bureau of Labor Statistics, 1-27.

Weiderhold-Fritz, Susanne. "Is There a Relationship between Cost of In-Company Vocational Training and the Offer of Training Places in the Federal Republic of Germany." Social Forces: Supplement on Youth Pay and Employers' Recruitment Practices for Young People in the Community, Commission of the European Communities, Directorate-Generale for Employment, Social Affairs and Education, 1985.

Andrew Weiss, "Simple Truths of Japanese Manufacturing", Harvard Business Review, July-August, 1984, p. 119124.

Wills, Joan. (1993) An Overview of Skill Standards Systems in Education and Industry. Washington, D.C.: The Institute for Educational Leadership.

Endnotes

1. This suggests that a government subsidy equal to 10 percent of the full marginal opportunity costs of training (or a reduction in turnover or required rates of return which had an equivalent impact on rental cost) would increase time devoted to the training of each new hire by 7 percent. An inelastic demand for training also means that holding the job constant, a decrease in learning efficiency (e.g. because the workers hired are slow learners or the firm is not very effective in its training) simultaneously increases the time devoted to training and reduces it's value added.

2 . When Bartel and Sicherman (1993) model the amount and incidence of training as a function of industry specific total factor productivity growth and dummies for one-digit industry category, they obtain statistically significant positive effects of TFP growth on training. A one percentage point increase in TFP increases the incidence of training by 15.3 percent in the manufacturing sector and by 11.5 percent in the economy as a whole. When controls for growth of output are added to the model the effect of TFP becomes insignificant and falls to 10 percent for manufacturing and to 6.5 percent for the full economy.

3 . Surveys focused on formal training, in part, because it was thought that it would be easier to get reliable data about formal training than other types of training. Unfortunately, the data that has been obtained has severe reliability problems. Comparing CPS and SIPP answers to almost identical questions about formal training necessary to get and keep one's job, Zemsky and Shapiro's (1991) found large discrepancies between the number of people reporting that they received such training, in the two surveys. It would appear that answers to questions about formal training are quite sensitive to context-nuances in the wording of questions, the format and length of the interview, where the question is placed in the interview and which the questions appear immedi4'lely before the training question. This finding implies that the effort to obtain reliable measures of training by asking only about the most salient form of training-- formal training-- has failed. Clearly the word "training" means different things to different people and the interpretation of the word depends upon context.

4. If the arithmetic mean were being reported these numbers would be considerably larger. Nevertheless these numbers seem low especially for professional and managerial jobs.

5 . The relationship between training investment measured in time units (line 5 of Tables 1 and 2) and returns to that investment, the increase in productivity (line 7 or line 8) is described by:

$$\frac{P_{2YR} - P_{1Q}}{P_{1Q}} = \%\Delta P = AGROR_j*(\Theta_j)*(\text{Hours Devoted to Training})$$

where Θ is the opportunity cost of time devoted to training

$AGROR_j$ is the average gross rate of return on dollars of investment in the training of stayers at the jth establishment.

The lower percentage productivity growth ($\%\Delta P$) to (Hours devoted to Training) ratio of tiny establishments implies that either they have a lower $AGROR_j$ or a lower Θ_j. It is unlikely that tiny firms have lower $AGROR_j$ for they have higher turnover and poorer

access to capital markets. The probable explanation of their small %ΔP is a lower opportunity cost of time devoted to training (Θ_j).

6 . Selection effects might be contributing to the large estimated effects of employer sponsored training. If employers identify talent by observing past job performance and !hen select the top performers for training, promotions and wage increases, the association between training receipt (not quantity) and wage increases might not reflect a causal effect of training on productivity, so much as a decision to reward the worker's past contributions to the firm. If this is what is happening, OLS coefficients would over estimate the effect of training on wage rates. Veum included selection correction terms in his model to deal with this problem. While the coefficient on the selection correction for company training was negative as hypothesized, it was not statistically significant and the corrected estimate of the impact of company training remained quite large. Another way to examine the issue of causality in the wage growth equation is to examine productivity growth. Is it really true that top performers get more training, or do they get less because they learned the job more quickly? If less competent workers must receive more training, that might explain why it is receipt not the quantity of training that explains wage growth.

7 . The most accurate source of data on college attendance in the NLS72-transcript data-is available for post-secondary institutions that were attended prior to 1979. Only self-reported data was available to describe spells of post-secondary education that began after 1979. Grubb had two sets of schooling variables in his model-- transcript derived measures and self-reports of additional schooling obtained after 1979. The coefficients on these self-reported schooling variables were almost all negative particularly for men. This could be because (1) self reports of schooling obtained as an adult are very error prone and this causes a severe bias, (2) more time is required after schooling is completed for its effects to show up, and/or (3) the returns to college attendance by adults are truly much smaller than the returns to college attendance immediately after high school. If the third explanation is the correct one, profound policy implications are profound.

8 . Another meta-analysis of the "higher quality" studies of management education obtained even larger mean effect sizes got even larger mean effect sizes. The results of this analysis, however, appear to be very sensitive to a small number of extremely large effect sizes--3.41, 4.73 and 5.39. (Niemiec et al. 1992)

9 . Since occupational experience rises as tenure increases, the total effect of tenure is the sum of the tenure effects in row 2 of table 6 and the occupational experience effect in row 1. Age is treated as fixed.

10. Because the period for which training intensity is measured is much shorter than the period over which productivity growth is measured, an assumption must be made about the strength of the correlation between training intensity during the first 3 months and training hours during the rest of the 2-year period. When the two year productivity gain of the typical new hire is being analyzed, a unit increase in a training activity during the first 3 months was assumed to be associated with a further 2-unit increase in that training activity during the rest of the 2-year period. When the productivity gain during the first fourteen months for a particular new hire is being analyzed, a unit increase in a

training activity during the first 3 months was assumed to be associated with a further 1.2 unit increase in that training activity during the remainder of the first year on the job.

11. Lack of information about the quality of general OJT received can increase investment in general OJT only under the very unlikely circumstances of very high retention rates and large differentials between the rates at which employers and employees trade off present before-tax income for future before-tax income. Under these circumstances the employer's desire to invest in general training may be stronger than the worker's desire. Because the wage will have to be increased by an equivalent amount, employers cannot benefit from (and therefore do not pay for) general training that is visible to other employers. Consequently, as such training becomes more visible to other employers, the calculus that determines the amount of training shifts to give greater weight to the very high discount rates faced by the worker, possibly reducing investment in general training. The condition that would have to be satisfied is that the retention rate would have to be equal to or greater than the ratio of the firm and worker discount factors. Even if the worker were to face yearly interest rates that were double the firm's rate (e.g., 30 percent rather than 15 percent), the yearly retention rate would have to be above 85 percent. Retention rates for the first year at a job are seldom above 50 percent and average yearly retention rates for all employees new and old seldom exceed 85 percent. Yearly retention rates of employees who have been at the firm for many years may exceed 85 percent, but these more mature workers will typically have better access to capital markets than younger workers and face a tax regime that is neutral to OJT. This discussion has been based on the theoretical analysis of the training decision presented in Bishop and Kang ;1984, 1988).

12. Well-trained employees who leave the firm that provided the training may benefit if their new employer eventually learns of their greater-than-anticipated productivity and makes later adjustments to the wage or bases a promotion on it. In the model presented in Bishop and Kang (1984, 1988), high renegotiation costs prevent such adjustments from occurring at the first employer. If a third period was added to the model and retention in the second job modeled, the same assumption of high renegotiation costs would prevent the worker from benefiting from better-than-expected training in the second job. If one were to relax the assumption that post-training wage rates are prespecified and analyze a multi-period model, the size of the distortion to training investment decisions would be reduced, but it would not disappear. Productivity is measured with error so one could never expect the new employer to perceive the full value of the worker's greater-than-anticipated training. Furthermore, other employers remain ignorant of greater-than-anticipated productivity. To all intents and purposes this greater productivity is specific to the firm, so the worker will only receive a small share of this greater productivity in higher wage rates.

13. If training an employee causes a reduction in output or necessitates an increase in hours paid, profits and thus taxes are reduced. If workers pay for training by accepting love- wage jobs, individual income tax payments are reduced. In both of these cases, training costs are effectively deductible in the year they are incurred. If all individuals pay taxes every year at the same marginal tax rate, the tax system would not distort decisions to invest in OJT. In fact, however, some training costs are not deductible and tax rates are generally higher when benefits are being received than when costs are being incurred, so the tax system discourages training investments.

14. Becker clearly recognized the existence of liquidity constraints in his 1962 paper. "Since employer specific skills are part of the intangible assets or good will of firms and can be offered as collateral along with tangible assets, capital would be more readily available for specific than for general investments (p.42)." He did not, however, explicitly analyze how such constraints might influence the tenure profile of wages and thus induce employers to share the costs of general training. Parsons (1972) points out that "The worker's ...discount rate will affect the firm's choice of wage policies ....It can be shown that firms will decrease the worker's share of specific investment as the workers discount the future more heavily (p.1129). "

15. Policy capturing experiments have found that employers give significantly higher ratings to job applicants with high grade point averages (Hollenbeck and Smith 1984). Marshall Brenner's (1968) study of performance during the first year on the job of 100 Lockheed Corporation employees who had recently graduated from Los Angeles high schools found that days absent at school correlated .30 with days absent at work and .20 with tardiness at work. Teacher ratings of the student's work habits (and cooperation) found on the high school transcript correlated .44 (.45) with the supervisor's conduct ratings, .41 (.39) with the supervisor's production rating and -.26 (-.29) with absences. Three year GPA had a correlation of .37 with the supervisor's conduct rating and .34 with the production rating.

16. Litigation costs and the potential liability are substantial. Using an event study methodology, Joni Hersch (1991) concluded that corporations that were the target of a class action discrimination suit that was important enough to appear in the Wall Street Journal experienced a 15 percent decline in their market value during the 61 day period surrounding the announcement of the suit. The 1991 Civil Rights Act banned the use of race normed selection tests and made other changes in employment law. It is not clear how the courts will interpret many of these changes, so it will be many years before case law establishes a new set of ground rules.

17. Mincer (1989), for example, attempts to calculate a rate of return to the worker's investment in training by dividing the percentage wage increase by estimates of the cost of training (generally running between .2 and .25 of a years productivity) that are based on the fraction of a years time that worker's report they spend in training. This fraction tells us something about the combined employer and employee costs of training not the costs incurred by the trainee. In fact, in the Lillard and Tan (1986 Table 4.3 and 4.5) earnings regression which Mincer uses to estimate the depreciation rate for training, trainees experienced no earnings reduction during the year in which training was received. Similar results have been obtained in other data sets (Parsons 1985, Bishop and Kang 1988, Barron, Black and Loewenstein 1989). While the positive association between current training and current earnings is probably due to the omission of unobserved worker quality, it strains credibility that the true earnings sacrifice is 20-25 percent of a years wages when multivariate models that include schooling, test scores, actual work experience and a host of other variables indicate a positive effect of current training on current wages. The worker's investment in training is probably much smaller so the wage GROR for worker investments in training is probably much higher than the numbers estimated by Mincer.

18. Basic skills are positively correlated with other directly productive traits like dependability, initial occupational skills, learning ability and people skills. Basic skills

can also be evaluated prior to hiring more cheaply and reliably than these other traits, so selecting employees on the basis of scores on a basic skills test is an effective way identifying new hires who are likely to be more productive.

19 . Prior to 1981 CPS respondents were asked, "When did ...start working at his present job or business?" Starting in 1983 the wording was "How long has... been working continuously for the present employer (or as self-employed)?" This change in wording has increased reported tenure because prior to 1981 some respondents reported job changes when they were promoted to higher level positions at the company. Now the CPS supplement has a separate question on occupational tenure.

20. The U.S. rate of training related placement might have been somewhat higher if measured 6 months after high school graduation. However, the German definitions of relatedness are more rigorous and applying them to U.S. data would have lowered training related placement rates. High unemployment rates no doubt contribute to the low rates of training related placement in the U.S. However, aggregate differential between the countries in training related placement cannot be attributed to differentials in the general tightness of labor markets.

21. Skills and knowledge deteriorate from non-use at least as rapidly as they become obsolescent. In one set of studies, students tested 2 years after taking a course had forgotten 1/3 of the high school chemistry, 1/2 of the college psychology and zoology and 3/4 of the college botany that had been learned (Pressey and Robinson, 1944). Reading, writing and arithmetic are used in most occupations and many adult roles and probably do not deteriorate as much after leaving school as the other subjects taught in high school. The payoff to occupation specific education is much more sensitive to placement in a relevant job (and the danger of forgetting skills if a relevant job is not immediately found) than to rates of skill obsolescence. Consequently, when deciding what to study, the probability of using a skill or knowledge base is more important than the rate of obsolescence of that knowledge.

22. The time periods over which wage growth was measured were quite short-- one year in the Lowenstein & Spletzer study and 3-4 years in the Lengermann study. Grubb's (1993) cross-section study measured the effect of self-reported schooling increments from age 26 to 32 on earnings at age 32. Since wage impacts of school provided training grow with time since completion, these studies may underestimate the eventual effect of school provided training. The analyses of CPS data by Hollenbeck and Willkie and Bowers and Swaim are less subject to this criticism, but they completely lack controls for ability and family background.

23. Such a change clearly makes the worker better off. General training would be recognized better and new equilibrium would result with higher wages after training and lower wages during training. The firm would be able to lower the starting wage by enough to ensure that it benefited as well.

24. For example a newspaper story by Dwyer (1994) which is critical of the levy quotes extensively from Jane Marsden of the National Society for Performance and Instruction. She is concerned that 80 percent of human resource practitioners "failed to conduct a proper evaluation of what training was needed in the organizations they served and whether training had any discernable effects (Dwyer 1994). According to Marsden, "A

lot of money spent on training is totally wasted because most employers don't realize that training is only one aspect of an individual's performance and work outcomes." Training textbooks contain the same criticisms of how training is conducted in the United States. Regardless of whether the details of Marsden's criticisms are valid or not, the general point that training does not always work is definitely true.

25. As a further quality control measure, companies above a certain sire might be required to develop a training plan and present it to a training advisory committee that contains worker representation. Unions would select the representatives for workers in the collective bargaining unit. In non-union settings membership would be selected by management. This would be a major step in American industrial relations so such a provision would probably be quite controversial.

26. To ensure that only training gets subsidized and not vacations or motivational sales meetings, eligible expenditures might be defined to exclude: (1) travel to remote sites other than the company's national or the appropriate regional headquarters; (2) housing and food expenses above a specified daily rate; and (3) the costs of training non-employees or employees for whom commissions account for more that 66 percent of compensation. The costs of developing a training package or system for use in training one's own staff would be an allowable expense.

27. The French promote particular kinds of training by having sub-mandates requiring all firms to spend at least X percent of wage bill on a particular category of formal training. Since youth apprenticeship opportunities should be spread across all industries and firms (not concentrated solely in retailing where they will be easiest to develop), a sub-mandate for apprenticeship is probably desirable.

28. Moore and Blake, 1992. The ETP has funded two evaluations of itself focusing on earnings impacts. These studies, however, used a seriously flawed before-after methodology which greatly exaggerates the effect of the program. Neither used random assignment. In the most recent study the main focus was on a comparison of earnings gains for completers (those who complete the training and are retained by the employer for at least 3 months) to the gains for dropouts (those who quit or are laid off or fired within three months of initiating training). For incumbent workers involved in retraining, the difference was 14 percent. This is not, however, an estimate of the effect of training. It is an estimate of the effect of turnover.

29. Once the subsidy has been operating awhile and has gained public support, consideration could be given to requiring that participating companies with more than 200 employees have a training advisory committee with worker representation.

30. While 98 percent of Australian companies with more than 100 employees reported expenditures on formal training during the third quarter of 1993, only 19 percent of companies with fewer than 20 employees reported such expenditure. The small firms that did undertake training during that quarter spent 9.4 percent of their wage bill on training and so would have been eligible for subsidy of their training expenditure.

31. Cross-section models were estimated predicting training investment (both formal and informal) during the first three months on the job occupation, industry, establishment size, skill composition of the workforce, temporary job and background characteristics

of the new hire as independent variables. Quantitative estimates of price elasticity were derived from the coefficient on weekly hours of work. The estimate therefore assumes that a 50 percent subsidy of training costs would have the same impact on training investment in a worker as a doubling of the scheduled hours of work for that individual.

32. Boundaries between formal training and informal training are inevitably elastic. Any system of subsidizing training (whether tax credit, mandate or direct subsidy) will induce employers to formalize some on-the-job learning activities that previously did not meet the program's eligibility requirements.

33. For a skill to be eligible, both recent and projected rates of growth would have to be high. Projections of future growth should be based on a methodology that can be updated on a quarterly basis and that uses contemporaneous market signals (such as current or forward prices of the industry's product, new orders, or current industry sales or employment) to project future employment. The methodology must be capable of giving timely warning of industry turnarounds like the one that occurred in 1981 in oil drilling and exploration. A projection of rapid growth would be sufficient on its own (in the absence of high past rates of growth) only if the evidence is particularly strong (e.g., Congressional passage of obligational authority for a huge multi-year contract). Where classroom training at schools or colleges substitutes for OJT, information on the number of graduates of such programs (recent and projected) would have to be compared to growth of demand.

34. The survey would not be very costly and would not take long, once a sample of employers who have trained such workers was obtained. Although visits to establishments by specialized staff would be the preferred mechanism, it could be done over the phone. A telephone interview approach to measuring on-the-job training costs for specific jobs has been developed by the National Center for Research in Vocational Education and implemented by the Gallup Organization at a cost of less than $75 per interview. The training costs that would be measured by this survey would include--

. payments to outside vendors such as a training institution,
. depreciation on machinery devoted 100 percent to training,
. time of specialized training personnel that is spent in contact with the trainee or preparing lessons.
. time of supervisors or co-workers spent giving formal or informal training to the nonworker above a 40 hour minimum, and
. time of the trainee that is spent in a formal or informal training activity that is not directly productive.

The survey would also serve as a basis for developing an operational definition of the job or skill for which training subsidies would be provided and of the levels of the skills. The results of the survey would be reviewed by DOL staff and the industry labor committee. DOL staff would make a formal recommendation to the Secretary that the advisory committee could endorse or take exception to as it wished. Training costs allowed in future years would be indexed to the economy's average hourly wage, so the survey would only need to be done once.

35. Systems for competency certification currently exist in construction, telecommunications, banking. and a variety of other industries. In some industries and occupations, an existing system(s) could be adopted "as is" or modified; in other

industries and occupations, a new system would have to be developed. Since an occupation is eligible for a SOOJTI for only a limited period, a judgement would have to be made as to whether the benefits of competency certification would outweigh the inevitable costs and delays that such a requirement would impose. Conditioning the SOOJTI on the existence of competency certification would tend to encourage industry groups to create a certification process for occupations critical to their industry.

36. The application form could be quite simple, requiring only the name and social security number of the trainee, employer ID number, the training establishment's name and address, the firm’s name and address, the skill for which training is being provided, the trainee's wage, and a description of the job (including its wage) for which he or she is being trained. Payments would be made when the trainee successfully completes the course of training.

37. American training institutions and customs are now adapted to a world of high turnover, poor signaling of skills and regulations requiring employers to provide training during compensated time. A change in external environment will affect customs and practices only with a long lag. Workers and their union representatives are accustomed to being paid while they engage in general training and would probably resist a change in this practice. If new regulations allowed employers to offer training during uncompensated time, past practices would probably persist for many years.