

Underemployment, Education, and Job Satisfaction

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1. INTRODUCTION

The economic role of human capital, particularly education has long been documented by economists and policy makers [Becker (1964)]. According to some observers view, educational system is an effective vehicle for producing the skills required to maintain growth in the economy.¹ The versatile impact of education on every aspect of human existence makes it a vital area for policy framework especially for developing countries. Developing countries where majority of world's population resides need to maximise productivity and capabilities of the advanced human capital. The benefits of education range from human to economic, social and cultural. At human level, education contributes in attractive self esteem and confidence leading towards empowerment.

In Pakistan, there is significant rise in the average level of education, but over time, more and more workers incapable to use their educational background on the job. Two decades ago, it was judgment that supply of labour meeting the demand of labour. However in recent years, it is argued that supply of some skilled labour may have outstripped the demand of labour in some professions and high qualified peoples taking positions of low qualified peoples. Such underemployment/over-education has not been fully explored in Pakistan.

The increasing supply of college and university educated workers has led some researchers to argue that higher education does not yield the economic returns to the degrees that it did just two decades ago. Today, some workers feel themselves that their attained education exceeds to the required education in a particular occupation. Furthermore, some workers have educational level far beyond others working in the same occupation; therefore the skills of some highly educated group may be underutilised. Overeducated workers are defined as those whose educational attainments exceed to the requirements of education in a particular occupation.

The mismatch between education and job is an interesting issue from both theoretical and policy perspectives. From a theoretical perspective, many social scientists have argued that education is an important corridor to improve one's economic status, as

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¹Ivar Berg (1970) *Education and Jobs: The Great Training Robbery*. New York: Praeger Publishers.

education enhances earnings by increasing skills and productivity. From a policy point of view, there are two implications. First, may be there is too much societal emphasis on acquiring education, especially if the job market cannot accommodate such a large number of educated workers. 2nd, policy makers might consider the possible social implications resulting from such a numerous group of educated and dissatisfied.

A dominant paradigm in both sociology and economics suggests that surplus schooling does not always raise productivity and therefore will not always be rewarded with higher earnings [Duncan and Hoffman (1981), Rumberger (1987), Dolton and Vignoles (2000)]. There is evidence that underemployment/over-education is correlated with higher level of job dissatisfaction [Berg (1970); Bisconti and Solmon (1977)] lower level of job involvement [Kalleberg and Sorensen (1973)], high job turn over rates and low level of productivity [Berg (1970)].

There is a substantial amount of American and European empirical evidence on the topic of over-education but unfortunately no such literature existing in Pakistan and in other developing countries. It is the intention of this study to fill this gap in the literature and investigate whether many empirical studies in developed economies hold for Pakistan or not.

The paper employs a job specific measure of over- under-education based on the information provided by respondent themselves. The paper examines the effects of over-education on 82 low-level subordinate/clerical workers of the Sui Northern Gas Pipelines Limited (SNGPL) Islamabad region. SNGPL is a public limited company. It provides the facility of natural gas for domestic, commercial, special domestic and industrial consumers in two provinces of the country i.e. Punjab and NWFP. The total number of staff is 1425. Permanent employees in region are 968, while the employees on contract/causal are 457. The numbers of sub departments/sections are in company are Admin, Billing, Sales, Maintenance, Development, IT and MIS, Store and Operation department. The main focus of this study is the education-job mismatch. The paper investigates the relationship between over-education and job satisfaction, job involvement, importance of promotion and future aspirations.

The structure of the paper is organised as follows. Section 2 provides an overview of the theoretical background of over education which enfolds the description of over-education, some conceptual theories and measurement of over-education. Section 3 composed of literature review. Section 4 provides some detail about methodology and data description. Section 5 contains the results and in the last but not least section offers some concluding remarks and policy implications.

2. THEORITICAL BACKGROUND OF OVER- AND UNDER-EDUCATION

Overeducated workers are defined as those whose educational attainments exceed to the requirements of education in a particular occupation. It can be seen as the decline in economic position of educated individuals relative to historically higher levels and underutilisation of worker's educational skills [Tsang (1984)]. One may speak 'over-education' when a person holds a job for which his attained education is not required, 'under-educated' when a person's educational attainment less than required education, and 'misallocation' when the education or training fails to correspond to the job held. Over-education is a relative phenomenon. A person is defined as overeducated in one job may not be so defined in another job.

In the seventies decade, the wave of supply of fresh graduates in U.S. initiate the first research on over-education. According to Freeman (1976), the overqualified workforce would trim down the return on education. To maintain the equilibrium in labour market, this low return should reduce the investment on higher education. Over-education was due to temporary disequilibrium in the labour market, but empirical evidence rejects this picture, because over-education appears to be a lasting trait of the U.S. economy.

2.1. Socioeconomic Background and Over-education

In Pakistan, public sector employment is the preferred intention of the majority of educated workers. Education has expanded rapidly during the last two decades. Secondary enrolment level almost increased thirteen times from 1980 to 2005 and it led to a large increase in the demand for tertiary-level education.

The education level of the Pakistan labour force also increase over time but still it is relatively low as compared to some other South Asian countries like India; China etc. There is high social demand for university education despite the fact that the monetary rewards associated with education, especially at the higher level, is very low in traditional subjects.

The conceptual problems in the literature are much significant. The exact meaning of the terms 'over-education' and 'under-education' have often depended on the assumptions made by the researcher about the workings of the labour market.

According to Human Capital theory, it is assumed that labour market is fully efficient, and every worker is paid the value of their marginal products. Productivity and wages are fixes in relation to perspective jobs; therefore overeducated workers have same productivity and receive the same wage levels as those workers who are in jobs with required level of education.

According to some social scientists, any increase in supply of educated labour should trim down the relative wage of such educated labour. In turn employer would now substitute the cheaper educated labour with less educated labour and capital. The low return may encourage worker to invest less on education. This adjustment in labour market implies that over-education will be at most *short run phenomena*. Human Capital theory fails to explain the concept that some individuals are temporarily or permanently are in jobs where their skills are underutilised.

Second one is occupational mobility theory [Rosen (1972); Sicherman and Galor (1990)], over education represents a *temporary phenomenon* because overeducated workers are more readily promoted or more able to move to higher level jobs.

Third one is job competition model [Thurow (1975)], marginal products and consequently earnings are associated with jobs, not individuals. Individuals are 1st allocated on jobs on the bases of personal characteristics, including education that guides the employers to measure the cost of training them to perform healthy on their jobs. Since this allocation is based on available supplies of both workers and jobs, workers may possess more education and skills than their jobs necessitate.

Spence's (1973) developed signalling model or job screening model. According to this theory, there is imperfect information in the labour market and education is used as a signal to identify the more able, motivated, or productive workers. The basic signalling

model therefore requires that the costs of education must be lower for higher ability workers.

The fourth one is assignment model [Tinbergen (1956); Haratog (1985); Sattinger (1993)] captured a more encompassing outlook. According to this model; worker's salaries are determined in part by the job they are doing, particularly whether they are overeducated and in part by their human capital. An allocation problem exists in which workers differing in attributes are allocated jobs with differing levels of complexity. In a dynamic economy with heterogeneity of workers and jobs these frequency distributions are unlikely to match and mismatch will be a *permanent feature* of labour market.

2.2. Methods for Measuring Education and Skill Requirements

The prevalence of over-education in the labour market is usually measured by comparing individuals' years of schooling with some indicator of the requirement of education in a particular occupation. To determine the required level of education for a job and the degree of over-education and under-education, four methods for measuring mismatch are implicit in the literature. They are as follow;

- Workers Self-assessment Criteria.
- Expert's Evaluation.
- Mean and Standard Deviation Criteria.

(a) *Workers' Self-assessment Approach (Subjective Approach)*

The subjective measure refers to cases where workers report that they have acquired more schooling than their job allows them to utilise. To measure over-education and misallocation, the subjective reports include questions such as "how much formal education is required to get a job like yours"? [Rumberger (1987); Duncan and Hoffman (1981)]. The estimates provide the basis for computing the total costs of educating a labour force with the desired level of skills. It may reflect the exact schooling required because it is based on an assessment of the actual job held by the incumbent. The method does not go uncriticised either. This approach could be biased if job incumbents are more likely to report required schooling levels that more closely correspond to their actual level of education. In this case, the level of over-education will be underestimated, which affects the validity. Further more respondents may not always have a good insight in the level of education required for a job [Cohn and Khan (1995) and Halaby (1994)].

(b) *Expert's Evaluation (Objective Approach)*

This method pertains to job analysts determining the level of education required for a job. In literature, this approach is based on the General Education Development (GED) scores available from the *Dictionary of Occupational Titles (DOT)* in U.S. The (GED) scores are designed to reflect skill requirements "typically" required for "satisfactory" job performance [Eckaus (1964); Berg (1970); Rumberger (1981)]. It derived independently of the job incumbent. Trained job analyst grades the jobs. It is unreliable as there may be no basis in reality for what certain workers believe to be the case [Clogg and Shockey (1984)]. Moreover new technologies or forms of workplace organisation leads to changes in educational requirements, DOT requirements from an earlier period may not reflect the requirement at a later period.

(c) *Mean Plus Standard Deviation Approach*

Another approach tried to find the mismatch by two variables; years of schooling and occupation [Clog (1979); Clog and Shackey (1984); Verdugo and Verdugo (1989)]. The distribution of education is calculated for each occupation; employees who depart from the mean by more than some ad hoc value (generally one standard deviation) are classified as overeducation. Completed years of schooling are used as the proxy for educational attainment. This method ignores the variation in educational requirements within an occupation, while the limit of one standard deviation would also seem rather arbitrary [Halaby (1994)]. This method is very sensitive to changes in labour market conditions. In case of excess supply of labour, employers will hire higher educated workers than is in fact required. Therefore it concludes that the method based on the realised matches is the least adequate one for determining over-education and under-education.

3. REVIEW OF LITERATURE

The accuracy of the match between a worker's education and his or her job has attracted the attention of economists over the last two decades. The main reasons for this interest is that education-job mismatches has relevant effects on the efficiency of the public and private investment in education by influencing wages as well as on other labour market outcomes such as job dissatisfaction and labour turnover [Hersch (1991)]. Berg (1970) used 1950 and 1960 Census data to discover "a drift of 'better' educated people into 'middle' level jobs". He also concludes that an increasing percentage of workers are employed in jobs that utilise less education than they *possesses*; that in many jobs experience is a better indicator of earnings than is education.

Freeman (1976) found that the proportion of male college graduates entering non-managerial and nonprofessional jobs increased from 14 percent to 31 percent in 1958 to 1971. Rumberger (1981), comparing 1960 and 1976 data, found that "the distribution of educational attainments.... shifted dramatically during this period": by 1976 less than 25 percent of the U.S. population had low-level education, but nearly half had jobs requiring low-level skills.

Berg, *et al.* (1978) found that 51 percent of all college graduates and 24.8 percent of the entire U.S. labour force were underemployed in their present occupations. Norwood (1979), using Bureau of Labour Statistics data found that college graduates were increasingly entering the labour market as low-level workers, especially in clerical and sales positions. Sullivan (1978) and Clogg (1979) found that some workers are overeducated, suggesting that the skills of this highly educated group are being underutilised. More subjective measures of underemployment also find the similar results that in U.S. workers felt that they were not utilising their skills, they are overeducated for their jobs and that they lacked training opportunities etc [Bisconti and Solmon (1976); Duncan and Hoffman (1978); Staines and Quinn (1979)].

Some negative effects of underemployment also begun to explored. Advanced education, by raising workers' expectations for interesting and challenging work, is claimed to result in increased frustration and dissatisfaction when those expectations are not fulfilled. There is evidence that underemployment is correlated with higher level of job dissatisfaction [Berg (1970); Bisconti and Solmon (1976)] lower level of job

involvement [Kalleberg and Sorensen (1973)], high job turn over rates and low level of productivity [Berg (1970)].

Burris (1983) examined the effects of underemployment on 32 low-level clerical workers, comparing their educational backgrounds with their attitude and behaviours, and concluded that higher education produces increased job dissatisfaction, high turn over rates, reduced job involvement, impaired co-worker relations, and more emphasis on future aspirations by Using the data set of 12 manufacturing and warehouses firms. Hersch (1991), discuss the issues of surplus education, satisfaction, and turnover rates. The results supported the previous studies that overeducated workers were less satisfied to their jobs and have higher turn over rates. Battu, *et al.* (1997) also find similar results by using a survey of graduates from two cohort years (1985 and 1990) in United Kingdom.

4. METHODOLOGY AND DATA DESCRIPTION

4.1. Hypothesis

“Overeducated workers are less satisfied with their jobs as compare to the matched workers.”

The model is as follow;

$$\text{Satisfaction} = X_i + a_1 E^r + a_2 E^o + a_3 E^u + \ln W + \mu_i$$

Satisfaction is measured by ten point scale, $\ln W$ is the logarithm of monthly wages, X is a row vector of control variables variable of individual i including field of study, experience, tenure, marital status, and nature of job (contract, permanent). The number of years of over-education (E^o) is determined on the basis of the level of education attained (in years) and the respondent's self reports about their level of education required. These two variables are constructed as follow. If E is the actual number of year of education and E^r is number of years of education required for a job, thus over-education (E^o) is represented by;

$$E^o = E - E^r \text{ if } E > E^r \quad \text{and}$$

$$E^o = 0 \text{ if } E = E^r$$

Similarly, the number of years of undereducation (E^u) is determined as;

$$E^u = E^r - E \text{ if } E^r > E \quad \text{and}$$

$$E^u = 0 \text{ if } E^r = E$$

4.2. Data and Empirical Specification

In 2007, we interviewed 82 clerical/subordinate male workers from the SNGPL Islamabad. We excluded from the sample those employed part time. The workers all held similar clerical jobs but had different educational backgrounds with age 20 to 50 years. Clerical work is especially suitable for such investigation for three reasons. 1st Over-education is high in the clerical sector due to traditional humanistic educational programs in Pakistan. 2nd over-education in the lower white-collar sector are especially prone to job dissatisfaction. 3rd the paper analyse the utilisation of skills in the public sector.

Questionnaire covers a wide range of topics including personal characteristics, academic information, family background, job satisfaction, job involvement, co-worker relationship, quit intentions, on the job trainings, promotions and future aspirations. Respondents were also asked to evaluate their satisfaction with their degree and job. To obtain the data on the incidence of over-education, the respondents were asked: “considering your education/skills, do you feel that you are overqualified for your job?” To obtain the required education for the job respondents were asked to state the minimum level of education which was required for the position they hold. Satisfaction is measured on a linear scale from zero to 10, where zero mean “not at all satisfied”. Skill utilisation is measured by offering a choice between the following response categories: less than 25 percent, 25 percent, 50 percent, 75 percent, and more than 75 percent. Quit Intention is a dummy variable equal to one if the worker responded that he is “very” or “somewhat likely” to make a genuine effort to find a new job within the next six months. On The Job Training is the response to the question. “Did the company provide any on the job training? If yes then how many weeks?” Additionally, the survey has time specific informations as respondents were asked to tell their previous employment situation. Finally a series of questions were asked about workers’ general productiveness, and economic participation-month unemployed, amount of training and contractual status.

Table 1 provides a detailed overview of the variable definitions and sample characteristics for clerical workers.

Table 1

Description of Variables

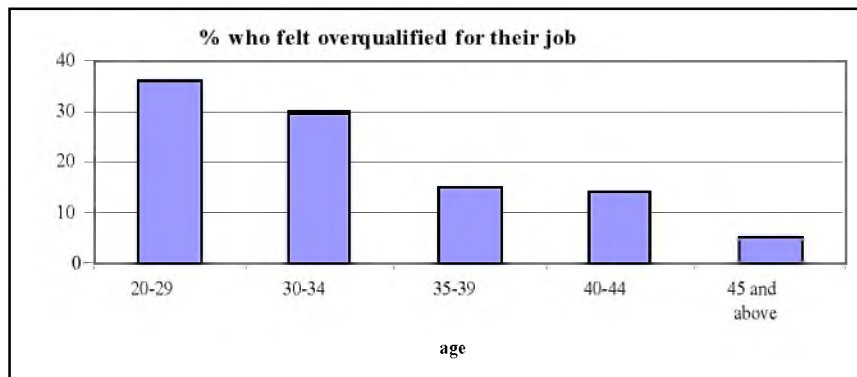
| Variables | Operational Definition | Mean |
|----------------------------|--|--------|
| Wage | = Monthly wage | 13,655 |
| Education Attainment | = Years of schooling completed | 15.25 |
| Required Education | = Years of schooling required to perform the job well | 12.3 |
| Surplus Education | = Attained education minus required education | 2.95 |
| Percent Surplus Education | = % of surplus education of total sample | 0.70 |
| percent Adequate Education | = % of Adequate education of total sample | 0.26 |
| Percent Under-education | = % of Under-education of total sample | 0.04 |
| Experience | = Years of full time work experience since age 18 | 13.52 |
| On the Job Training (OJT) | = Weeks of company provided on-the job training | 9.12 |
| Satisfaction | = Ranking a job satisfaction on a scale 0 to10 from not at all satisfied | 4.25 |
| Quit Intention | = If a worker is somewhat or very likely to make a genuine effort to change employment in the next 6 months, 0 otherwise | 0.52 |
| Tenure | = Years of tenure with present employer | 8.32 |
| Married | = 1, if married ; 0 other wise | 0.64 |
| Nature of Job | = 1, if worker has permanent job, 0 otherwise | 0.62 |
| No. of Observation | | 82 |

5. RESULTS

5.1. Feelings of Over-qualification

To find out how much education constitutes over-education for clerical work, we asked all respondents whether they felt overqualified for their jobs. Out of the sample 70 percent respondents reveal over-qualification. Among post graduates, these feelings of over-qualification grew from the sense that they had fine educational background but

poor utilisation of skills. They wanted to “try something different and more according to their education/skills.” According our results, young workers feel more overeducated as compare to old workers (as shown in figure below).



Thus, even though most of the graduate workers felt that the skills and knowledge they had acquired at school were not being used. They felt overqualified because their potential was not being fully used and their opportunities to learn and to grow on the job were limited. In the words of a 32-year-old computer operator: “I would like to do innovative. I know, education is very important, but I don’t think that here people are utilising their skills, and I feel that I don’t necessarily have to have a degree for this job. I notice that there are lots of people sitting on top that don’t have professional degrees”.

A 26 year-old MBA clerk, who had been at SNGPL only seven months, said: “At the beginning I was so eager about the job—my tasks. In first few weeks, it was something you had to get used to. But now, I’ve memorised the whole job is slab calculation. There isn’t much thinking involved in it. I wouldn’t say that I am using my full potential. I become very frustrated. And now I think it’s stopped.”

Post graduate workers expressed similar feelings: they wanted to learn and grow on the job. They complained of a lack of training opportunities and an inability to learn about the overall operation of company. They complained that the specific content of what they had learned in education was not relevant to their job. There’s a lot of frustration because there isn’t the usage of the skills that were developed. Their work is more boring, more routine, less creative, and less autonomous.

5.2. Job Satisfaction

One of the various consequences accredited to over-education, the one which receive the most support in this study is the association between over-education and job dissatisfaction. Using the broadest possible definition of job dissatisfaction,

approximately 57.5 percent of the total sample reported dissatisfaction with their present employment. This included 26.1 percent who were “very dissatisfied,” 17 percent who were “little satisfied” and 14.4 percent who were only “moderately satisfied” with their work. Workers with too much education are less satisfied. None of the respondents with less than two years of college education expressed extreme dissatisfaction.

Table 2 presents the percentage of very satisfied workers to level of attained education. At the first glimpse, this table would seem to provide strong support for the hypothesis associated between over-education and job dissatisfaction. It is evident that the very highest rates of job satisfaction are found among workers who are the most under qualified workers in terms of formal education. While the very low rate of job satisfaction are found among those who are the most overqualified.

Table 2

| Level of Over-education | % Satisfied |
|-------------------------|-------------|
| -1 | 84.9 |
| 0 | 62.8 |
| 1 | 45.7 |
| 2 | 37.5 |
| 3 | 27.6 |
| 3.5 | 21.8 |

(a) Individual Characteristics

Table 3 shows the relationships between job satisfaction and individual characteristics. Overall about 43 percent reported satisfaction with their jobs. Pertaining to age, older were more satisfied as compare to young. With respect to parent’s level of education, workers with better educated parents were more satisfied than those whose parents had not had a high level of education. Similarly married people more satisfied as compare to singles. Workers with more family incomes are more satisfied than those who have less family income.

Table 3

Job Satisfaction by Individual Characteristics

| | (% of Satisfied Individuals) |
|------------------------------------|------------------------------|
| Age | |
| 20-29 | 35.6 |
| 30-39 | 43.2 |
| 40-50 | 49.1 |
| Parents’ Level of Education | |
| Below Metric | 34.4 |
| Metric | 38.6 |
| Intermediate | 42.1 |
| Graduate and above | 54.2 |
| Marital Status | |
| Married | 45.2 |
| Single | 34.5 |
| Family Income | |
| below 10000 | 29.1 |
| 11000-15000 | 32.5 |
| 16000-20000 | 34.8 |
| 21000-30000 | 43.7 |
| 31000-40000 | 48.7 |
| 41000 and above | 60.3 |

(b) Job Satisfaction by Job Characteristics

Table 4 shows the relationship between job satisfaction and a number of job characteristics. The cross tabulation results show that high pay is associated with higher level of satisfaction. Workers holding a temporary contract are less satisfied than their counterparts. Similarly workers, who have union memberships, are more satisfied than non union workers.

Table 4

Job Satisfaction by Job Characteristics

| | (% of Satisfied Individuals) |
|-------------------------|------------------------------|
| Monthly Income | |
| Below 10000 | 28.2 |
| 11000–15000 | 36.3 |
| 16000–20000 | 45.9 |
| 21000–25000 | 51.4 |
| Type of Contract | |
| Permanent | 54.3 |
| Contract | 39.2 |
| Union Member | 51.7 |
| Non Union Member | 41.6 |

Table 5 summarised the results of the estimation of job satisfaction equation, where satisfaction is regressed on surplus, required and deficit education, as well as the remaining human capital variables and individual characteristics. The results show that overeducated workers are less satisfied and undereducated workers are more satisfied (significant at 5 percent). Satisfaction is not significantly related to required education. Workers with higher wages are more satisfied. One imperative feature is understandable that workers with traditional subjects (social sciences) are more satisfied as compare to the workers having professional subjects (Math, Commerce). Since in clerical jobs, workers have to do only slab calculations, more routine work, less creative and less autonomous work, so obviously they feel frustration in their jobs. Similarly permanent employees are more satisfied as compared to with contract workers

Table 5

Estimates of the Impact of Educational Mismatch on Job Satisfaction

| Variable | Coefficient | Standard Error |
|--------------------|-------------|----------------|
| Required Education | 0.67 | 0.70506 |
| Surplus Education | -0.351* | 0.04033 |
| Deficit Education | 0.051* | 0.0509 |
| Wage | 0.073** | 0.3442 |
| Commerce | -0.037** | 0.1254 |
| Math | -0.875* | 0.1621 |
| Science | -0.064 | 0.082 |
| Social Science | 0.193* | 0.093 |
| Marital Status | 0.450 | 0.2980 |
| Permanent | 0.045 | 0.0169 |
| R ² | 0.49 | |
| No. of Observation | 82 | |

Significant 5 percent, ** significant 1 percent.

Equation also included the variables experience, and tenure.

5.3. Importance of Promotion and Aspiration for the Future

Feeling of entitlement, combined with a sense of greater occupational options, made the higher educated workers more edgy. Since workers who change jobs often do so in response to higher outside wage offers, and attained education is most important determinant of outside wage offers than the required education in current job.

The post graduate workers were more likely to say "No" when asked, "Would you be content to stay in your present job for the foreseeable future?" 66 percent of this group, compared with 35 percent of those with four year college education, said "No." the lesser educated felt they had fewer occupational options. A senior supervisor said, he deserves and like the promotion, but added "I don't know when it will happen"; another said it's hard to get a promotion in this company without approach". A third respondent asked whether he would be content to stay in her present job, said "I may have no other choice."

6. CONCLUSION

Over-education is obviously a critical problem because it represents the wasteful investment of scarce resources. The over-education is costly for the society and for the individuals. Existing approaches to over-education are generally characterised by a technocratic orientation: the view that over-education represents an "imbancing of the social machinery" [Squires (1979)], a superficial dislocation of the social system which must be managed to make the system function more smoothly. The hidden agenda of technocratic administrators is efficiency and productivity: "over-education/underemployment represents an inefficient usage of human resources and lost output for the society" [Glyde (1977)].

Our key conclusion is that:

- There is significant and genuine incidence of over-qualification in clerical occupation (70 percent out of the sample).
- Overeducated workers are young as compared to old and possess more qualification as compare to old.
- There is little substantiation of widespread qualification inflation, i.e. employer systematically upgrading the educational requirements of jobs in response to the increase in the supply of more educated labour, without changing the job content.
- There has also been a substantial increase in the supply of more educated labour.
- The results confirm our hypothesis that individuals in jobs that underutilise their education and skills are dissatisfied because they earn almost no return on surplus education. Since the excess education that is not required and hence may be underutilised, have zero or lower impact on earning.
- Further more there is evidence that individuals who studied certain types of traditional humanistic subjects are more likely to be overeducated.

We did not focus on the determinants of over-education. The results here add support further empirical evidence supporting the view that the effect of education on satisfaction. Additional research and analysis is, of course, defensible, especially on such

topics as how to measure overeducation, estimating the determinants and impact of overeducation on earning, job satisfaction, turn over, and on the job training. Research which undertakes such analysis in great detail than we have done here may be particularly fruitful.

REFERENCES

- Battu H., C. Belfield, and P Sloane (1999). Over-education Among Graduates: A Cohort View. *Education Economics* 7, 21–38.
- Becker, Gary S. (1964) *Human Capital*. New York: National Bureau of Economic Research.
- Berg, I. (1970) *Education and Jobs: The Great Training Robbery*. New York: Praeger Publishers.
- Berg, Ivar, Marcia Freedman, and Freeman Michael (1978) *Managers and Work Reform: A Limited Engagement*. New York: The Free Press.
- Bisconti, Ann and Solmon Lewis (1977) *College Education on the Job: The Graduates' Viewpoint*. Bethlehem, Pa.: The CPC Foundation.
- Burris, Beverly H. (1983) The Human Effects of Underemployment. *Social Problems* 31:1, 96–110.
- Clog, C. C. and W. J. Shockey (1984) Mismatch between Occupation and Schooling: A Prevalence Measure, Recent Trends and Demographic Analysis. *Demography* 21:2, 235–257.
- Clogg, C. C. (1979) *Measuring Underemployment: Demographic Indicators for the United States*. New York: Academic Press.
- Cohn, E. and S. P. Khan (1995) The Wage Effects of Over-schooling Revisited. *Labour Economics* 2, 67–76.
- Dolton, P. and A. Vignoles (2000) The Incidents and Wage Effects of Over-education. *Economics of Education Review* 19, 179–98.
- Duncan, G. and S. Hoffman (1978) The Economic Value of Surplus Education. pp. 233–246. In Greg Duncan and David Morgan (eds.) *5000 American Families*. Volume 6. Ann Arbor, Mich.: Institute of Social Research.
- Duncan, G. J. and S. D. Hoffmann (1981) The Incidence and Wage Effects of Over-education. *Economics of Education Review* 1:1, 75–86.
- Eckaus, R. (1964) Economic Criteria for Education and Training. *Review of Economics and Statistics* 46, 181–190.
- Freeman, Richard B. (1976) *The Over-educated American*. New York: Academic Press.
- Glyde, Gerald P. (1977) Under-employment: Definition and Causes. *Journal of Economic Issues* 11:2, 245–261.
- Halaby, C. N. (1994) Over-education and Skill Mismatch. *Sociology of Education* 67:1, 47–59.
- Hartog, Joop (1985) Earnings Functions: Testing for the Demand Side. *Economics Letters* 19, 281–85.
- Hersch, Joni (1991) *Education Match and Job Match*. University of Wyoming.
- Kalleberg, Arne and Sorensen Aage (1973) The Measurement of the Effects of Overtraining on Job Attitudes. *Sociological Methods and Research* 2:2, 215–238.

- Norwood, Janet L. (1979) The Job Outlook for College Graduates Through 1990. *Occupational Outlook Quarterly* Winter, 2–7.
- Rosen, S. (1972) Learning and Experience in the Labour Market. *The Journal of Human Resources* 7:3, 326–42.
- Rumberger, Russell W. (1981) The Changing Skill Requirements of Jobs in the U.S. Economy. *Industrial and Labour Relations Review* 34:4, 578–590.
- Rumberger, Russell W. (1987) The impact of Surplus Schooling on Productivity and Earnings. *Journal of Human Resources* 22:1, 24–50.
- Sattinger, M. (1993) Assignment Models of the Distribution of Earnings. *Journal of Economic Literature* 31, 831–880.
- Sicherman, N. and O. Galor (1990) A Theory of Career Mobility. *Journal of Political Economy* 98:1, 169–92.
- Spence, M. (1973) Job Market Signalling. *Quarterly Journal of Economics* 87, 353–74.
- Squires, Gregory (1979) *Education and Jobs: The Imbalancing of the Social Machinery*. New Brunswick, N.J.: Transaction Books.
- Staines, Quinn Robert (1979) American Workers Evaluate the Quality of their Jobs. *Monthly Labour Review* 102:1, 3–12.
- Sullivan, Teresa M. (1978) *Marginal Workers, Marginal Jobs: The Underutilisation of American Workers*. Austin: University of Texas Press.
- Thurow, Lester C. (1975) *Generating Inequality*. New York: Basic Books.
- Tinbergen, J. (1956) On the Theory of Income Distribution. *Weltwirtschaftliches Archiv* 77, 155–73.
- Tsang, Mun C. (1984) The Impact of Overeducation on Productivity: A Case Study of Skill Underutilisation of the U.S. Bell Companies. Stanford: Institute for Research on Educational Finance and Governance, Stanford University. (IFG Programme Report No. 84-B10.)
- Verdugo, Richard R. and Verdugo Naomi Turner (1989) The Impact of Surplus Schooling on Earnings: Some Additional Findings. *Journal of Human Resources* 24:4, 629–643.