©*The Pakistan Development Review*
50:3 (Autumn 2011) pp. 219–244

The Utilisation of Education and Skills: Incidence and Determinants among Pakistani Graduates

SHUJAAT FAROOQ

This study estimates the incidence of job mismatch and its determinants in Pakistan, based on three categories: (i) qualification mismatch, (i) skill mismatch, and (iii) field-of-study mismatch. It uses both primary and secondary datasets that target graduates employed by the formal sector. The study measures the qualification mismatch using three approaches and finds that about one third of the graduates sampled face a qualification mismatch. Similarly, more than one fourth are mismatched in terms of skill, about half are over-skilled, and half are under-skilled. The analysis also shows that 11.3 percent hold jobs that are irrelevant to their discipline and 13.8 percent have jobs that are slightly relevant to their discipline. Women are more likely than men to be over-qualified, and age has a negative association with over-qualification. Graduates who belong to political families have a better qualification match but a lower field-of-study match. While a higher level of schooling prevents graduates from being under-qualified, it also raises the likelihood of being over-qualified and over-skilled. Occupation-specific disciplines offer more protection against the possibility of job mismatch. Both full-time education and semester-system education reduce job mismatch, while distance learning raises job mismatch. The phenomena of being over-qualified and over-skilled is more prevalent in lower occupations, as is field-of-study mismatch.

JEL classification: I23, I24, J21, J24
Keywords: Education and Inequality, Higher Education, Human Capital, Labour Market

1. INTRODUCTION

Research on job mismatch has mushroomed in the developed world since the late 1980s. Although initial studies perceived it as a temporary phenomenon [Freeman (1976)], it was, later, not empirically supported [Groot and Maassen (2000a)]. Estimates of job mismatch led to the emergence of new theories, e.g., that of job competition and job assignment, which examined institutional rigidities, allocation problems, and skill heterogeneities.

Shujaat Farooq <shjt_farooq@yahoo.com> is Research Economist at the Pakistan Institute of Development Economics (PIDE), Islamabad.

Author's Note: The author completed a PhD in Economics at PIDE in 2011. This paper is part of his doctoral dissertation. He is grateful to his supervisors, Dr G. M. Arif, Joint Director of PIDE, and Dr Abdul Qayyum, PIDE, for their valuable suggestions and guidance.

Economists and sociologists both term job mismatch a serious efficiency concern with pertinent socioeconomic costs at an individual level—wage penalties, lower levels of job satisfaction and involvement, and higher turnover rates[1]—as well as lower productivity and extra costs of screening, recruiting, and training at firm level [Tsang (1987); Sloane, *et al.* (1999)], lower national welfare, and the 'bumping down' of the labour market process at the national level [Battu, *et al.* (2000); McGuinnes (2006)]. Thus, rapid educational expansionary policies may not yield the desired real economic benefits [Budria and Egido (2007)].

Although no direct study on job mismatch has been conducted in Pakistan, some studies have examined it in the context of educated unemployment and underemployment [various rounds of the Labour Force Survey, Ghayur (1989)]. Recent official reports related to labour market issues also highlight this phenomenon by connecting it to the prevailing low level of skills, poor government policies, lack of information, limited labour market opportunities, labour market rigidities, and rising share of youth in the labour force.[2] References to job mismatch also arise in various studies conducted on socio-demographic factors, educational systems, and labour market rigidities. In terms of socio-demographic factors, traditional norms and customs are regarded as a constraint to female labour market participation [Nazli (2004)]. Despite rising female participation, the gender gap remains high, with skewed labour participation across the sectors and occupations—more than two thirds of women still work in the agriculture sector and are more vulnerable than men [Pakistan (2010)]. The ongoing demographic transition in Pakistan may also be a cause of job mismatch—employment generation has not kept pace with the increase in the labour force [SBP (2004)] and the share of the informal sector and female unpaid family helpers has increased, while issues of vulnerable employment are rising [Pakistan (2007a, 2008a)].

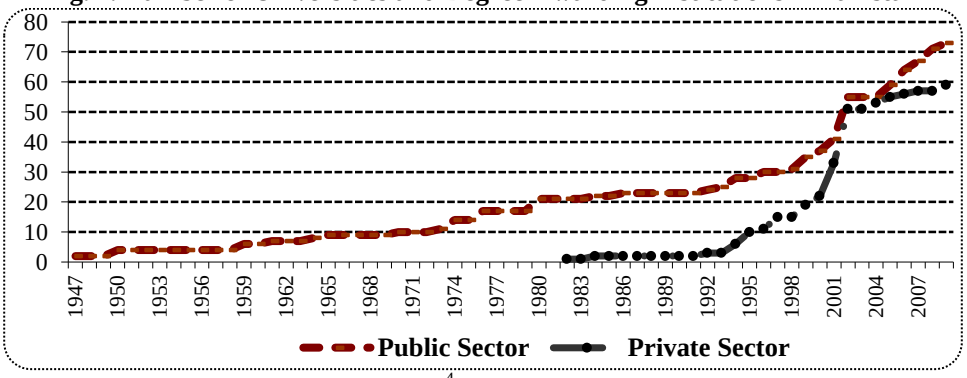
The recent rapid expansion in higher education and establishment of new universities has raised educational participation, especially among female students (2.6 times among males and 3.5 times among females) from 2001-02 to 2007-08 (Figure 1).[3] The heterogeneity of skills across regions and institutions has also increased. With limited job opportunities for this educated influx, educated unemployment has risen while the returns to education have declined [Pakistan (2007a); Qayyum, *et al.* (2007)]. The education system in Pakistan is unable to cope with labour market demand because it imparts mainly education in conventional subjects. In addition to outdated curricula, frequent fluctuations in education policies, and limited spending, the system follows a variety of tiers: the O and A level system, the English-medium vs. Urdu-medium system, the private vs. public system, the *madrassah* system, the full-time education vs. part-time education system, and the semester vs. annual system [Pasha (1995); Nasir (1999)].

[1]Cohn and Kahn (1995), Dolton and Vignoles (2000), Dolton and Silles (2003), Chevalier and Lindley (2006).

[2]Pakistan (2007a, 2007b, 2008a, 2008b, 2010).

[3]In 1947, there were only two universities. The number jumped to 54 in 1999 and is 132 at present.

Fig. 1. Number of Universities and Degree-Awarding Institutions in Pakistan



Source: Higher Education Commission of Pakistan.[4]

Employment generation has not kept pace with the growing labour force, resulting in longer job search periods, the rising share of the informal sector, lower productivity, and a higher risk of vulnerability, especially for the youth population and females [Pakistan (2007a, 2008b)].[5] The rising rate of unemployment among the educated population in recent years could indicate the poor choice of educational fields [Pakistan (2007b)].

Keeping in view the importance of job mismatch for researchers and policy-makers, this study aims to contribute to the literature on two fronts. As a pioneering study on the national front, it can help planners make better decisions, especially for the youth population, which is the country's greatest asset. On the international front, the study extends the research on job mismatch by highlighting significant influential characteristics, i.e., family power, customs, and traditions, which have not been discussed in earlier studies. It also contributes to the existing literature by analysing skill mismatch and the determinants of field-of-study mismatch, which has been widely ignored.

The study has the following three objectives:

(i) To estimate the three types of job mismatch: qualification mismatch, skill mismatch, and field-of-study mismatch.
(ii) To analyse whether formal education is a good proxy for human capital (qualifications) by examining the association between qualification mismatch and skill mismatch.
(iii) To explore which factors determine the three types of job mismatch identified above.

The study is organised as follows. Section 2 describes the method of measurement and presents a theoretical review of job mismatch. A discussion on data sources and methodology is given in Section 3. The results for the incidence of job mismatch and its determinants are given in Section 4, followed by conclusions and policy considerations in the final section.

[4]http://www.hec.gov.pk/InsideHEC/Divisions/QALI/Others/Statistics/Pages/DepartmentofStatistics.aspx

[5]60.6 percent were considered vulnerable, meaning "at risk of lacking decent work" in 2006-2007 [Pakistan (2007a)].

2. DEFINITION AND THEORETICAL FOUNDATIONS OF JOB MISMATCH

2.1. Definition and Measurement Issues of Job Mismatch

Job mismatch has three dimensions: qualification mismatch, skill mismatch, and field-of-study mismatch. Qualification mismatch compares a worker's acquired qualifications with those required by his/her current job. The empirical literature has so far relied on formal education (in years) as a proxy for measuring qualification mismatch. Three main methods have been used to measure required qualifications. The first is the job analyst (JA) method (*objective approach*), in which professional job analysts grade jobs and recommend the minimum qualification (educational) requirements for a certain job/occupation. In the literature, this approach is based on the General Education Development (GED) and Specific Vocational Preparation (SVP) scores available from the Dictionary of Occupational Titles (DOT) (U.S. Department of Labour). The second method is the workers' self-assessment (WSA) method (*subjective approach*), where workers are asked directly for information on the minimum qualification (educational) requirements for their current job or whether they are mismatched or not [Sicherman (1991); Alba (1993)]. The third method, the 'realised match (RM)' approach, measures the degree of qualification mismatch using two variables: years of schooling and occupation. The distribution of education is calculated for each occupation; employees who depart from the mean by some ad hoc value (generally one) standard deviation are classified as mismatched workers [Verdugo and Verdugo (1989) and Ng (2001)].

Skill is a broad signal of human capital because it assimilates the other constituents of human capital (skills, experience) as well as formal qualification/ education. Indeed, ability and on-the-job training has long been emphasised for improving competence [Neumark and Wascher (2003)]. Workers' attained skills may be lower or higher than those required by their prospective jobs, known as skill mismatch. Most studies have used formal qualifications as a proxy for skills,[6] but later studies have criticised this approach because it is difficult to quantify the magnitude of this proxy [Jim and Egbert (2005); Lourdes, *et al*. (2005)]. Of the two measurement approaches to skill mismatch, most studies have used the *subjective approach*, which is based on workers' perceptions [Green and McIntosh (2002); Lourdes, *et al.* (2005)], while some have used the *specific approach* by measuring workers' attained skills and those required by their current jobs [Lourdes, *et al*. (2005); Jim and Egbert (2005) and Chevalier and Lindley (2006)].

Field-of-study mismatch analyses the level of match between an individual's field of study and his/her job. Three studies in particular have adopted a combination of the subjective and education-occupation approach to measure field-of-study mismatch [Jim and Robert (2004); Robst (2007) and Martin, *et al*. (2008)].

The validity and choice of various measures of qualification mismatch depend on the data available and is subject to limitations. The 'subjective' measure of mismatch relies on employees accurately reporting the qualifications required by their job. Employees might report current hiring standards, which underestimate over-qualification in the presence of qualification inflation. Similarly, workers in smaller and less structured

[6]As Battu, *et al.* (1999), Frenette (2004), Groot (1996), Hersch (1995) and Ng (2001) did.

organisations may not always have good insight into the level of qualifications required [Cohn and Khan (1995); McGuiness (2006)]. The RM method is very sensitive to labour market changes and cohort analysis. In cases of excess supply, it will underestimate the level of over-qualification and overestimate it in cases of excess demand [Kiker, *et al.* (1997); Mendes, *et al.* (2000)]. Both the JA and RM approaches ignore the ability and possible deviation of job levels within a given occupation [Halaby (1994); Dolton and Siles (2003)]. Chevalier (2003) argues that widening access to higher education has increased the heterogeneity of skills, while Green, *et al.* (2002) highlights the potential heterogeneity effects that may arise because of grade drift in the UK.[7] It is worth noting that the choice of definition has a significant effect on the incidence of qualification mismatch. As reported in Appendix Table 1, most studies have used the JA and WSA approach and report mixed findings.

2.2. Theoretical Foundations of Job Mismatch

A significant segment of the literature on job mismatch considers how job mismatch is positioned within the context of the labour market, although there is no unified, accepted theory on qualification mismatch.

According to the *human capital theory (HCT),* the labour market is competitive: overqualified workers are therefore as productive and receive the same wages as matched workers [Schultz (1962); Becker (1964)]. Opponents of the HCT argue that the theory fails to explain the underutilisation of skills, institutional rigidities, and non-competitive labour markets [Carnoy (1994)]. Tsang (1987) suggests that the relationship between qualifications/education and productivity is more multifaceted than the direct and positive relationship as suggested by the HCT. Some studies point out that the returns to education might not increase with the level of education [World Bank in "Knowledge for Development" (1999); Psacharopoulos and Patrinos (2002); Faheem (2008)].

In contrast to the HCT, the *job competition theory (JCT)* highlights institutional rigidities where earnings are associated with job characteristics [Thurow (1975)]. The allocation of jobs is based on the available supply of workers and jobs: workers may be more qualified and skilled than their jobs necessitate. In the extreme, a qualification may simply serve to obtain a job, and there is a zero return to human capital beyond that required to do the job.

A third strand of the literature concerns the *assignment theory* **[**Sattinger (1993)], which asserts that there is an allocation problem in assigning heterogeneous workers to jobs that differ in their complexity. Job mismatch is the result of a mismatch in frequency distributions on the demand and supply side if the job structure is relatively unresponsive to changes in the relative supplies of educated labour. The majority of studies on qualification mismatch support the job assignment theory.[8]

According to the theory of *occupational mobility*, individuals may choose jobs with a lower entry level than those with other feasible entry levels with a higher

[7]Grade drift is a drop in the quality of education, and becomes evident when employers are found increasing educational requirements for younger workers. The concept of grade drift is related to heterogeneity as individuals with similar education potentially have significantly different ability levels [McGuiness (2006)].

[8]Alba (1993); Groot (1996); Sloane, *et al.* (1999); Dolton and Silles (2001); Kler (2005); Chevalier and Lindley (2006); Martin, *et al.* (2008) etc.

probability of promotion [Sicherman and Galor (1990)]. According to the *job screening model*, qualification is used as a signal to identify more able and productive workers when the labour market is not perfect [Spence (1973)]. The *matching theory* assumes that the labour market is not opaque [Rosen (1972); Jovanovic (1979)]. To avoid search costs, both employees and employers may have a mutual incentive to agree on a non-optimal match.

Other explanations have also been put forward that appear to be largely unrelated to any major theoretical framework. The theory of *differential over-qualification* explains the higher probability of being over-qualified among married women [Frank (1978)]. McGoldrick and Robst (1995) and Buchel and Ham (2003) suggest that ethnic minorities are likely to be more severely affected. Robst (1995) notes: "those who attend the lowest quality schools may be over-educated throughout their career." Dolton and Silles (2001) find that regional mobility has a positive influence on the quality of the match. Green and McIntosh (2002) argue that if the quality of education falls, this too may encourage employers to upgrade the educational requirements of a job, known as *grade drift*. Over-qualified workers may belong to a poorer class or lack social and cultural capital [Battu, *et al.* (1999)]. Green, *et al.* (1999) find that attaining higher scores in mathematical subjects reduces the likelihood of being mismatched. Büchel and Schult (2001) note that poor educational grades have a strong effect on the likelihood of over-qualification. Wolbers (2003) finds that an occupation-specific field of study reduces the probability of qualification mismatch. Job mismatch is also the result of family commitments, geographic immobility, and lack of information [Green, *et al.* (2002); Dolton and Silles (2003)]. Trade unions may also restrict work practices [Dolton and Silles (2003)] while variations in education systems and labour market regulations can influence the integration of youth into the labour market [Wolbers (2003)].

3. METHODOLOGICAL FRAMEWORK AND DATA DESCRIPTION

3.1. Data Description

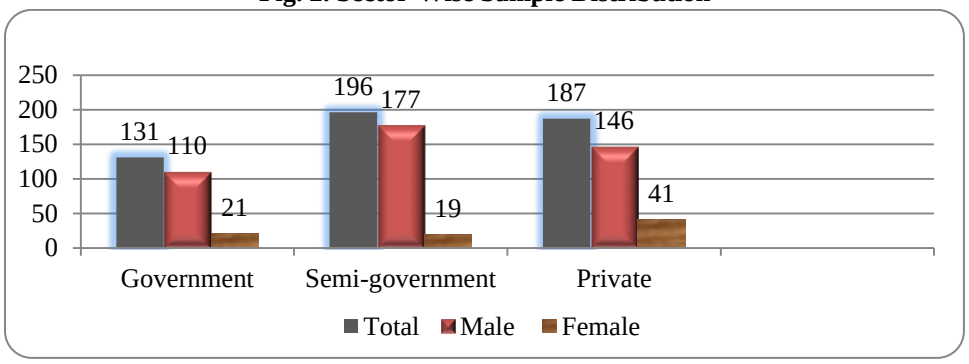
The present study uses both secondary and primary datasets, targeting employed graduates working in the formal sector with 14 or more years of education, i.e., with a Bachelor's, Master's, or doctoral degree—designated 'graduate workers'. As a secondary dataset, we have used the two Labour Force Surveys (LFS) carried out in 2006-07 and 2008-09. The LFS 2006-07 comprises 2,839 employed graduates while the LFS 2008-09 comprises 3,896 employed graduates. In both LFS datasets, about 84-85 percent are male while the rest are female.

Keeping in view the lack of key information in the LFS dataset—required level of qualifications, attained and required level of skills, relevance of field of study to occupation, socio-political family background, field of study, quality of education (part-time vs. full-time, semester system vs. annual system, etc.), satisfaction with current job etc.—a primary survey, the Survey of Employed Graduates (SEG) was conducted in early 2010 in two major cities of Pakistan, Islamabad and Rawalpindi, to study job mismatch in depth. At a broad level, the targeted universe in the SEG dataset was divided into three major groups: graduates employed in the federal government, those employed in autonomous/semi-autonomous bodies under the federal government, and those in the

private sector. The Thirteenth Census Report of the Federal Government Civil Servants (2003-04)[9] and *Annual Statistical Bulletin* of the Federal Government and Semi-government (2007-08)[10] have been used to estimate the number of graduate employees in federal government and semi-government service. For the private sector, the relevant information was gathered from the documented records of a number of private departments, such as banks, hotels, telecom companies, international donor offices, and media organisations (newspaper and broadcasting companies). For the remaining private sector, such as hospitals, educational institutions, NGOs, manufacturing and industry etc., we used the Internet and other sources to determine the total number of units located in Islamabad/Rawalpindi and a rapid sample survey to obtain information on employed graduates.

To avoid sampling bias and errors, we adopted a proportional stratified random sampling technique, where the published BPS grades for the government and semi-government sectors and the private sector's three-digit occupational codes are used as 'strata'. Figure 2 shows the distribution of the complete sample of 514 graduates across the three major groups according to their relative employment share. All the questionnaires were completed during face-to-face interviews.

Fig. 2. Sector-Wise Sample Distribution



3.2. Methodological Framework for Estimating Job Mismatch

The literature is mixed on the use of labels for the three types of job mismatch. Some studies use the term 'qualification mismatch' [Green and McIntosh (2002)] and 'education mismatch' [Verdugo and Verdugo (1989), Battu, *et al.* (2000), Lourdes, *et al.* (2005)] for the first type of job mismatch (qualification mismatch). Similarly, different labels have been used for the second type of job mismatch (skill mismatch), e.g., 'qualification mismatch' [Lourdes and Luis (n.d.)], 'competence mismatch' [Lourdes, *et al*. (2005)], and 'skill mismatch' [Green and McIntosh (2002), Jim and Egbert (2005)]. We use the following three labels: qualification mismatch, skill mismatch, and field-of-study mismatch. Under qualification mismatch, graduates are classified as over-qualified,

[9]Government of Pakistan (2003-04) "Thirteenth Census of Federal Government Civil Servant". Pakistan Public Administration Research Centre, Management Services Wing, Establishment Division, Islamabad.

[10]Government of Pakistan (2007-08) "Annual Statistical Bulletin of Federal Government". Pakistan Public Administration Research Centre, Management Services Wing, Establishment Division, Islamabad.

under-qualified, or adequately qualified. Under skill mismatch, graduates are classified as over-skilled, under-skilled, and matched in skills. Under field-of-study mismatch, graduates' fields of study are classified as irrelevant, slightly relevant, moderately relevant, or completely relevant.

3.2.1. *Measuring Qualification Mismatch*

We measure qualification mismatch using three methods: the JA method, the WSA method, and the RM method, on the basis of the SEG 2010 dataset. However, the secondary datasets (LFS 2006-07, 2008-09) fulfil the measurement requirements only for the RM method. Attained education (number of completed years) is used as a measure of qualifications, while required qualifications (education) are also measured in years. For the JA method in the SEG dataset, the required level of qualifications in terms of years was measured by asking sampled graduates, "*In your opinion, what level of formal education (years) and experience (years) is demanded by your employer/organisation to get a job like yours?*" For the WSA approach in the SEG dataset, graduates were asked, *"In your opinion, how much formal education (years) and experience (years) is required to perform your current job well?"* Graduates are classified into three categories: over-qualified, under-qualified, and matched, as follows.

If E is the actual number of years of qualification and E^r is the number of years of qualification required for a job, then over-qualification (E^o) is represented by:

$$E^o = 1 \quad \text{if} \quad E > E^r \quad \text{and} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$
$$E^o = 0 \qquad \text{otherwise}$$

Similarly, under-qualification (E^u) is determined as follows:

$$E^u = 1 \quad \text{if} \quad E^r > E \quad \text{and} \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$
$$E^u = 0 \qquad \text{otherwise}$$

For the third RM measure in the both SEG and LFS datasets, we follow the methodology of Verdugo and Verdugo (1989), Kiker, *et al.* (1997), and Ng (2001) to measure required qualifications on the basis of two variables: completed years of schooling and occupation. The mean years of schooling in a two-digit occupational classification are used as a measure of required qualifications by assuming that graduates working in a similar occupation require the same level of qualifications (the mean required qualifications for two-digit occupations is reported in Appendix Table 3). After computing the required qualifications, we estimate the qualification mismatch by comparing the attained and required qualifications with (+/–) one standard deviation of the mean.[11] Graduates with attained qualifications greater than one standard deviation are defined as overqualified. Similarly, graduates with attained qualifications less than one standard deviation are defined as under-qualified. The middle range, within +/– one standard deviation, comprises matched workers.

To factor in skill heterogeneity among overqualified graduates, we relax the assumption that graduates with the same level of qualifications are perfect substitutes and hypothesise that they may not have the same skill endowment. This assumption also

[11] +/– One standard deviation was used since the actual mean deviation of the difference between attained and required qualifications was 0.989, i.e., close to 1.

captures the widening access to higher education in Pakistan, which has increased skill heterogeneity among fresh graduates. Following Chevalier (2003), we adopt a measure of qualification mismatch and occupation satisfaction to capture idiosyncratic characteristics by dividing overqualified graduates into two categories: those who are satisfied with their mismatch are defined as *apparently* over-qualified, and those who are dissatisfied are classified as *genuinely* over-qualified.[12]

3.2.2. *Measuring Skill Mismatch*

As discussed in Section 2.1, two measurement approaches emerge from the literature to measure skill mismatch: the subjective approach and the specific approach. Both approaches are based on workers' perceptions of skill mismatch. The SEG questionnaire initially attempted to measure skill mismatch using the subjective approach on the basis of two questions: "*Do you feel that your overall skills and training provide you sufficient knowledge to perform your current job well?"* and "*Do you feel that your overall skill and training and your personal capacities allow you to perform a more qualified job?"* Respondents who answered 'yes' to both questions would be classified as over-skilled, while those who answered 'yes' to the first question and 'no' to the second would be classified as accurately skilled. Finally, those who answered 'no' to the first question would be classified as under-skilled, irrespective of their answer to the second question. However, in the pilot SEG survey, it was found that graduates were over-emphasising their answers as most responded with 'yes' to both questions.

To resolve this potential bias, this study follows the specific approach whereby graduates in the SEG survey were asked to respond to questions on a five-point scale ranging from 1 ('not at all') to 5 ('a lot'), concerning nine specific attained and required skills. In Pakistan, graduates similar in terms of attained qualifications (in completed years) may differ in terms of skills attained due to innate ability and skill heterogeneity as a result of different education systems and disciplines. Details of the questions asked concerning the nine attained and required skills are given in Appendix A.

Using the principal component analysis (PCA) method, weights are estimated on the basis of the mean required level of nine skills in two-digit occupations by assuming that workers in similar occupations require similar skills in two-digit occupational classifications. Since the various components have different eigenvalues, the eigenvector with the highest eigenvalue is the principle component of the dataset, and we select the associated weight of the highest eigenvalue. After normalising, these mean values are used as weights by multiplying them by each attained and required skill. This yields a weighted aggregate attained skill index and a weighted aggregate required skill index that capture the individual nine weighted average values (the estimated weight of each skill in the two-digit occupational classification is given in Appendix Table 2).

Finally, the skill mismatch is estimated by comparing the attained skill index and required skill index with (+/–) 0.08 standard deviation (SD) of the mean.[13] Graduates

[12]Job satisfaction is measured on a five-point Likert scale that ranges from 'very dissatisfied' to 'very satisfied'. The range 1 ('very dissatisfied') to 2 ('dissatisfied') is used for *apparently* over-qualified workers and the range 3 to 5 is used for *genuinely* over-qualified workers.

[13]The difference series of the attained skill index and required skill index has mean 0 and standard deviation 0.08. This estimated standard (0.08) is used to calculate the skill mismatch.

with attained skills that exceed 0.08 standard deviation of the mean of required skills are defined as over-skilled. Those with attained skills that are below 0.08 standard deviation of the mean of required skills are defined as under-skilled. The middle range comprises skill-matched graduates.

3.2.3. *Consistency Among Qualification Mismatch and Skill Mismatch*

The joint distribution and non-parametric (Spearman rank correlation test, Kendall tau rank correlation coefficient test, and Kruskal Wallis test) approaches are used to analyse the statistical association between qualification mismatch and skill mismatch.

3.2.4. *Measuring Field-of-Study Mismatch*

One of the most significant types of mismatch in Pakistan, field-of-study mismatch, is estimated in the SEG dataset using the subjective approach with the question: *'How relevant is your current job to your area of education?'* The four possible options are: irrelevant, slightly relevant, moderately relevant, and completely relevant.

3.2.5. *Methodological Framework for Determinants of Job Mismatch*

We estimate the following equations to find out the determinants of the three types of job mismatch:

$$MIS^{sa}_{ki} = \alpha_0 + \alpha_1 I_{ki} + \alpha_2 Ed_{ki} + \alpha_3 Wk_{ki} + \mu_{2i} \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

$$MIS^{j}_{ki} = \alpha_0 + \alpha_1 I_{ki} + \alpha_2 Ed_{ki} + \alpha_3 Wk_{ki} + \mu_{1i} \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

$$MIS^{q}_{ki} = \alpha_0 + \alpha_1 I_{ki} + \alpha_2 Ed_{ki} + \alpha_3 Wk_{ki} + \mu_{3i} \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$MIS^{h}_{ki} = \alpha_0 + \alpha_1 I_{ki} + \alpha_2 Ed_{ki} + \alpha_3 Wk_{ki} + \mu_{4i} \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Equations 3 and 4 estimate the determinants of qualification mismatch using the WSA and JA measure, respectively. Equation 5 measures the determinants of skill mismatch. Multinomial logistic regression is applied to the first three equations where the matched workers serve as the reference category. In Equation 6, the four outcomes of field-of-study mismatch are combined into two categories; the first two categories are labelled 'irrelevant field of study' while the last two are labelled 'relevant field of study', and binary logistic regression is carried out. On the right-hand sides of the four equations, I_{ki} is the vector of independent variables measuring individual characteristics, vector Ed_{ki} measures educational characteristics, and vector Wk_{ki} measures job characteristics. It is worth noting that this is a pioneering piece of research to find out the determinants of field-of-study mismatch.

4. RESULTS

4.1. Incidence of Job Mismatch

Using the RM measure, the LFS datasets show that 30-31 percent of the graduates sampled are mismatched at the national level, with a rising incidence of over-qualification and a falling incidence of under-qualification between 2006-07 and 2008-09. In both rounds, female graduates are seen to face more qualification mismatch than males with more over-qualification among females and more under-qualification among

males (Table 1). For the SEG dataset, the estimates show that the incidence of qualification mismatch varies by each measure. Both the WSA and JA measures show that the level of over-qualification and under-qualification are close to each other compared to the RM measure (Table 1). There is a high statistical relationship between the WSA and JA measures, but a poor association between the RM and JA and RM and WSA measures.[14] These estimates are consistent with earlier findings that the RM method reports a lower incidence of over-qualification [the meta-analysis of Groot and Maassen (2000a) and McGuinnes (2006)]. The higher incidence of under-qualification in the SEG dataset and the lower incidence in the LFS dataset through the RM measure reflects the excess supply of graduates in the SEG dataset, which overestimates the level of under-qualification and underestimates the level of over-qualification.

Table 1

Level of Qualification Mismatch by Various Approaches (%)

Datasets	Measures	Matched	Under-Qualification	Over-Qualification	N
RM Method applied to LFS 2006-07	Female	65.7	4.4	30.0	457
	Male	69.4	9.7	20.9	2,382
	Total	68.8	8.9	22.3	2,839
RM Method applied to LFS 2008-09	Female	60.5	4.2	35.4	577
	Male	71.2	2.3	26.6	3,319
	Total	69.6	2.5	27.9	3,896
SEG, 2010	**WSA Method**	65.4	9.9	24.7	514
	JA Method	69.5	4.5	26.1	514
	RM Method	63.4	21.6	15.0	514

In dividing over-qualified workers into '*apparently over-qualified'* and '*genuinely over-qualified'*, Table 2 shows that under the WSA and JA approaches, about 57 to 63 percent of over-qualified respondents in non-graduate jobs are *apparently* over-qualified while the rest (37 to 43 percent) are classified as *genuinely* over-qualified.

Table 2

Level of Genuine and Apparent Over-Qualification (%)

Qualification Mismatch	WSA Approach	JA Approach	RM Approach
Matched	65.4	69.5	63.4
Under-Qualified	9.9	4.5	21.6
Genuinely Over-Qualified	10.7	9.7	4.7
Apparently Over-Qualified	14.0	16.3	10.3

The results for skill mismatch are reported in Table 3, which shows that more than one fourth of the graduates surveyed are mismatched in terms of skill, either because they are over-skilled or because they are under-skilled. The proportion of 'matched graduates' is considerably higher among males (73 percent) than among females (67 percent). A smaller proportion of female graduates are under-skilled, while more are over-skilled. This reflects the higher under-utilisation of females' skills in their jobs in Pakistan.

[14]Parametric *t*-test and Spearman rank correlation tests were applied.

Table 3

Distribution of Respondents by Level of Skill Mismatch (%)

	Matched Graduates	Under-Skilled	Over-Skilled
Female	66.7	11.1	22.2
Male	72.8	13.9	13.4
Total	**71.8**	**13.4**	**14.8**

To analyse whether or not formal education is a good proxy for skill level, Table 4 reports the results for marginal and joint distribution. A poor level of consistency is found between qualification mismatch and skill mismatch: 59 percent under the JA method and 57 percent under the WSA method. The Spearman rank correlation test and Kendall tau rank test shows a lower level of correlation between qualification mismatch and skill mismatch (0.11 to 0.13). Applying the Kruskal Wallis Rank test, we find that the estimated Chi-square tie values are less than the tabulated values (124.3 at 5 percent), which supports the null hypothesis that a there is a significant difference between qualification mismatch and skill mismatch.

Table 4

Marginal and Joint Distribution of Qualification and Skill Mismatch (%)

	Matched	Under-Skilled	Over-Skilled	Qualification Match
JA Method				
Matched	52.0	10.3	7.2	69.5
Under-qualified	3.5	0.4	0.6	4.5
Over-qualified	16.3	2.7	7.0	26.1
Skill Match	71.8	13.4	14.8	100
WSA Method				
Matched	48.8	9.0	7.6	65.4
Under-qualified	6.8	2.1	1.0	9.9
Over-qualified	16.2	2.3	6.2	24.7
Skill Match	71.8	13.4	14.8	100

The results for field-of-study mismatch are reported in Table 5, which shows that 11 percent of the graduates surveyed considered their current jobs to be totally irrelevant to the disciplines they studied. Another 14 percent reported their jobs as being slightly relevant, followed by 38 percent with 'moderately relevant', and 37 percent with 'completely relevant'. An important finding is that female graduates face more field-of-study mismatch than male graduates: one third of female graduates are mismatched, either falling in the 'irrelevant' or 'slightly relevant' category, while less than one fourth of male graduates fall in these two categories (Table 5).

Table 5

Percentage Distribution of Respondents by Field-of-Study Mismatch

Level of Mismatch	Female	Male	Total
Irrelevant	14.8	10.6	11.3
Slightly Relevant	18.5	12.9	13.8
Moderately Relevant	33.3	39.3	38.3
Completely Relevant	33.3	37.2	36.6

4.1. Determinants of Job Mismatch

4.2.1. *Determinants of Qualification Mismatch*

Table 6 reports the relative risk ratios (RRRs) for the determinants of qualification mismatch, using the WSA and JA approaches. Using the 'spost' STATA commands, a comparison of being 'under-qualified' and 'over-qualified' is given in Appendix Table 4. The predicted probabilities for selected indicator control variables are reported in Appendix Table 5 in which each control variable has been fixed at its mean and the probability of the other has been calculated. The first important finding is that qualification mismatch is associated with gender in Pakistan, supporting the results of Frank (1978), Lassibille, *et al.* (2001), and many others. Moreover, the results of the WSA and JA methods show that age is negatively associated with over-qualification. The socioeconomic background of a graduate's family also influences the level of match: the results of the WSA approach show that graduates from political families or those with close relatives holding positions of political authority are better matched than other matched graduates.

Although higher levels of schooling prevent graduates from being under-qualified, they do raise the likelihood of over-qualification (Table 6). It might be testing to use qualification as an explanatory variable since the dependent variable itself has been calculated on the basis of attained qualifications minus required qualifications. However, we have added it for two reasons. First, attained and required qualifications vary across graduates and we expect those with higher qualifications (e.g., PhDs) to hold jobs that demand correspondingly higher required qualifications and vice versa for graduates who have fewer years of education (i.e., less than 14), thus leaving the estimated qualification mismatch independent of attained and required qualifications. The estimated correlation between attained and required qualifications is found to be 0.59 and 0.65 for the WSA and JA measures, respectively, which, though high, is acceptable as it is below 0.8.

Second, the attained qualifications variable can affect the level of qualification mismatch itself, especially when a rapid expansion in higher education takes place, e.g., as was the case in Pakistan in the last decade when many of the graduates produced could not be absorbed by the labour market. In this case, higher qualifications raise the level of over-qualification. To control this effect, it is necessary to examine the impact of qualifications on qualification mismatch as a number of studies in developed countries have done [Battu, *et al.* (1999), Dolton and Silles (2001), Chevalier (2003), Dieter and Omey (2004, 2009), Chevalier and Lindley (2006), etc.]. The probability of over-qualification is smaller among those graduates who have completed their education as full-time students or through a semester system than among those who have studied part-time or through an annual system. Graduates who have studied occupation-specific subjects are better qualified than those who have studied traditional subjects and humanities (Table 6).

Table 6

Determinants of Qualification Mismatch: Multinomial Logit Model (Relative Risk Ratios)

	WSA Approach				JA Approach			
	Under/Match		Over/Match		Under/Match		Over/Match	
Regressors	RRR	Std. Error	RRR	Std. Error	RRR	Std. Error	RRR	Std. Error
Sex (Male = 1)	0.651	0.368	0.334**	0.449	0.398	0.417	0.498**	0.502
Age (Years)	1.251	0.237	0.797**	0.109	1.290	0.354	0.785**	0.102
Age Square	0.997	0.002	1.002	0.002	0.997	0.003	1.003**	0.002
Relative in Govt. (Yes = 1)	0.309**	0.224	0.392*	0.182	0.905	1.094	0.727	0.317
Family Election Contest (Yes = 1)	1.307	0.701	0.513**	0.189	1.935	1.738	0.748	0.269
Education (Years)	0.236*	0.068	2.494*	0.411	0.064*	0.047	3.258*	0.563
Field of Study (Traditional Subjects as Ref.)								
Computers	2.106	1.823	0.778	0.475	8.968	13.129	0.674	0.389
Administration, Marketing, Finance	0.895	0.511	0.696	0.281	0.820	0.705	0.388*	0.163
Law, Journalism	0.282	0.330	0.520	0.271	2.356	3.873	0.203*	0.116
Statistics, Mathematics, Economics	1.121	0.845	0.334*	0.176	1.461	1.870	0.355*	0.182
Health	0.844	0.792	0.335	0.298	1.870	3.456	0.155*	0.139
Natural Sciences, Engineering	0.601	0.440	0.384**	0.212	0.317	0.439	0.453**	0.234
Full-Time Degree (Yes = 1)	1.051	0.553	0.562**	0.190	1.650	1.431	0.559	0.189
Annual System (Yes = 1)	1.875	0.966	2.229*	0.813	0.565	0.524	1.510	0.536
Occupation (Elementary and Other Lower Occupations as Ref.)								
Manager	1.770 E+08*	9.630 E+08	0.017*	0.016	9.770 E+08**	1.150 E+10	0.007	0.007
Professional	1.730E+ 08*	9.480 E+08	0.032*	0.026	1.980E+0 8**	2.290E+ 09	0.016	0.014
Associate Professional	7.130E+ 07*	3.770 E+08	0.090*	0.065	2.000E+0 8**	2.280E+ 09	0.027	0.022
Clerk	5.044E+ 06*	2.690 E+07	1.356	0.973	0.000	0.016	0.619	0.494
LR chi-2(66)	307.91				295.11			
Prob > chi2	0.0000				0.0000			
Log Likelihood	–282.438				-231.469			
Pseudo R^2	0.354				0.389			
N	512							

* Denotes significance at 5 percent, ** denotes significance at 10 percent.

Note: Models also include sex, marital status, quality of institution, distinction, type of organisation, type of job, and sector of employment.

Occupational choices also play an important role in determining qualification mismatch. In comparison with the elementary occupation graduates holding matched jobs, other occupational groups are more likely to be under-qualified. The peculiar RRRs in the case of under-qualification are due to the higher coefficient values of the occupational groups, and the exponentials of these coefficients yield even higher values. A similar trend is seen in the case of over-qualification, where all occupational graduates are less likely to be over-qualified (Table 6). These results lead us to conclude that under-qualification is most likely to occur in higher occupations, i.e., among managers and professionals, while over-qualification is found in lower occupations. In line with current enrolment in Pakistan and Sattinger's (1993) theory of job assignment, higher enrolment in Pakistan is generating an excess supply of graduates in some occupations. This progression may lead to a 'bumping down process' in the labour market where these educated graduates may end up with low-level mismatched jobs.

4.2.2. *Determinants of Skill Mismatch*

Table 7 reports the RRRs for the determinants of skill mismatch. A comparison of 'under-skilled' and 'over-skilled' is given in Appendix Table 4. In line with Table 7, the predicted probabilities for selected indicator control variables are given in Appendix Table 5, in which each control variable has been fixed at its mean and the probability of the other has been calculated. Table 7 shows that age has a positive association with being 'under-skilled' and a negative association with being 'over-skilled'. This suggests that older workers have not updated their skills over time especially in computers, business administration, and finance. Younger graduates are more likely to have these skills, but their skills are being underutilised. Again, graduates from political families are under-skilled as compared to matched graduates from non-political families.

Over-skill is positively associated with a graduate's level of education, while those who were educated through a semester system and/or as full-time students have a reduced probability of being over-skilled. There is a better skill match among graduates who have studied occupation-specific subjects in their highest degree. The probability of over-skill is lower among managers, professionals, and associate professionals than among graduates in lower occupations (Table 7).

Table 7

Determinants of Skill Mismatch: Multinomial Logit Model (Relative Risk Ratios)

	Under/Match		Over/Match	
Regressors	RRR	Std. Error	RRR	Std. Error
Sex (Male = 1)	0.669	0.303	0.655	0.243
Age (Years)	1.382*	0.207	0.784**	0.118
Age Squared	0.996*	0.002	1.002	0.002
Relative in Govt. (Yes = 1)	1.059	0.480	0.602	0.282
Family Election Contest (Yes = 1)	2.315*	0.807	0.756	0.312
Education	1.252	0.191	1.302**	0.208
Field of Study (Traditional Subjects as Ref.)				
Computers	0.471	0.331	1.269	0.754
Administration, Marketing, Finance	0.274*	0.135	0.79	0.337
Law, Journalism	0.168*	0.109	1.407	0.821
Statistics, Mathematics, Economics	0.29*	0.173	0.141*	0.116
Health	0.259**	0.182	0.619	0.536
Natural Sciences, Engineering	0.165*	0.118	1.532**	0.928
Full-Time Student (Yes = 1)	0.50**	0.205	1.11	0.491
Annual System (Yes = 1)	1.73	0.664	0.467**	0.198
Occupation (Elementary Occupation as Ref.)				
Manager	0.755	0.771	0.065*	0.065
Professional	0.53	0.529	0.188*	0.151
Associate Professional	0.691	0.661	0.228*	0.171
Clerk	0.889	0.858	0.453	0.342
LR Chi-2(62)	138.03			
Log Likelihood	–325.212			
Pseudo R^2	0.1751			
N	513			

*Denotes significance at 5 percent, **denotes significance at 10 percent.

Note: Model includes marital status, quality of institution, distinction, type of organisation, type of job, and sector of employment.

4.2.3. *Determinants of Field-of-Study Mismatch*

The odd ratios of the logistic regression model for the determinants of field-of-study mismatch in Table 8 show that males are about 1.5 times more likely than females to hold a job that is relevant to their field of study. The insignificant coefficient of education reflects the real scenario in Pakistan, i.e., that a higher level of education does not necessarily mean a match between field of study and job. The coefficients (odd ratios) show that moving towards an occupation-specific subject raises the probability of being in a relevant job. Graduates who were educated as part-time students face more issues of mismatch, having obtained their education in conventional subjects from distance-learning institutions and lacking the skills demanded by the labour market.

Table 8

Determinants of Field-of-Study Mismatch Logistic Regression

Regressors	Odd Ratio	Std. Error
Sex (Male = 1)	1.501**	0.357
Relative in Govt. (Yes = 1)	1.297	0.553
Family Election Contest (Yes = 1)	1.136	0.397
Education (Years)	1.163	0.182
Field of Study (Traditional Subjects as Ref.)		
Computers	6.800*	4.945
Administration, Marketing, Finance	3.920*	1.520
Law, Journalism	1.326	0.625
Statistics, Mathematics, Economics	3.975*	2.156
Health	5.839**	6.375
Natural Sciences, Engineering	11.706*	8.444
Full-Time Degree (Yes = 1)	2.234*	0.804
Annual System (Yes = 1)	0.855	0.311
Occupation (Elementary as Ref.)		
Manager	9.103*	7.588
Professional	11.944*	9.288
Associate Professional	6.913*	5.015
Clerical Support Workers	1.550	1.121
Pseudo R2	0.34	
N	513	

* Denotes significance at 5 percent, ** denotes significance at 10 percent.

Note: Equation also includes marital status, age, type of organisation, and sector of employment.

Occupational choice also determines the level of field-of-study mismatch. The coefficients (odd ratios) show that graduates employed in specialised occupations—managers, professionals, and associate professionals—are more likely to hold well matched jobs than those in elementary occupations, i.e., mismatched graduates.

5. CONCLUSIONS AND POLICY IMPLICATIONS

The main aim of this study has been to estimate the three types of job mismatch and analyse its determinants. We have found evidence of all three

categories of job mismatch (qualification mismatch, skill mismatch, and field-of-study mismatch) among Pakistani graduates. The choice of measurement method has a significant effect on the incidence of qualification mismatch. The estimates suggest that formal education is not a good proxy for skill because there is a poor association between qualification mismatch and skill mismatch. The determinants of the three types of job mismatch highlight a number of factors and/or imperfections prevailing at the individual level in the educational system and labour market, which cause this phenomenon.

Overall, the incidence of job mismatch does not support the human capital theory [Becker (1964); Schultz (1962)], which assumes a competitive labour market; in a pure human capital framework, the concept of job mismatch may be meaningless when wages are linked to productivity. However, we cannot necessarily reject the human capital theory on the basis of the cross-sectional dataset since the mismatch phenomenon could be temporary.

Our results support the job assignment theory [Sattinger (1993)] as both individual and job characteristics determine the level of job mismatch, i.e., gender, age, family background, educational characteristics, and occupation title. The lower prevalence of over-qualification and over-skill among older workers than among younger workers supports the theory of occupational mobility, according to which individuals choose lower-level jobs with better chances of moving to higher-level jobs over time. Similarly, greater qualification mismatch among female graduates supports the theory of differential over-qualification.

The incidence of over-qualification does not mean that the level of education should be lowered; instead, it suggests the need for better-quality education and skills. Our findings lead to the following policy implications and recommendations primarily in two areas: reforms in human resource development and labour market institutions.

- The prevalence of job mismatch suggests that there should be closer coordination between the various demand- and supply-side stakeholders of the labour market for a better understanding of issues in order to formulate the right policies.
- Skill heterogeneity, the various tiers of Pakistan's education systems, and the statistics on under-skill indicate the need for educational reforms to ensure equality across universities and regions, and for a planned skills-based education system according to the demands of the labour market. Tracer studies may be useful for better understanding the employment patterns and skills that various sectors and occupations demand, not only to guide planners and enrolled students in labour market opportunities and the types of skill needed, but also to project future educational needs.
- Rapid enrolment accompanied by limited labour participation and further job mismatch for females makes it necessary to address socio-cultural constraints and labour market discriminations against women. Policies and programmes are needed that will not only increase their participation but also provide them with greater entrepreneurial opportunities.

- Pakistan's youth faces rising job search periods (highlighted by official statistics) and over-qualification issues (estimated by this study, based on the LFS dataset). Further research is required to determine whether these are temporary phenomena—as argued by the occupational mobility theory—or whether they are the result of a weak educational system and labour market imperfections. If the latter also prevails, then a major intervention is required in the shape of creating more jobs and knowledge-based activities to minimise current and future socioeconomic risk.
- Our estimates of job mismatch, especially field-of-study mismatch, highlight the prevalence of labour market rigidities and imperfections. There is a need to design and promote policies that will ensure the six dimensions of decent work: opportunities for work, conditions of freedom, productive work, and equity, security, and dignity at work. 'Merit' norms and equal job opportunities should be ensured for all segments of society.
- At present, Pakistan is one of the largest recipients of foreign remittances in the developing world. The population of overseas Pakistanis is about 4.4 million with an annum average of 234,379 migration outflows in the current decade. Recent statistics show the declining share of skilled labour and the rising share of unskilled labour during 2002-03 and 2007-08.[15] A technical and vocation-based education policy would raise the share of highly skilled emigrants, which, in turn, would increase foreign remittances.
- The present labour market information system is inadequate. It depends mainly on the Labour Force Survey (LFS), which does not provide job seekers with sufficient or up-to-date information. The LFS questionnaire on skills assessment, labour market opportunities, and job mismatch needs to be improved. Moreover, the LFS should include a module on the history of employment.

[15] National Migration Policy (2008), Government of Pakistan, Ministry of Labour, Manpower and Overseas Pakistanis, Islamabad.

Appendices

APPENDIX A

C04. How far has your education provided you with the following skills?		**1**	**2**	**3**	**4**	**5**
a.	Supervising a group of people without the guidance of seniors	□	□	□	□	□
b.	Writing presentations, letters, etc., in English easily	□	□	□	□	□
c.	Speaking English fluently	□	□	□	□	□
d.	Calculating and dealing with mathematical numbers/accounts	□	□	□	□	□
e.	Working together with other people	□	□	□	□	□
f.	Solving management problems with the best solutions	□	□	□	□	□
g.	Working with computers	□	□	□	□	□
h.	Thinking of new ideas and carrying out research activities	□	□	□	□	□
i.	Completing job assignments/tasks on time	□	□	□	□	□

C05. How much are the following skills required in *your current job*?		**1**	**2**	**3**	**4**	**5**
a.	Supervising a group of people without the guidance of seniors	□	□	□	□	□
b.	Writing presentations, letters, etc., in English easily	□	□	□	□	□
c.	Speaking English fluently	□	□	□	□	□
d.	Calculating and dealing with mathematical numbers/accounts	□	□	□	□	□
e.	Working together with other people	□	□	□	□	□
f.	Solving management problems with the best solutions	□	□	□	□	□
g.	Working with computers	□	□	□	□	□
h.	Thinking of new ideas and carrying out research activities	□	□	□	□	□
i.	Completing job assignments/tasks on time	□	□	□	□	□

Codes for C04 & C05: ***1 = Not at all,*** ***2 = A little,*** ***3 = Average,*** ***4 = Nearly good,*** ***5 =*** **A lot**

Appendix Table 1

A Reviewed Summary of the Incidence of Qualification Mismatch with Variations in Estimates by Various Approaches

Author(s)	Country	Type of Definition	Estimated Results of Qualification Mismatch
Hartog and Oosterbeek (1988)	Netherlands	Job Analyst Subjective (WSA)	**JA:** 7% OQ, 35.6% UQ for 1960; 13.6% OQ, UQ 27.1% UQ for 1971 **WSA:** 17% OQ, 30% UQ for 1974
Hersch (1995)	US	Subjective and Job Analyst	**WSA:** 29% OQ, 13% UQ; **JA:** 33% OQ, 20% UQ
Cohn and Khan (1995)	US	Subjective and Realised Match (RM)	**WSA:** 33% OQ, 20% UQ; **RM:** 13% OQ, 12% UQ
Battu, *et al.*, (2000)	UK	Subjective - satisfaction Job Analyst Subjective - degree requirement	**WSA-satisfaction:** 40.4% OQ **JA:** 40.7% OQ **WSA - degree requirement:** 21.75% OQ
Chevalier and Walker (2001)	UK	Job Analyst Subjective	**JA:** 13% OQ in 1985, 18.9% (male): 14.7% OQ in 1985, 21.6% (female) **WSA** 33.8% OQ in 1985, 33.8% (male): 30.9% OQ in 1985, 30.9% (female)
Groot and Maassen (2000b)	Holland	Subjective Job Analyst Realised Match	**WSA** 8.7% OQ, 3.8% UQ (male), 13.6% OQ, 2.1% UQ (female) **JA** 12.3% OQ, 13.3% UQ (male), 19.5% OQ, 5.7% UQ (female) **RM** 11.5% OQ, 16.7% UQ (male), 12.2% OQ, 14.2% UQ (female)
Bauer (2002)	Germany	Realised Match using Mean and Modal Values	**Mean Index:** 12.3% OQ, 10.4% UQ (male), 10.7% OQ, 15.6% UQ (female) **Mode Index:** 30.8% OQ, 20.6% UQ (male), 29.9% OQ, 37% UQ (female)
Chevalier (2003)	UK	Job Analyst Subjective Subjective - Job requirements	**JA:** 17% OQ **WSA:** 32.4% OQ **WSA- Job requirements:** 16.2% OE
Kler (2005)	Australia	Realised Match Job Analyst	**RM:** 19% OQ, 11% UQ (male), 17% OQ, 13% (female) **JA:** 7% OQ, 45% UQ (male), 10% OQ, 50% UQ (female)
Lourdes, *et al*. (2005)	Spain	Subjective approach to measuring education and skill mismatch	**Education Mismatch:** 35% OE, 26% UE **Skill Mismatch:** 34% OS, 44% US
Dieter and Omey (2006)	Belgium	Subjective and Job Analyst	**WSA:** OQ 39.2%, UQ 3.4%; **JA:** OQ 26.4%, UQ 4.9%

Note: OQ for over-qualification, UQ for under-qualification, AQ for qualification, OS for over-skill, and US for under-skill.

Appendix Table 2

Estimated Weights of 2-Digit ICSO 2008 Occupational Classifications Based on 9 Required Skills (PCA Approach)

Occupa-tions	Super-visory	Writing	Speak-ing	Numeracy	Team-work	Manage-ment	Compu-ters	Re-search	Time manage-ment
12	0.096	0.140	0.160	0.087	0.140	0.103	0.106	0.106	0.064
14	0.102	0.137	0.133	0.078	0.137	0.127	0.055	0.093	0.137
21	0.120	0.118	0.138	0.101	0.045	0.128	0.137	0.131	0.081
22	0.199	0.024	0.117	0.125	0.143	0.179	0.076	0.129	0.008
23	0.105	0.128	0.136	0.106	0.080	0.118	0.128	0.122	0.078
24	0.100	0.123	0.154	0.084	0.108	0.089	0.061	0.160	0.121
25	0.151	0.152	0.068	0.113	0.081	0.143	0.094	0.083	0.115
26	0.122	0.100	0.076	0.104	0.109	0.135	0.110	0.129	0.117
32	0.123	0.122	0.097	0.093	0.110	0.120	0.105	0.112	0.117
33	0.121	0.140	0.121	0.108	0.118	0.099	0.095	0.087	0.110
35	0.132	0.129	0.122	0.077	0.084	0.139	0.102	0.089	0.126
41	0.099	0.121	0.092	0.094	0.142	0.114	0.120	0.078	0.142
42	0.107	0.115	0.092	0.124	0.102	0.114	0.140	0.100	0.107
52	0.137	0.113	0.141	0.049	0.056	0.138	0.085	0.144	0.137

Appendix Table 3

Estimated Mean Levels of Required Qualifications at 2-digit Occupational Classification

Occupation code*	Estimated Mean Required Qualification	N
12	15.7667	30
14	15.7143	35
21	16.4737	34
22	16.4167	32
23	16.2029	39
24	15.7000	34
25	16.2667	27
26	16.3158	38
32	15.0476	31
33	15.3307	103
35	15.2609	23
41	14.7647	34
42	14.6842	19
52	14.6286	35

Note: The higher number of observation against the 33 occupation (Business and administration associate professionals) is due to the higher share of business services sector in Islamabad/Rawalpindi.

*International Standard Classification of Occupations (ISCO) 2008.

Appendix Table 4

Factor Change with Odds Comparing Under-Qualified/Under-Skilled to Overqualified/Over-Skilled (Odds when P >|z| < 0.10)

Regressors	WSA Approach Coeff.	JA Approach Coeff.	Skill Mismatch Coeff.
Age (years)	0.451	0.50	0.57
Age-squared	–0.005		–0.007
Education	–2.36	–3.94	
Computer		2.59	
Administration, marketing, finance			–1.06
Law, journalism			–2.13
Statistics, mathematics, economics			
Health			
Natural sciences, engineering			–2.47
Full-time degree (yes = 1)			
Annual System (yes = 1)			1.31
Manager	23.09	25.63	2.46
Professional	22.407	23.26	
Associate professional	20.49	22.74	
Clerk	15.13		

Note: only significant has been reported with selective variables, parallel to Tables 6.12 and 6.13.

Appendix Table 5

Predicted Probabilities for Three Outcomes of Qualification and Skill Mismatch with Selected Indicator Variables (Multinomial Logit)

		WSA Approach			JA Approach			Skill Mismatch		
Regressors		Under	Over	Match	Under	Over	Match	Under	Over	Match
Sex	Male	0.02	0.15	0.83	0.00	0.15	0.85	0.13	0.05	0.82
	Female	0.01	0.17	0.82	0.00	0.18	0.82	0.09	0.04	0.88
Relative in govt.	No	0.02	0.18	0.80	0.00	0.18	0.82	0.09	0.04	0.87
	Yes	0.01	0.08	0.91	0.00	0.14	0.86	0.10	0.02	0.88
Family election contest	No	0.01	0.18	0.80	0.00	0.18	0.82	0.08	0.04	0.88
	Yes	0.02	0.10	0.88	0.00	0.14	0.86	0.17	0.03	0.80
Field of study (traditional subjects as ref.)										
Computer studies	No	0.01	0.17	0.82	0.00	0.18	0.82	0.10	0.04	0.87
	Yes	0.03	0.13	0.84	0.00	0.12	0.88	0.05	0.05	0.90
Administration, marketing, finance	No	0.02	0.17	0.81	0.00	0.20	0.80	0.12	0.04	0.84
	Yes	0.01	0.13	0.86	0.00	0.09	0.91	0.04	0.03	0.93
Law, journalism	No	0.02	0.17	0.81	0.00	0.19	0.81	0.11	0.04	0.86
	Yes	0.00	0.10	0.90	0.00	0.05	0.95	0.02	0.05	0.93
Statistics, mathematics, economics	No	0.01	0.18	0.81	0.00	0.19	0.81	0.11	0.04	0.85
	Yes	0.02	0.07	0.91	0.00	0.08	0.92	0.03	0.01	0.96
Health	No	0.02	0.17	0.81	0.00	0.19	0.81	0.10	0.04	0.86
	Yes	0.01	0.07	0.92	0.00	0.03	0.97	0.03	0.03	0.94
Natural science, engineering	No	0.02	0.18	0.81	0.00	0.19	0.81	0.11	0.03	0.86
	Yes	0.01	0.08	0.91	0.00	0.09	0.91	0.02	0.07	0.91
Full-time degree	No	0.01	0.23	0.75	0.00	0.24	0.76	0.15	0.03	0.82
	Yes	0.02	0.15	0.84	0.00	0.15	0.85	0.08	0.04	0.88
Annual system	No	0.01	0.12	0.87	0.00	0.14	0.86	0.07	0.05	0.88
	Yes	0.02	0.23	0.75	0.00	0.20	0.80	0.12	0.02	0.86
Occupation (elementary occupation as ref.)										
Manager	No	0.00	0.25	0.75	0.00	0.28	0.72	0.10	0.05	0.85
	Yes	1.00	0.00	0.00	0.38	0.00	0.62	0.08	0.00	0.92
Professional	No	0.00	0.42	0.58	0.00	0.49	0.51	0.11	0.07	0.82
	Yes	1.00	0.00	0.00	0.00	0.02	0.98	0.07	0.01	0.92
Associate professional	No	0.00	0.30	0.69	0.00	0.40	0.60	0.10	0.06	0.84
	Yes	1.00	0.00	0.00	0.00	0.02	0.98	0.08	0.01	0.91
Clerk	No	0.00	0.16	0.84	0.00	0.18	0.82	0.09	0.04	0.87
	Yes	1.00	0.00	0.00	0.00	0.12	0.88	0.09	0.02	0.89

REFERENCES

Alba-Ramirez, A. (1993) Mismatches in Spanish Labour Market: Overeducation? *The Journal of Human Resources* 27:2, 259–278.

Battu, H., C. Belfield, and P. J. Sloane (1999) Overeducation among Graduates: A Cohort View. *Education Economics* 7, 21–38.

Battu, H., C. Belfield, and P. J. Sloane (2000) How Well Can We Measure Graduate Overeducation and Its Effects? *National Institute Economic Review* 171, 82–93.

Bauer, T. K. (2002) Educational Mismatch and Wages: A Panel Analysis. *Economics of Education Review* 21, 221–229.

Becker, Gary S. (1964) Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education. New York, Columbia University Press.

Büchel, F. and M. Pollmann-Schult (2001) Over-education and skill Endowments: The Role of School Achievement and Vocational Training Quality. (IZA Discussion Paper 337).

Buchel, F. and van M. Ham (2003) Overeducation, Regional Labour Markets and Spatial Flexibility. *Journal of Urban Economics* 53, 482–493.

Budría, S. and A. I. Moro-Egido (2007) Education, Educational Mismatch, and Wage Inequality: Evidence for Spain. Forthcoming in *Economics of Education Review*.

Carnoy, M. (1994) Education and Productivity. *The International Encyclopedia of Education* 3, 1690–1695.

Chevalier, A. (2003) Measuring Over-education. *Economics* 70, 509–531.

Chevalier, A. and I. Walker (2001) Further Results on the Returns to Education in the UK. In I. Walker, N. Westergard-Nielsen and C. Harmon (eds.) *Education and Earnings in Europe: A Cross-country Analysis of Returns to Education.* Edward Elgar.

Chevalier, A. and J. Lindley (2006) Over-education and the Skills of UK Graduates. (IZA Discussion Paper No. 2447).

Cohn, E. and S. P. Khan (1995) The Wage Effects of Overschooling Revisited. *Labour Economics* 2, 67–76.

Dieter, V. and E. Omey (2004) What Determines Measured Overeducation? Ghent University. (FEB Working Paper, No. 04/215).

Dieter, V. and E. Omey (2006) Measuring the Incidence of Over- and Undereducation. *Quality and Quantity* 40, 783–803.

Dieter, V. and E. Omey (2009) The Determinants of Overeducation: Different Measures, Different Outcomes? Ghent University. (FEB Working Paper No. 2009/592).

Dolton, P. and M. Silles (2001) Overeducation in the Graduate Labour Market: Some Evidence from Alumni Data. (CEE Discussion Paper, June).

Dolton, P. and A. Vignoles (2000) The Incidence and Effects of Overeducation in the UK Graduate Labour Market. *Economics of Education Review* 19:2, 179–198.

Dolton, P. and M. Siles (2003) The Determinants and Consequences of Overeducation. In Buchel, de Grip and Mertens (eds.) *Overeducation in Europe.* Cheltenham: Edward Elgar.

Faheem, B. (2008) Return on Higher Education in Pakistan. M.Phill Dissertation. Quaid-i-Azam University, Islamabad.

Frank, R. (1978) Why Woman Earn Less: The Theory and Estimation of Differential Overqualification. *American Economic Review* 68:3, 360–373.

Freeman, R. (1976) *The Overeducated American*. New York: Academic Press.

Frenette, M. (2004) The Overqualified Canadian Graduate: The Role of the Academic Program in the Incidence, Persistence, and Economic Return to Overqualification. *Economics of Education Revie*w 23, 29–45.

Ghayur, S. (1989) Educated Unemployed in Pakistan: Estimates of Imbalances in the Current Flows. *The Pakistan Development Review* 28: 4, 603–613.

Green, F., and S. McIntosh, (2002) Is there a Genuine Underutilisation of Skills Amongst the Overqualified? London School of Economics.

Green, F., S. McIntosh, and A. Vignoles (1999) Overeducation and Skills—Clarifying the Concept. London: Centre for Economic Performance. (Discussion Paper Number 435).

Green, F., S. McIntosh, and A. Vignoles (2002) The Utilisation of Education and Skills: Evidence from Great Britain. *The Manchester School* 70:6, 792–811.

Groot, W. (1996) The Incidence of, and Returns to Overeducation in the UK. *Applied Economics* 28, 1345–1350.

Groot, W. and van den B. Maasen (2000a) Overeducation in the Labour Market: A Meta-Analysis. *Economic of Education Review* 19, 149–158.

Groot, W. and van den B. Maasen (2000b) Skill Mismatches in the Dutch Labour Market. *International Journal of Manpower* 21:8, 584–595.

Halaby, C. N. (1994) Overeducation and Skill Mismatch. *Sociology of Education* 67:1, 47–59.

Hartog, J. and H. Oosterbeek (1988) Education, Allocation and Earnings in the Netherlands: Over Schooling? *Economics of Education Review* 7; 2, 185–194.

Hersch, Joni (1995) Optimal 'Mismatch' and Promotions. *Economic Inquiry* 32, 611–624.

Jim, A. and de V. Robert (2004) Determinants of Skill Mismatches: The Role of Learning Environment, The Match between Education and Job Working Experience. Paper presented at TLM.NET Conference: Quality in Labour Market Transition; A European Challenge. November 2004. Royal Academy of Sciences, Amsterdam.

Jim, A., ROA and de W. Egbert (2005) What Do Educational Mismatches Tell us About Skill Mismatches? A Cross Country Analysis. Paper for the Seminar: European Labour Market of Higher Education Graduates: Analysis of the CHEERS Project Segovia.

Jovanovic, B. (1979) Job Matching and the Theory of Turnover. *Journal of Political Economy* 87:5, 972–90.

Kiker, B., M. Santos, and M. de Oliveiria (1997) Overeducation and Undereducation: Evidence for Portugal. *Economics of Education Review* 16:2, 111–125.

Kler, P. (2005) Graduate Overeducation in Australia: A Comparison of the Mean and Objective Methods. *Education Economics* 13:1, 47–72.

Lassibille, G., L. N. Gómez, A. I. Ramos, and de la O. Sánchez (2001) Youth Transition from School to Work in Spain. *Economics of Education Review* 139–149.

Lourdes, Badillo-Amador, A. Garcia-Sanchez, and L. E. Villa (2005) Mismatches in the Spanish Labour Market: Education vs. Competences Match. *International Advances in Economic Research* 11, 93–109.

Lourdes, Badillo-Amador, and L. E. Vila-Luis (n.d.) Education Mismatch and Qualification Mismatch: Monetary and Non-Monetary Consequences for Workers.

Martin, N., I. Persson, and Dan-Olof Rooth (2008) Education-Occupation Mismatch: Is there an Income Penalty? (IZA Discussion Paper No. 3806).

McGoldrick, K. and J. Robst (1996) Gender Differences in Overeducation: A Test of the Theory of Differential Overqualification. *American Economic Review* 86, 280–304.

McGuinness, S. (2006) Overeducation in the Labour Market. *Journal of Economic Surveys* 20: 3, 387–418.

Mendes de Oliveria, M., Santos, and B. Kiker (2000) The Role of Human Capital and Technological Change in Overeducation. *Economics of Education Review* 19, 199–206.

Mincer, J. (1974) Schooling, Experience and Earnings. New York: Columbia University Press.

Nasir, Zafar Mueen (1999) Do Private Schools Produce More Productive Workers? *The Pakistan Development Review* 38:4, 937–954.

Nazli, Hina (2004) The Effects of Education, Experience and Occupation on Earnings: Evidence from Pakistan. *The Lahore Journal of Economics* 9, 1–30.

Neumark, D. and W. Waschor (2003) Minimum Wages and Skill Acquisition: Another Look at Schooling Effects. *Economics of Education Review* 22, 1–10.

Ng, Y. C. (2001) Overeducation and Undereducation and Their Effect on Earnings: Evidence from Hong Kong, 1986-1996. *Pacific Economic Review* 6:3, 401–418.

Pakistan, Government of (2007a) Pakistan. Employment Trends. Ministry of Labour, Manpower and Overseas Pakistanis, Labour Market Information and Analysis Unit, Islamabad.

Pakistan, Government of (2007b) Pakistan. Employment Trends Youth, Ministry of Labour, Manpower and Overseas Pakistanis, Labour Market Information and Analysis Unit, Islamabad.

Pakistan, Government of (2008a) Pakistan. Employment Trends. Ministry of Labour, Manpower and Overseas Pakistanis, Labour Market Information and Analysis Unit, Islamabad.

Pakistan, Government of (2008b) Pakistan. Employment Trends Youth, Ministry of Labour, Manpower and Overseas Pakistanis, Labour Market Information and Analysis Unit, Islamabad.

Pakistan, Government of (2010) Labour Force Survey, 2010. Federal Bureau of Statistics, Islamabad.

Pasha, H. (1995) Political Economy of Higher Education: A Study of Pakistan. *Pakistan Economic and Social Review* 33:172, 19–36.

Psacharopoulos, G. and Patrinos (2002) Returns to Education: A Further International Update and Implications. *The Journal of Human Resources* 20:4.

Qayyum, Abdul, *et al*. (2007) Growth Diagnostics in Pakistan. (PIDE Working Paper 2006-07).

Robest, J. (1995) College Quality and Overeducation. *Economics of Education Review* 14:3, 221–228.

Robst, J. (2007) Education and Job Match: The Relatedness of College Major and Work. *Economics of Education Review* 26:4, 397–407.

Rosen, S. (1972) Learning and Experience in the Labour Market. *The Journal of Human Resources* 7:3, 326–42.

Rumberger, R. 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* 31:2, 831–880.

SBP (2004) *The State of Pakistan Economy*. Karachi: State Bank of Pakistan.

Schultz, T. W. (1962) Investment in Human Capital. *American Economic Review* 51:1, 1–17.

Sicherman, N. (1991) Overeducation in the Labour Market. *Journal of Labour Economics* 9:2.

Sicherman, N. and O. Galor (1990) A Theory of Career Mobility. *Journal of Political Economy* 98:1, 169–92.

Sloane, P. J., H. Battu, and P. T. Seaman (1999) Overeducation, Undereducation and the British Labour Force. *Applied Economics* 31:11,1437–1453.

Spence, M. (1973) Job Market Signalling. *Quarterly Journal of Economics* 87:3, 353–74.

Thurow, L. C. (1975) *Generating Inequality*. New York: Basic Books.

Tsang, M. C. (1987) The Impact of Underutilisation of Education and Productivity: A Case Study of the U.S. Bell Companies. *Economics of Education Review* 6:2, 239–254.

Verdugo, R. R. and N. T. Verdugo (1989) The Impact of Surplus Schooling on Earnings: Some Additional Findings. *Journal of Human Resources* 24:4, 629–643.

Wolbers, M. H. (2003) Job Mismatches and their Labour-Market Effects among School-Leavers in Europe. *European Sociological Review* 19:3, 249–266.