ELIT
Economic Laboratory Transition Research Podgorica

Montenegrin Journal of Economics

For citation:

Khan, M.Z., Said, R., Hafeez, A., Maqsood, N., Qadir, F. (2022), "Asymmetries in the Labor Demand in Pakistan: Estimating Own and Cross Wage Elasticities Using Frictional Probit Model", *Montenegrin Journal of Economics*, Vol. 18, No. 4, pp. 31-37.

Asymmetries in the Labor Demand in Pakistan: Estimating Own and Cross Wage Elasticities Using Frictional Probit Model

MUHAMMAD ZAHEER KHAN[1], RUSMAWATI SAID[2] (*Corresponding Author*), AMTUL HAFEEZ[3], NAILA MAQSOOD[4] and FARHEEN QADIR[4]

[1] PhD Research Scholar, School of Business and Economics, University Putra, Malaysia (UPM); Assistant Professor, Department of Economics, Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS), Pakistan
[2] Professor, School of Business and Economics, University Putra, Malaysia (UPM), e-mail: rusmawatisaid@gmail.com
[3] Assistant Professor, Department of Economics, National University of Modern Languages (NUML), Pakistan
[4] Assistant Professor, Department of Basic Sciences and Humanities, University of Engineering and Technology (UET), Taxila, Pakistan
[5] Lecturer, Department of Economics, Lasbela University of Agriculture, Water & Marine Sciences (LUAWMS), Pakistan

ARTICLE INFO

Received November 25, 2021
Revised from December 23, 2021
Accepted January 24, 2022
Available online October 15, 2022

JEL classification: G20, G21, G32.

DOI: 10.14254/1800-5845/2022.18-4.3

Keywords:

Asymmetries;
labor demand,
Pakistan.

ABSTRACT

The objective of this study is to estimate asymmetries in the labor demand across industrial sectors in Pakistan and determine whether the behavioral economic explanation can be used for the labor demand structure and low employment generation in the country. This is done by estimating own and cross-wage elasticities of labor demand for workers categories in 3 different skill levels. Frictional panel Probit estimates indicate that the labor demand structure and low employment generation can be explained in terms of endowment effect and risk averting behavior of the country's industrial sectors.

INTRODUCTION

Pakistan is the sixth-largest country in the world in terms of population and the 10th largest in terms of the labor force. The total labor force had increased from 59 million in 2005-06 to 61 million in 2017-18. This shows that approximately 1.2 million people join the labor force every year, which is significantly higher than the backlog of the unemployed labor force. However, the capacity of the economy to create jobs does not keep pace with the increase of the labor force. As a result, approximately 3.48 million workers are unable to find work, thereby increasing the pool of unemployed individuals in the country.

According to some estimates, Pakistan will require the creation of more than 1.3 million new jobs to accommodate the influx of new labor into the market. On the other hand, the appears to be a paradoxical situation in the labor market of the country; according to Pakistan Labor Force Survey 2017-18, unemployment is significantly higher (20%) for more qualified individuals (graduates) than unskilled individuals (5%). Unskilled labor and lower-skilled labor are in greater demand; the labor market appears to be trapped in a low-skills trap, with employers settling for the kind of low skills rather than hiring the individuals with higher education level even though the large number of graduates as unemployed and looking for job (NHDR, 2017). Although the government has enacted many programs aimed at creating new job opportunities, they are not enough.

Labor demand structure is considered as one of the most fundamental policy concerns for any labor market. It can have a significant impact on job creation. Traditional labor demand theories generally assume firms or entrepreneurs act rationally on markets with perfect competition and full information. Within the framework of these assumptions, symmetrical behavior is presumed, which means that a rise in wages should have quantitative long-run implications that are precisely the same in absolute terms as a fall in wages of the same amount (Hamermesh, 1993).

However, the research in behavioral economics is altering the conventional understanding of how people choose and respond and some of our conclusions concerning the policy design (Thaler and Sunstein 2008; Congdon et al., 2011; Rabin 1998). Behavioral economics emphasizes empirical findings of human behavior that partially contradict the standard economic assumptions. The main empirical findings of behavioral economics suggest that people can commit systematic mistakes or be deterred by complexity, that they procrastinate, and have atypical preferences and beliefs (DellaVigna, 2009). To the level that these behavioral tendencies manifest themselves in labor market contexts, and they may alter our awareness of both the challenges and the opportunities that policy design must address and the design tools that policymakers have at their disposal.

In the context of labor demand analysis, behavioral economics suggests that the firm's behaviors are not strictly rational, and as a result, certain asymmetry may arise in demand for labor with heterogeneous skills. In recent studies, A. Köllling (2018, 2020) incorporated the concepts of loss aversion and endowment effects to determine an asymmetric relationship between own and cross-wage elasticities with labor demand in Germany. The study Identified loss aversion and skill shortage as a possible reason why the establishments respond asymmetrically to own and cross-wage elasticities for the labor force having different skills levels.

Given the current labor market condition in Pakistan, this paper will attempt to investigate whether the behavioral economic concepts can help explain the existing labor demand structure and low employment generation across different industrial sectors in Pakistan. This is accomplished by estimating the own and cross-wage elasticities of labor demand across major industrial sectors of the country. This study will specifically address risk aversion or loss aversion, as well as the endowment effect. Risk Aversion is defined as the general preference for safety (certainty versus uncertainty) and the possibility of incurring losses. Risk-averse investors will choose the lower-risk investment when presented with the option of choosing between two investments with the same expected return.

On the other hand, loss aversion is defined as an agent's strong aversion to losses (Kahneman & Tversky, 1979). As a result, businesses may take more risks to avoid losses. This could imply that businesses are more willing to reduce employment when losses occur, for example, due to higher wage costs. The endowment effect is a term used to describe how ownership affects a good's value. For example, when people own an item, they place a higher value on them than if they don't (Thaler, 1980). Even if firms or establishments do not "own" labor in the property sense, employers may be less willing to exchange existing labor with other workers since they put a high value on their existing workers. This could be thought of as an endowment effect. If that assumption is correct, this could explain why labor demand exhibits asymmetrical cross-wage elasticities.

1. EMPIRICAL MODEL

The analytical model used in this paper is grounded on the translog cost function (Berndt and Khaled, 1979) and is based on labor demand equations (Hamermesh, 1993 and Kölling, 2012, 2018, 2020). To begin, the following structure is assumed:

$C = C(W_i, r, y)$ .... (1)

The translog cost function deduced from equation (1) by (Hamermesh 1993) is as follows:

$$\ln C = \ln Y + a_0 + \Sigma_i a_i \ln w_i + b \ln r + 0.5\Sigma_i \Sigma_j c_{ij} \ln w_i \ln w_j + 0.5\Sigma_i di \ln w_i \ln r, \quad (2)$$

Where c_{ij}, d_i, a_0, a_i, and b are parameters. C denotes the cost, r represents the cost of capital, w_i indicates the wages for various skill levels, and Y denotes the sectoral output. All variables are in log form.

By applying Shephard's lemma to labor input and taking into account the ratio of labor costs gives the following equation:

$$s_i = a_i + c_{ii} \ln w_i + \Sigma_j c_{ij} \ln w_j + d_i \ln r, \quad \text{.... (3)}$$

Where s_i Denotes the wage share of labor costs for each skill level obtained as: ($w_i L_i = Y_{ip}$), since we aim to estimate labor demand equations for three skill levels thus, final estimations are based on a system of seemingly unrelated regressions (SUR) type model where all three equations are estimated simultaneously.

The dependent variable (wage share of total costs) in equation three ranges between 0 and 1 in the various industrial sector. To estimate such models, Wooldridge (2010) presented a fractional panel probit estimate method, in which the non-linear nature of the variable is used within a probit model, as opposed to the traditional method of probit estimation. Therefore, this study incorporates the frication panel probit model for analyses.

To estimate "average partial effects" (APEs), the standard normal cumulative distribution function for a set of the explanatory variable (X) is assumed, and I (group size) is omitted because it is not required:

$$E(s_{it} | x_{it}, c_i) = \Phi(x_{it}\beta_i + c_i) \quad \text{..... (4)}$$

Where c_i denotes unobserved establishment effects and denotes the directions of the partial effects due to the monotonicity of the function.

$$\frac{\partial(s_{it} | X_{it}, c_i)}{\partial X_{it}} = \beta_i \phi(X_{it}\beta_i + c_i) \quad \text{..... (5)}$$

Calculating the APE in (11) is impractical due to the time-constant nature and correlation with explanatory variables. The partial (marginal) effects are obtained by computing the derivatives of:

$$E_c\left(\beta_i \phi(x_{it}\beta_i + c_i)\right) = \beta_i E_c\left[\phi(x_{it}\beta_i + c_i)\right] \quad \text{..... (6)}$$

This paper focused on labor demand elasticities, not calculating APE. Hence own-wage, cross, and output elasticity are derived from the APE's by using the expected mean of the following (Kölling, 2012):

$$\eta_{LW} = \frac{\hat{\beta}_{lnw} \sum_{t=1}^{T} \sum_{i=1}^{N} \phi(x_{it}\beta + \varepsilon_i)}{\sum_{t=1}^{T} \sum_{i=1}^{N} \Phi(x_{it}\beta + \varepsilon_i)} - 1 \quad \text{..... (7)}$$

$$\eta_{Lr} = \frac{\hat{\beta}_{lnr} \sum_{t=1}^{T} \sum_{i=1}^{N} \phi(x_{it}\beta + \varepsilon_i)}{\sum_{t=1}^{T} \sum_{i=1}^{N} \Phi(x_{it}\beta + \varepsilon_i)} \quad \text{..... (8)}$$

$$\eta_{LY} = \frac{\hat{\beta}_{lnY} \sum_{t=1}^{T} \sum_{i=1}^{N} \phi(x_{it}\beta + \varepsilon_i)}{\sum_{t=1}^{T} \sum_{i=1}^{N} \Phi(x_{it}\beta + \varepsilon_i)} + 1 \quad \text{..... (9)}$$

The average partial effect (APE) was determined using previously calculated coefficients obtained in equation (3). The elasticity of own-wage, cross-wage, and output is derived from APE by employing equations (7), (8), and (9).

3. DATA DESCRIPTION

The data is obtained from the three waves of Pakistan labor force survey for the period 2013-2018, which among other labor force characteristics, also provides detailed information about contract type, nature of employment, enterprise size, enterprise ownership, and other labor market characteristics. This study intends to estimate the own and cross-wage elasticates for low, high, and medium-skilled employees working under different contracts using the data pooled across 11 major industrial sectors in Pakistan. As in (Kölling 2020), to categorize the labor force under three skill groups, the individuals with a lower secondary, secondary, or upper secondary level of education but no Technical/Vocational Training are categorized as low-skilled workers. The individuals with technical/vocational training and a lower secondary, secondary, or upper secondary level of education are classified as medium-skilled workers. The individuals having a university degree are categorized as high-skilled workers.

The main explanatory variables from the theoretical model are the logs of wages and costs of capital. There is, as always, concern about the accuracy of the capital cost measure (Griffin, 1992). There is a slight variation in measuring capital prices in different papers. For example, a few of which are mentioned. The cost of capital to a firm is equal to the rate of return on capital in Griffin (1992, 1996). The user cost of capital, according to Jorgenson (1986), is another variable. D. Draper and A. Manders have derived the cost of capital from value-added, the costs of other inputs, and the stock of capital. Capital price is assumed to equal the price of acquiring new capital (Haouas and Yagoubi, 2004) and the book value of capital stocks (Hasan et al., 2007). In Kölling (2012 and 2020), the yearly mean of the 12-month rate at which euro interbank term deposits within the Eurozone is used as an instrument for capital costs.

Following Kölling (2012), the yearly mean of the 12-month interbank term deposits is used as a proxy for capital costs. Furthermore, based on the existing literature, several covariates are included in the model. Sector-wise gross value added is included in the model to determine the elasticity of sectoral output on labor demand with different skill levels. Several studies have identified firm size as an important factor affecting labor demand (Kölling, 2012; Shalmani et al., 2019). Even though The Labor force survey does not provide information about firm size, but it does provide information about the enterprise size; thus, this study has also incorporated the dummy variable for enterprise-size in the model. Three different variables for a share of labor cost (calculated as: $si = w_iL_i/Y_i$) are used as the dependent variables. Therefore, we end up with three regression equations for three different wage shares. We used a system of seemingly unrelated regressions (SUR) to estimate the regression equations.

4. RESULTS AND INTERPRETATIONS

Table 1 presents the results of the fractional probit model. the parameters of own wages are statistically significant for all skill levels, with expected sizes ranging from zero to one. The estimates show that the own-wage elasticity for high-skilled workers is the lowest in absolute values. Although the effect on labor demand is small, however, as A. Lichter et al. (2015) observed in their meta-analysis, these parameters present a wide range of outcomes and are not unique. The cross-wage variable of medium-skilled workers is significant in demand for high-skilled workers. This could corroborate the notion of an endowment effect, as higher remuneration for medium-skilled workers raises labor demand for high-skilled workers, which is also in line with (Kölling 2020).

The capital price parameter is positive and significant, indicating a substitutional relationship between labor cost and capital for all skill levels. The estimates also show types of the contract shows the ratio of the labor force with no contract has a negative impact on labor cost in the equation of low skilled workers. All type of contracts appears to affect the labor cost for high-skilled labor positively. The percentage of females shows a negative impact on labor cost irrespective of the skill level.

Additionally, Table 2 includes estimates that account for differences in employers' behavior when wages increase or decrease. To do this, interaction variables were incorporated into the regressions by multiplying the wage variable by a dummy variable indicating an increase in earnings. As indicated by A. Kölling (2018) noted that symmetrical wage elasticities would lead to a rise in labor demand of similar size due to an increase of wages in absolute terms as a decrease of wages of the same size. The estimates of interaction variables show some additional insights, only significant parameters of interaction variables are of low-skilled labor, while the effect of a wage increase is insignificant for medium-skilled and high-skilled workers. This could be the sign of risk aversion in the firms as the entities react very cautiously to increase wages and are unwilling to take risks because of possible unknown labor characteristics.

Table 1. Estimations of Labor Demand with a Fractional Panel Probit Model

	Low skilled	*Middle skilled*	*High Skilled*
Log. of wages for low skilled per capita	-.0116188 .010919*	.001146 .0081895	-.009785 .0064522
Log. of wages for medium skilled per capita	.0184839 .0172546	.0115694 .0079997*	.0145995 .0117857*
Log. of wages for high skilled per capita	-.005232 .0099191	.0201718 .0102489*	.0102326 .0066198*
Interaction variable			
Δ log. wages of low-skilled workers (increasing wages for low-skilled)	.1055342 .1077832*	.0641715 .1032304	.0540366 .1084549
Interaction variable: Δ log. wages of med.-skilled workers (increasing wages for med.-skilled)	.0802341 .0915694	.0630089 .0921923	.0484514 .0940408
Interaction variable: Δ log. wages of high-skilled workers (increasing wages for high-skilled)	.1160365 .1429737	.0844845 .1304558	.0724877 .1330857
Log. of value added	-.2919834 .1613767*	-.2601079 .1665733*	-.2529828 .1695065*
Dummy for contract type			
pensionable	.3204931 .1667501*	.2367885 .2960184	.4141334 .2918082*
contract	.158129 .1488507 *	-.1235194 .1556621	-.0974833 .0994623*
NO contract	-.031361 .1223158*	-.2211971 .1934113	.1543033 .1346568*
*Dummy for enterprise size**			
11-49 workers	.337684 .0757612*	.2663367 .1440493*	.0656021 .0514451*
50-99 workers	.4614984 .162458*	.2967891 .1880514*	.2179861 .0946015*
> 100 workers	.4427817 .1911083*	.283360 .155606*	.082278 .055943*
% of female employees	1.16623 .624225*	-.123831 1.29341*	-1.79104 1.59358*
Cost of Capital	2.264808 7.476428*	6.93469 3.86972*	1.76610 8.26432*

Note: reported std. Errors are Robust and clustered across industrial sectors.

In the next step, elasticities are derived from the APEs, which are presented in Table 2. The calculations confirm the results of the previous estimations. Elasticities for estimated wage parameters are shown in Table 2. A positive coefficient indicates a substitutional relationship between the corresponding factors, e.g., an increase (decrease) in one factor's cost relative to that of the other will cause a decrease (increase) in the relative quantity of the latter. A negative sign of coefficient represents a complementary relationship between the corresponding factors.

The calculated own-wage elasticities have the expected sign; however, the estimated elasticity appears to be very low. This is in line with (Lichter et al., 2015), who indicated several reasons for heterogeneous wage elasticity. Estimates also show a relative difference in the own wage elasticities for different skill levels. The lowest own wage elasticity exists for low-skilled workers, while the highest own wage elasticity exists for highly skilled workers. This result is justifiable since unemployment is highest among the highly educated works in the country. The finding is also in line with (Nazier 2019), while the country's employment statistics also support these findings. The cross-wage elasticity of medium-skilled workers exhibits a significant effect on the demand for high-skilled workers. The negative parameter indicates a complementarity relationship in labor demand of medium and high skilled workers. The cross-wage elasticity of high-skilled workers also exhibits a complementary effect on the demand for medium-skilled works; however, the effect is relatively small. This extends support to the idea of an "endowment effect" in employing medium-skilled and highly skilled workers.

Table 2. Own and Cross Elasticities of Labor Demand

	Low skilled	*Middle skilled*	*High Skilled*
Log. of wages for low skilled per capita	-.018363*	.0000365	-.0014095
Log. of wages for medium skilled per capita	.000365	-.040452*	.037065*
Log. of wages for high skilled per capita	.0045398	-.064212*	-.036069*

Note: only Own and cross-wage elasticities are reported here.

CONCLUSION

Employment generation is one of the critical issues faced by the labor maker of Pakistan, and despite several efforts from the government, the economic sectors are not generating enough employment opportunities to observe the new entrants in the labor market. This study investigates whether the low employment generation in the Pakistani labor market can be explained by incorporating behavioral economic concepts such as endowment effect, loss aversion, or risk aversion. In doing so, we have applied a fractional Probit model that includes the unobserved heterogeneity. The equations were estimated with a SUR model. The regressions' outcome indicates that the country's low labor demand can be explained according to the behavioral economics concepts. Estimated models confirm the hypothesis that behavior asymmetries impact labor demand structure and the presence of labor market asymmetries. It can be concluded that the industrial sectors show risk-averse behavior to avoid uncertainties related to unknown characteristics of the labor force that leads to low employment generation in the economy. The possible reasons that explain the existing asymmetric labor demand for different skill levels; include (1) possible skill labor shortage that significantly reduces the number of potential hiring's especially in the case of medium and high skilled workers, and (2) behavioral explanations such as endowment effect, especially in case of high skilled workers.

ACKNOWLEDGEMENT

The author(s) are grateful to Professor Arnd Kölling for his valuable suggestion about SUR modeling and labor cost calculation. All the errors and omissions (if any) are of the author's own and have nothing to do with Professor Arnd Kölling.

REFERENCES

Berndt, E.R., Khaled, M.S. (1979), "Parametric productivity measurement and choice among flexible functional forms", *Journal of Political Economy*, Vol. 87, No. 6, pp. 1220-1245.

Congdon, W.J., Kling, J.R., Mullainathan, S. (2011), *Policy and choice: Public finance through the lens of behavioral economics*, Brookings Institution Press.

DellaVigna, S. (2009), "Psychology and economics: Evidence from the field", *Journal of Economic Literature*, Vol. 47, No. 2, pp. 315-372.

Draper, D.A.G., Manders, A.J.G. (1997), "Structural changes in the demand for labor", *De Economist*, Vol. 145, No. 4, pp. 521-546.

Griffin, P. (1992), "The substitutability of occupational groups using firm-level data", *Economics Letters*, Vol. 39, No. 3, pp. 279-282.

Griffin, P.B. (1996), "Input demand elasticities for heterogeneous labor: Firm-level estimates and an investigation into the effects of aggregation", *Southern Economic Journal*, Vol. 62, No. 4, pp. 889-901.

Hamermesh, D. (1993), *Labor demand princeton university press*, Princeton, NJ.

Hamermesh, D.S., Pfann, G.A. (1996), "Adjustment costs in factor demand", *Journal of Economic Literature*, Vol. 34, No. 3, 1264-1292.

Haouas, I., Yagoubi, M. (2004), "Trade liberalization and labor-demand elasticities: Empirical evidence from Tunisia", *IZA Discussion Papers*, No. 1084.

Hasan, R., Mitra, D., Ramaswamy, K. V. (2007), "Trade reforms, labor regulations, and labor-demand elasticities: Empirical evidence from India", The Review of Economics and Statistics, 89(3), 466-481.

Jorgenson, D.W., Yun, K.Y. (1986), "Tax policy and capital allocation", The Scandinavian Journal of Economics, Vol. 88, No. 2, pp. 355-377.

Kahneman, D., Tversky, A. (1979), "Prospect theory: An analysis of decision under risk", *Econometrica*, Vol. 47, No. 2, pp. 363-391.

Kölling, A. (2012), "Firm size and employment dynamics: Estimations of labor demand elasticities using a fractional panel probit model", *Labour*, Vol. 26, No. 2, pp. 174-207.

Kölling, A. (2018), "Asymmetries in labor demand: Do loss aversion and endowment effects affect labor demand elasticities on the establishment level?", *The Journal of Economic Asymmetries*, Vol. 18(C), pp. 1-11.

Kölling, A. (2020), "Long-run Asymmetries in Labor Demand: Estimating Wage Elasticities of Labor Demand Using a Fractional Panel Probit Model", *Labour*, Vol.34, No. 1, pp. 26-47.

Lichter, A., Peichl, A., Siegloch, S. (2015), "The own-wage elasticity of labor demand: A meta-regression analysis", *European Economic Review*, Vol. 80, pp. 94-119.

Nazier, H. (2019), "Estimating Labor Demand Elasticities and Elasticities of Substitution in Egyptian Manufacturing Sector: A Firm-Level Static Analysis", *The Indian Journal of Labour Economics*, Vol. 62, No. 4, pp. 549-575.

Pakistan, U.N.D.P. (2017), Pakistan National Human Development Report.

Rabin, M. (1998), "Psychology and economics", *Journal of Economic Literature*, Vol. 36, No. 1, 11-46.

Roostaei Shalmani, K., Elmi, Z. M., Perez Amaral, T. (2020), "Non-linear Relationship between Labor Demand Elasticities and Firm Size in Iran", Iranian Economic Review, 24(4), pp. 1049-1078.

Thaler, R. (1980), "Toward a positive theory of consumer choice", Journal of Economic Behavior & Organization, Vol. 1, No. 1, pp. 39-60.

Thaler, R.H., Sunstein, C.R. (2008), "Following the herd. Nudge: Improving decisions about health", *Wealth and Happiness*, Vol. 6, pp. 53-73.

Wooldridge, J.M. (2010), *Econometric analysis of cross section and panel data*, MIT press.