A Decomposition of Male-Female Earnings Differentials

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1. INTRODUCTION

The participation of women in paid economic activities has increased in almost all the countries and Pakistan is no exception.[1] However, the quantitative increase in female participation in market production has neither led to qualitative improvements in their lives nor to equality of opportunity and treatment between males and females at home and in the labour market. In emerging global economic scenario, the role of females in a country's economic development is becoming critical. This will be a major issue in the next century, as welfare of a society can not be improved unless specific measures are undertaken to improve the socio-economic status of women.

In this study we intend to examine the role of females in labour market, particularly their earnings relative to the earnings of males. The household data show that in 1993-94 the earning gap between males and females was 43 percent. This was lower than the 63 percent gap reported in 1979 and higher than 33.1 gap reported in 1985-86.[2] These changes in male-female earnings gap raise a number of questions, including the following:

(1) How the employment and earnings pattern of females and males have changes overtime and why?
(2) How the personal characteristics, particularly the human capital, have changed over time?
(3) How far the current earning gap can be attributed to differences in the personal characteristics and to labour market discrimination?

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[1]The female labour force participation rate has increased for two reasons: first, more women are entering the labour force; and second, the methodology to collect labour force data is improved [see Pakistan (1998)]. However, in Pakistan the female entry in the labour force is resulting in increase in unemployment rate among females.

[2]See Ashraf and Ashraf (1993).

These questions are important as the empirical literature shows reemergence of poverty and worsening income distribution in Pakistan. These adverse economic conditions may have a disproportionate effect on females as they are concentrated in the low paying and nonregulated section of the labour market.[3] In this paper, we intend to analyse the current earning gap using the earning function approach. Using the methodology developed by Oaxaca (1973) and Cotton (1988), we decompose the male-female earning differential in productivity differential and in labour market discrimination.

The paper is divided in four sections. In the next section, we briefly discuss the socio-economic profile of working males and females. The methodology to decompose the earning differential is discussed in Section 3. The results are discussed in Section 4, and the final section concludes the paper.

2. PROFILE OF WORKING POPULATION

If we compare a few indicators of female status between Pakistan and some developing countries in the region, we see that female achievements relative to male achievements are lower except in case of life expectancy (see Table 1). The adult literacy rate and years of schooling of females relative to males, are only 47 percent and 24 percent, respectively. This shows that educational attainment in Pakistan is extremely low relative to other countries, particularly to Sri Lanka. For the remaining indicators like primary school enrolment, labour force participation, particularly as administrators and managers, and share in parliament, female performance is worse in Pakistan relative to other countries in the region. Limited access to productive inputs, low investment in human capital, low capability of technology diffusion, measurement errors, discrimination at home and in labour market, and other social and cultural factors are listed as major reasons for this poor performance.[4]

Table 1

Gender Disparity Indicators (Males=100)

	Bangladesh	India	Nepal	Pakistan	Sri Lanka
Life Expectancy (1996)	100	100	98	103	106
Adult Literacy (1995)	52	56	33	47	92
Years of Schooling (1993)	29	34	31	24	79
Primary Enrolment (1995)	87	81	68	45	98
Labour Force (1993)	72	47	67	39	56
Earned Income Share (1993)	30	33	47	23	49
Economic Activity Rate (1993)	73	34	48	16	36
Administrative and Managerial (1993)	5	2	7	3	17
Share in Parliament (1993)	11	8	3	2	5

Source: *Human Development Report (1997)*.

[3]See Kemal (1994) and Iqbal and Siddiqui (1998).
[4]See Ashraf and Ashraf (1993, 1998); Cotton (1988); Gannicott (1986); Filer (1983); Hamid (1991); Ibraz (1993) and World Bank (1989).

Within Pakistan, if we compare the literacy rate among the adult population of the country, we see that female literacy rate is considerably lower than male literacy rate (see Table 2). The table shows that, in 1987-88, female literacy rate was almost half of the male literacy rate. However, for females the literacy rate increased from 10.54 percent in 1987-88 to 27.3 percent in 1993-94 whereas for males the increase was from 26.53 percent to 55.4 percent. The situation is even worse in the rural areas where only 22.43 percent males and 5.57 percent females are literate. The table also shows that the female literacy rate almost doubled during 1988–94. This increase in the literacy rate could be a result of implementation of Social Action Programme. However, despite sharp increase, the current literacy rate is still below the desired level.

Table 2

Literacy Rate in Pakistan

	1987-88			1993-94		
	Total	Rural	Urban	Total	Rural	Urban
Overall	37.06	28.00	57.57	41.7	32.4	63.1
Male	26.53	22.43	35.78	55.4	46.6	72.9
Female	10.54	5.57	21.79	27.3	16.3	52.5

Source: Pakistan (Various Issues).

Similarly, the health statistics show that though the life expectancy of males and females is almost the same, female health status is poor. According to Human Development Report (1997), in 1990, the maternal mortality rate was 340 per 10,000 births. Moreover, about 37 percent of the pregnant women were anemic resulting in pregnancy related problems and high infant mortality rate [see World Bank (1998)].

The lower level human capital is the major reason for lower female employment rate. Table 3 shows that refined activity rate has declined among males whereas it has increased among females. A decline in male activity rate could be result of slow down in economic activity and implementation of privatisation programme under Structural Adjustment Programme.[5] However, since the females are employed in low paying and informal sector jobs, their participation in the labour market has increased. This pattern also supports the findings of a number of studies that female labour force participation increases during recession [see Sparr (1994) and Ghosh (1994)]

[5]For a detailed analysis of employment effects of Structural Adjustment Programme, [see Kemal (1994)].

Table 3

Refined Activity Rates in Pakistan

	1987-88			1993-94		
	Total	Rural	Urban	Total	Rural	Urban
Overall	43.22	45.51	38.04	42.00	44.20	37.00
Male	73.79	76.41	67.98	69.10	71.00	64.70
Female	10.24	12.53	4.95	13.30	16.00	7.20
Improves Females	–	–	–	42.50	54.10	15.40

Source: Pakistan (Various Issues).

Table 4 shows that growth rate of female labour force was 7.73 percent per annum during 1988–94, but the employment growth rate was only 6.09 percent, showing a rapid rise in unemployment rate among females. As mentioned earlier, this decline in activity rate could be a temporary (negative) effect of the Structural Adjustment Programmes started in 1987-88 in Pakistan. If so, then we can say that the impact of these programmes is expected to be worse for females.[6]

Interestingly, the distribution of labour force, reported in Table 5, reveals that the increase in the female employment was in the category of employers and employees. The table also shows that though in 1993-94, more than 60 percent of the females are employed as unpaid family helpers, this share has declined from 63 percent in 1987-88. This shows that females participation in entrepreneurial activities and in regulated labour market sector is rising which may result in improvements in their socio-economic status. For the males, the share of unpaid family helpers declined from 19.7 percent in 1987-88 to 17.57 percent in 1993-94. The self-employment structure changed significantly during 1987–94—the period of Structural Adjustment Programme.

In this scenario, it is important to examine the earning behaviour of males and females separately and to decompose the earning differential in (1) productivity differences, and (2) in gender discrimination.

Table 4

Distribution of Labour Force in Pakistan

	1987-88			1993-94		
	Total	Rural	Urban	Total	Rural	Urban
Total Labour Force						
Total (Million)	29.93	21.59	8.34	34.69	25.36	9.33
Males (%)	88.58	86.68	93.82	84.60	82.37	90.73
Females (%)	11.42	13.32	6.18	15.40	17.63	19.26
Employed Labour Force						
Total (Million)	28.99	21.03	7.96	33.02	24.30	8.73
Males (%)	88.37	86.40	93.72	85.44	83.15	91.89
Females (%)	11.63	13.60	6.28	14.56	16.85	8.11

Source: Pakistan (Various Issues).

[6]A study examining these issues, in detail, is in progress.

Table 5

Distribution of Labour Force by Employment Status (%)

| | 1987-88 | | | 1993-94 | | |
	Total	Rural	Urban	Total	Rural	Urban
Employer						
Males	2.03	1.72	2.84	1.16	0.57	2.68
Females	0.20	0.27	0.09	0.21	0.18	0.25
Self-employed						
Males	51.37	55.70	40.34	46.33	51.00	34.59
Females	21.67	20.89	26.36	15.60	15.42	16.85
Unpaid Family Helpers						
Males	19.70	23.35	10.42	17.57	21.11	8.65
Females	63.21	70.52	19.45	60.07	67.97	18.08
Employees						
Males	26.90	19.23	46.41	34.93	27.34	54.07
Females	14.92	8.37	54.11	24.12	16.43	68.51

Source: Pakistan (Various Issues).

3. METHODOLOGY

In order to examine the differences in the earning of the males and females, we estimate the following earning function for working males and females separately:

$$Ln\,(Y^M) = f(X_i^M) \text{ and } Ln\,(Y^F) = f(X_i^F) \quad \dots \qquad \dots \qquad \dots \qquad \dots \qquad (1)$$

where $Ln\,(Y^M)$ and $Ln\,(Y^F)$ are log of monthly income of males and females, respectively. X_i^M and X_i^F represent vector of explanatory variables affecting income of males and females. X includes years of schooling, Age, Age-square, Area (urban/rural), number of days worked, dummy variables for provinces, and dummy variables for different occupational categories, dummy variables for different industrial categories, and dummy variables for employment status. Based on methodology of Oaxaca (1973) and Cotton (1988), if we define the discrimination indicator as:

$$D = [(Y^M/Y^F) - (MP^M/MP^F)] / (MP^M/MP^F) \quad \dots \qquad \dots \qquad \dots \qquad (2)$$

where (Y^M/Y^F) is the ratio of male-female earnings, and (MP^M/MP^F) is the ratio of marginal productivity of males and females in the labour market. The estimate of D

represents labour market discrimination. Since the two groups differ in personal characteristics resulting in earning differences, it is important to decompose the differences in earnings in the following two components: (i) the difference in earnings due to differences in productivity, and (ii) differences due to gender discrimination. Using the earning functions specified earlier, we can write:

$$Ln\,(Y^M) - Ln\,(Y^F) = f(X_i^{\ M}) - f(X_i^{\ F}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (3)$$

The situation of earning function in (3) and some manipulations will give us the following earning decomposition in differences in earnings and in discrimination. The final form can be written as:[7]

$$Ln\,(Y^M) - Ln\,(Y^F) = B^M\,(X_i^{\ M} - X_i^{\ F}) + ln\,(D+1) \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (4)$$
$$\text{or}$$
$$Ln\,(Y^M) - Ln\,(Y^F) = B^F\,(X_i^M - X_i^F) + ln\,(D+1) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \qquad (5)$$

The first term on the right hand side of Equations (5) and (6) measures the earning differential due to differences in personal attributes and the second term measures gender discrimination in the labour market. In Equation (5), the weights from male earning functions are used and in Equation (6) the weights from the female earning functions are used to decompose earnings.

The expected impact of each component of *X* on earnings is as follows:

Schooling represents the human capital of the workers, and it is expected to have a positive impact on the earning potential of the workers. The coefficient of this variable indicates the significance of human capital formation in reducing gender bias.[8] The variable is measured as years of schooling reported by the worker.

Age and Age-square, measured as number of years, are used as proxy for experience. As experience increases, the earnings are expected to rise due to formal on the job training and due to learning-by-doing. However, if the age-earning profile is concave, the rate of increase in earnings is expected to decline in response to increase in age (experience).

Both schooling and experience represent human capital of the worker. However, the earning differential between males and females could also be a result of differences in days worked, location, occupational choice, industrial choice, and employment status. In order to control for the effect of these factors on earnings, extended earning functions are specified for males and females, separately. The rationale for including these variable is as follows:

Days worked is included to capture the effect of differences in the labour supply between males and females. A rise in days worked is expected to have a

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[7]For details, see Oaxaca (1973) and Cotton (1988).

[8]For example, Ashraf and Ashraf (1998) report that, as compared to Pakistan, gender earning gap is small in Karachi. The reason could be higher human capital and better access to productive inputs and to job market for females in Karachi.

positive effect on income. Since the females play triple role (as mothers, as care-providers at home, and as productive agents in the labour market) in the economy, the opportunity cost of their time may be different resulting in difference in the labour supply than males resulting in differential in earnings.

Location: In order to see the impact of location, we control for the area and province. For area, we include, a dummy variable taking value 1 if worker is from rural area and equal to 2 if worker in from the urban areas. To control for the differences in socio-economic set up of provinces following three dummy variables are included:

Punjab = 1 (and = 0 otherwise) if worker is from the province of Punjab.
 Sindh = 1 if worker is from Sindh and 0 otherwise.
NWFP = 1 if worker is from the province of North West Frontier Province. The excluded category is the province of Balochistan.

Occupational Choice may result in differences in rewards to workers. In order to control for the choice of occupation, nine dummy variables are included for the following occupational categories: Professional, Administrative and Managerial, Clerical, Sales, Service, Agriculture and Production (3-categories). Each variable is specified as dichotomous dummy variable taking value 1 if worker belong to a certain occupational category and 0 otherwise.

Industrial Distribution is also important in explaining the earning of the workers. Eight dummy variables are included to control for the industry-effect: Agriculture, Mining and Quarry, Manufacturing, Electricity-Gas and Water, Construction, Wholesale and Retail Trade, Transportation, and Financial Institutions. Each of the dummy variable equals 1 if the worker belong that category and 0 otherwise.

Employment Status represents whether the worker is employer employing less than 10 workers, employer employing 10 or more workers, or self-employed.[9] The variables take value 1 if the worker belongs to a specific category and equals 0 otherwise. Considering the changes in employment structure, discussed earlier, it is important to control for employment status of males and females.

Furthermore, in order to analyse the robustness of coefficients of human capital variables, we estimate two alternative specifications of the earning function:

Model 1 includes only schooling and age as explanatory variables. This is the standard Mincerian earning function.

Model 2 includes all the variables, mentioned above. This will help to see if the conclusions regarding gender discrimination are sensitive to specification of the earning function.

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[9]The employees are treated as excluded category. The unpaid family helpers are not part of the sample.

The data source for the model estimation is *Household Income and Expenditure Survey 1993-94*. In order to include only the working population and to exclude the outliers from the model we impose the following restrictions:

(i) The reported income is greater than zero; and

(ii) The age of the worker varies between 10 and 65 years.

4. RESULTS

The results of the estimated earning functions are reported in Table 6 (Model 1) and Table 7 (Model 2). The results of Model 1 show that the rate of return (ROR) to education is higher for females (8.9 percent) as compared to for males (5.6 percent). This shows that ROR for males is about 2/3 of ROR for females. However, the experience pays off more to males than to females and the returns to age (experience) decline more rapidly as age increases supporting that age-earning profile is concave.

Table 6

Estimated Earning Functions

	Males	Females
Constant	5.527 (143.93)	5.830 (37.517)
Schooling	0.056 (59.638)	0.089 (22.387)
Age	0.086 (37.629)	0.034 (3.413)
Age-square	−0.0009 (30.047)	−0.0004 (2.359)
R^2-adj.	0.368	0.409
F	2415.98	154.79
N	12454	889

Notes: *t*-values are reported in parentheses.

N = Number of observations.

Similarly, the extended earning function shows higher returns to schooling for females and high returns to experience for males. This is not surprising due to more discontinuity in females job experience. Interestingly, the coefficients of schooling and experience in the female regression are more sensitive to changes in the specification of the earning function. The schooling coefficient in Model 2 declines to 0.043 from 0.056 for males whereas for females it declines to 0.062 from 0.089. The coefficient of age (proxy for experience) do not change much in male regression whereas for females the coefficient not only declines it becomes statistically insignificant. This is a surprising result as age is considered an important determinant of females participation in the labour market.

Table 7

Estimated Extended Earning Functions

	Males	Females
Constant	5.452 (102.93)	6.213 (23.915)
Schooling	0.043 (36.933)	0.062 (9.521)
Age	0.08 (37.525)	0.017 (1.778)
Age-squared	–0.009 (30.907)	–0.001 (1.010)
Area	0.191 (19.036)	0.088 (1.719)
Working Days	0.0094	
Provincial Dummy Variables		
Punjab	–0.169 (10.674)	–0.585 (5.610)
Sindh	–0.137 (8.412)	–0.343 (3.147)
NWFP	–0.168 (9.480)	–0.537 (4.449)
Occupational Choice		
Professional	0.134 (3.990)	0.177 (1.018)
Administrative and Managerial	0.005 (7.826)	–0.072 (0.427)
Clerical	0.593 (15.251)	1.021 (2.454)
Sales	–0.026 (1.150)	0.119 (0.609)
Service	0.043 (1.405)	–0.045 (0.185)
Agriculture	–0.007 (0.319)	–0.300 (1.901)
Production-I	0.015 (0.340)	–0.320 (0.768)
Production-II	–0.065 (2.748)	–0.420 (2.800)
Production-III	–0.032 (1.453)	–0.218 (1.174)
Industrial Distribution		
Agriculture	–0.199 (4.729)	–0.092 (0.234)
Minning and Quarrying	0.170 (2.183)	0.456 (1.021)
Manufacturing	0.096 (5.086)	0.011 (0.105)
Electricity, Gas and Water	0.087 (2.515)	0.620 (1.959)
Construction	0.039 (1.578)	0.076 (0.374)
Wholesale and Retail Trade	0.010 (0.394)	–0.008 (0.041)
Transport	0.135 (6.610)	0.114 (0.640)
Financial	0.279 (8.122)	0.257 (0.675)
Employment Status		
Employer (<10 Workers)	0.837 (16.065)	–
Employer (> = 10 Workers)	0.540 (7.016)	0.442 (0.703)
Self-employed	0.277 (19.496)	0.170 (2.509)
R^2-Adj.	0.472	0.503
F	398.295	34.325
N	12458	888

Notes: *t*-values are reported in parentheses. N = Number of observations.

Area and provinces are important determinant of earnings. In urban areas, relative to rural areas, the earnings for males and females are higher. However, the coefficient of area is larger for males. Thus, urban employment may be an important source to raise earnings of females. The coefficients for all the provinces are negative, revealing that as compared to Balochistan, the earnings in all the other provinces, particularly, in Punjab and NWFP are lower for males and females, both. This difference is more pronounced in case of females. This result supports the finding of Ashraf and Ashraf (1993). For the occupational choice, the coefficients of most of the dummy variables are significant. This shows that earnings of more specialised workers are higher as compared to workers in the miscellaneous category. For the females the earnings of the clerical workers are higher but the earnings in the agriculture and low skilled production workers are lower than the female workers in the 'miscellaneous' category. These results show that occupational choice is more important for males than for females. The reason could be that due to low human capital and other socio-economic restrictions the occupational choice for females is limited. Similarly, the industrial classification is also more important determinant of male earnings. This result supports the viewpoint that occupational and industrial choice may be important determinants of earnings gap between males and females.

The employment status is also an important determinant of male earnings. Male employers and self-employed, both, earn significantly more than employees. For self-employed females also the earnings are higher than for female employees.

Based on these results, we can say that differences in personal characteristics are important determinants of earning differences between males and females. Table 8 shows that increase in schooling will lower the ROR on schooling. Presently, the schooling may be an important policy variable to reduce gender discrimination. Similarly, differences in labour supply, location, occupational and industrial choice, and employment status, all contribute to earning gap. However, despite these differences in personal characteristics, discrimination is still high in Pakistan. As we can see the estimates of 'D' based on Model 1 are significantly higher (86–96 percent) than the estimates based on Model 2 (55–77 percent). Based on these results, we can see that even the minimum value of D indicates that 55 percent of the earning differential between males and females is a result of discrimination in the labour market.[10]

CONCLUSIONS

Following conclusions emerge from this discussion:

(1) Though the productivity differences explain a significant proportion of gender earning differences, the market discrimination against females is very high.

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[10]The estimates based on weights from female regression and on weights based on male weights specify a range of possible values of discrimination. For details, see Oaxaca (1973).

(2) Human capital formation, like schooling and age, are important determinants to reduce discrimination.

(3) The estimates of discrimination are sensitive to the specification of earning function.

(4) It is difficult to determine the extent of discrimination fully as it is difficult to control for the effect of feedback from the labour market to determine the extent of discrimination at home.

It is obvious from these results that in order to increase effective and productive involvement of entire population in economic growth of a country, it is important to eliminate the gender discrimination in the labour market. Focussed efforts should be made to eliminate the gender discrimination and the efforts should start at home with the help and support of the society. Considering the rise in share of females in total labour force, this will be a critical issue in the next century.

REFERENCES

Ashraf, J., and B. Ashraf (1993) An Analysis of the Male-Female Earnings Differential in Pakistan. *The Pakistan Development Review* 32:4 895–904.

Ashraf, J., and B. Ashraf (1998) Earnings in Karachi: Does Gender Make a Difference? *Pakistan Economic and Social Review* 36:1 (Summer) 33–46.

Cotton, J. (1988) On the Decomposition of Wage Differential. *The Review of Economics and Statistics* 18:1 (Winter).

Ehrman, J., and Z. Zhang (1995) Gender Issues and Employment in Asia. *Asian Development Review* 13:2 1–49.

Filer, R. K. (1983) Sexual Differences in Earnings: The Role of Individual and Tastes. *Journal of Human Resources* 18:1 (Winter).

Gannicott, K. (1986) Women Wages and Discrimination: Some Evidence from Taiwan. *Economic Development and Cultural Change* 32:4 (July) 721–730.

Ghosh, J. (1994) Gender Concerns in Macro-economic Policy. *Economic and Political Weekly* 29:18 (April).

Hamid, S. (1991) Determinants of the Supply of Women in the Labour Market: A Micro Analysis. *The Pakistan Development Review* 30:4 755–766.

Ibraz, T. (1993) The Cultural Contest of Women's Productive Invisibility: A Case Study of a Pakistani Village. *The Pakistan Development Review* 32:1 107–125.

Iqbal, Z., and R. Siddiqui (1998) The Impact of Structural Adjustment on Income Distribution in Pakistan. *The Pakistan Development Review* 37:4.

Kemal, A. R. (1994) Structural Adjustment, Employment, Income Distribution and Poverty. *The Pakistan Development Review* 33:4 901–911.

Oaxaca, R. (1973) Male-Female Wage Differentials in Urban Labour Markets. *International Economic Review* 14:3.

Pakistan, Government of (1988, 1992, 1998) *Labour Force Survey (1987-88, 1990-91, 1993-94).* Islamabad: Federal Bureau of Statistics.

Pakistan, Government of (1998) *Household Income and Expenditure Survey–1993-94.* Islamabad: Federal Bureau of Statistics.

Sparr, P. (1994) *Mortgaging Women's Lives.* Jew Jersey: Zed Books, Ltd.

United Nations (1997) *Human Development Report–1997.* New York: United Nations.

World Bank (1989) *Women in Pakistan: An Economic and Social Strategy.* A World Bank Country Study. Washington, D. C.: The World Bank.

World Bank (1998) *World Development Indicators.* Washington, D. C.: The World Bank.