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Analyzing the Effect of Infant Mortality, Life Expectancy and Health Expenses on Labor Force Participation in Pakistan

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Abstract: *This study has analyzed the effect of different health indicators like life expectancy, infant mortality rate and health expenses on labor force participation in Pakistan. The study employs autoregressive distributed lag model on time series data for empirical analysis. The study found that infant mortality rate and life expectancy have important impact on the labor force participation in Pakistan. The regression results indicated that public sector expenditures on health sector also exert positive impact on the labor force participation. This shows that healthy individuals can better participate in the market activities. Moreover, human capital variable like education is also likely to exert positive effect on labor force participation of individuals.*

Key Words: Health Indicators, Labor Force Participation, Education, Expenditure, Variables

JEL Classification:

Introduction

Taking care of human health is important for curing disease and sickness. Individuals can build their capabilities. Human welfare can be enhanced through investing in human health. This is an important component of human capital development. Moreover, it is important to expand the production capabilities and earning potential of human beings and that of the entire nation, (Grossman, 1972). According to a study by Hafeez & Ahmad (2002), labor force participation plays an important role in socioeconomic development of a country by promoting income and thereby lowering poverty. Labor force participation can be defined as a part of participation in production work to generate income. The structure of labor force participation has achieved focus over past some years in Pakistan. Study of participation is found important to understand the productive and reproductive roles of individuals.

Factors like infant mortality, life expectancy and secondary school enrolment have great impact on labor force participation in Pakistan. One percent increase in infant mortality lead to 0.653 percent decline in the labor market participation in Pakistan (WDI, 2023). The focus on the health status of individuals can result in health and productive force. It has

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implications for sustainable development in a developing country like Pakistan.

Human capital theory proposes that human beings can upsurge their dynamic capacity through better education and expertise (Becker, 1965). Human capital development indicates the investment that improves the human capabilities. Focusing on the health care can play a significant role in enhancing labor force participation rate. A number of studies shows that healthy work force contribute positively in growth of gross domestic product of an economy. It can lead to the sustainable economic growth through higher labor force participation. Investment in education and health of individuals are considered as imperative factors for the speedy growth of a country. It has been found that work force acquiring lower level of education and weak status of health energies down the economic growth in the long time period (Fogel 2004).

Health plays a vital role in moderating the production and real labor force. Better health status facilitates the investment in education of individual workers. It enables workers to improve their education level and their ability to learn. Education leads to higher labor force participation and productivity of individuals (Benham 1980; Hafeez & Ahmad, 2002; Hafeez, 2013). For example, improvement in health status will motivate people to spend more in order to reduce the infant mortality rate and increase in life expectancy. Physical capital and effective labor force leads to development on GDP (Peykarjou, et al. 2011).

It has been found that healthy labor market workers makes higher contribution in production process rather than less healthy or ill people. This shows that well and healthy workers can perform better in the labor market activity. They do not to stay idle and are likely to earn higher earnings. Therefore, they would be able play a significant role in their personal household development and national development.

A large number of research studies have incorporated the effect of education level on labor force participation and wages in their research (for example, Hafeez, 2015; Gondal, 2003). No vast literature has been found the elaborate the impact of health status on labor market participation behavior of workers in Pakistan. The present study incorporates different health indicators for example expected life, infant mortality rate and health expenditure to examine their effect on labor force participation. The time period specified for the study is 1980-2020.

Objective is to find the association between different health indicators like infant mortality rate and life expectancy on labor force participation in long run and in Pakistan.

Research question:

- What is the effect of infant mortality rate on labor market participation of workers?
- What is impact of life expectancy of individuals on labor market participation of workers?

Literature Review

This section presents the review of various studies both in Pakistan and international.

Nixon and Ulmann (2006) examined the association between expenditure on health care and outcomes of health. The study analyzed the relationship for fifteen European Union countries for fifteen European Union countries for the period 1980-1995. The results found that increase in the expenditures of health care has significant inverse association with the betterment in the situation of infant mortality rate.

A study by Muhammad investigated the impact of expected life on the economic growth and health caution expenditures in Bangladesh. This study used the data set of annual time series data. Relevant data acquired from world development indicators f or the period 1995-2011. The set of variables included were expected life and health spending as percentage of gross domestic product. This research study examined the elasticity of expected life on expenditure of health care activities and economic growth. It was proposed that government can raise the per capital level of income by increasing the investment in health of individuals.

Bpussalem, et Al. (2014) explained the association between spendings on health care and economic growth inling run in Algeria for the period 1974-2014. The variables included are Gross Domestic Product, health expenditure of public sector, and life expectancy. The study employed the granger caulsality test in order to test the causality between health expenditures by public sector and economic growth in the long run. The estimates of the study explained that long run association occurs between health expenditure and economic growth in Algeria.

Like wise, a study by Afridi (2016) analysed the liaison between human capital and economic growth in Pakistan for the period of 1972 to 2013. The data was based on the world health indicators. The model was based on the set of variable like mortalitu rate, birth rate and physical capital. Autoregressive distributed lag model was employed in this study. The results revealed that infant mortality rate has negative effect on economic growth in Paksitan.

Ali et al. (2017) investuagetd the association between public sector spendings om health in paksitan. The data was obtained from word development indicators and paksitan economic survey. The study included the set of variables comprising of real domestic output, public sector spendings on health, work force participation and government expenditures on education. Econometric model like johansion co-integration test was applied for estimation. The study found that public sector expenditures on health exhibit increasing effect on GPD growth in Pakistan. The results concluded that there exists bi-directional relationship between health and economic gowth in Pakistan.

On the basis of the dynamic micro-simulations, a study by Böheim, et al. (2023) found that the work force will rise by 17 percent between 2020 and 2060 in United States despites population aging. It will decline by 11 percent in Germany. The study explored that a development in education level will lead to increase the work force participation USA by almost 3 million individuals and by almost one and a half million in Germany. In addition, improvements in health status and integration of individual with labor market and health restrictions will recommend a larger rise in the participation of work force. Based on the Sweden bench mark, the study showed that lowering the gap between health and participation will increase the work force in USA by almost 13 million individuals in 20260.

Murad et al. (2023) investigated the determinants of infant and under five mortality rates in Bangladesh for the period 1991 to 2018. The study discussed the implications of sustainable development goal (SDG 3). The study employed the dynamic ordinary least square technique for analysis. The study found that employing more health care workers and staff can reduce the infant mortality rates. That is allocation of higher level of resources to the public health care system, provision of improved health care and continuous increase in the prevailing services and facilities can help to reduce the infant mortalities.

Data and Methdology

The present study utilized the secondary data set for the time period 1980-2020. The data is taken on labor force participation, rate for infant mortality, enrolment in secondary schools, life expectancy, capital formation, and volume of trade. World development indicators and various issues of Pakistan economic surveys were used as the sources of data.

Table 1 shows the sources of data and construction of all explanatory variables.

Table 1

Description of Variables

Variables	Names of variables	Measurement	Data Source
Dependent variable			
Labor Force Participation	LFP	Rate	Economic Survey of Pakistan
Independent Variables			
Life expectancy	LEXP	In years	WDI
Infant Mortality Rate	IMR	Rate	WDI
Health Expenditure	HEXP	Percentage of GDP	WDI
Secondary School Enrollment	SECEDU	% growth	WDI
Gross fixed capital formation	GFCF	Percent of GDP	WDI
Volume of Trade	VOT	Percent of GDP	WDI
Government Expenditure	GEXP	Percent of GDP	WDI

According to Ali et al. (2012) infant mortality rate is used as a proxy for health. It is the number of newly born babies who passed away before reaching the age of one year per thousands of live births (WDI, 2010). It is expected to have inverse relationship with the labor force participation. Life expectancy shows number of years of an individual hopes to stay alive. Health expenditure is another indicator that can be used for health status of individuals. Life expectancy and health expenditures are likely to reveal positive relation with the dependent variable. Barro's (1996) employed indicators like IMR, life expectancy and health expenditure as proxies for health status.

Specification of Model

The following models are specified based on the literature available. Natural log of various variables are used.

Model 1: IMR and Labor Force Participation Rate

$$LNLFP_T = B_0 + \Phi IMR_T + B_1 LNLEXP_T + B_2 LNGFCF_T + B_3 LNVOT_T + B_4 LNGEXP_T + B_5 LNSECEDU_T + M_T + \mu \qquad (1)$$

μ = error term.

T = Time period

Model 2: LEXP and Labor Force Participation Rate

$$LNLFP_T = B_0 + B_1 LNLEXP_T + B_2 LNGFCF_T + B_3 LNVOT_T + B_4 LNGEXP_T + B_5 LNSECEDU_T + M_T + \mu \qquad (2)$$

μ = error term.

T = Time period

Model 3: HEXP and Labor Force Participation Rate

$$LNLFP_T = B_0 + B_1 LNHEXP_T + B_2 LNGFCF_T + B_3 LNVOT_T + B_4 LNGEXP_T + B_5 LNSECEDU_T + M_T + \mu \qquad (3)$$

μ = error term.

T = Time period

Stationary of the data can be checked by applying Augmented Dicky Fuller (ADF) test. Auto regressive distributed lag model (ARDL) developed by Pesaren and Shin(1995) is used as estimation technique to find long run impact of health on labor force participation. Since some variables are integrated at zero and some are integrated ate 1, ARDL approach is specified to find long run relationship between the variables.

Empirical Results

This section explains the results of the specified models. The study employees the time series data set.

Descriptive Analysis

The descriptive statistics are given in Table 2. The statistics indicate the main values of data.

Table 2

Statistics of Variables

	lnLFP	LnIMR	LnLEXP	lnHE	lnGFCF	lnVOT	LnGGE	LNSEC$_{edu}$
Mean	6.72	4.51	4.13	0.38	2.78	1.92	2.40	3.26
Median	6.72	4.52	4.13	0.32	2.81	1.89	2.38	3.28
Maximum	7.04	4.80	4.19	0.2	2.96	2.33	2.82	3.80
Minimum	6.32	4.19	4.04	0.33	2.53	1.55	2.05	2.83
Sample	40							

*Table 3 provides the results **of** data by applying ADF test.*

Table 3

Results of Unit Root Test

Variables	T statistics	Critical values	Order of Integration
LFP	-3.290	-2.948	I(1)
IMR	-6.700	-1.950	I(0)
LEXP	-5.228	-5.228	I(0)
HEXP	-3.78238	-3.544284	I(0)
GFCF	-5.321	-1.951	I(0)
VOT	-4.005	-2.981	I(0)
GEXP	-3.774	-2.951	I(1)
LNSEC$_{edu}$	-3.612	-2.951	I(1)

The estimates indicate Table 3 indicates that work force participation is stationary at first order of integration. All health related variables like IMR, expected life, health expenditure, trade and capital formation are found stationary at level. The variables like government spendings and school enrolment are stationary at first difference. The results of the ARDL model are presented in Table 4.

Table 4

Long Run Results of Labor Force Participation

Regressors	Infant Mortality Rate and labor force participation Coefficients (t values)	Life Expectancy and labor force participation Coefficients (t values)	Health Expenditure and labor force participation Coefficients (t values)
LNIMR	-0.050 (-10.443)*	-	-
LNLEXP	-	0.965 (1.746)***	-
LNHEXP	-	-	0.015 (1.671)***
LNGFCF	0.163	0.087	0.153

Regressors	Infant Mortality Rate and labor force participation Coefficients (t values)	Life Expectancy and labor force participation Coefficients (t values)	Health Expenditure and labor force participation Coefficients (t values)
	(2.175)*	(1.722)***	(2.805)*
LNVOT	0.085	0.034	0.056
	(2.639)*	(2.164)*	(2.287)*
LNGGE	0.080	0.039	0.059
	(2.119)*	(1.646)	(1.990)**
LNSEC_edu	0.044	0.081	0.049
	(0.786)	(2.869)*	(1.363)
C	10.535	1.816	5.558
	(21.337)*	(1.811)***	(36.022)*
R²	0.86	0.86	0.88

* (**) *** indicate significance at 1 percent, 5 percent and 10 percent level correspondingly.

It has been observed that explanatory power of all three models is appropriate and show that independent variables play an important role in interpreting the results of all three models. The intercept terms are also found significant. That is, there exist other variables which are not present in the equations but play significant role in describing the behavior of labor force participation rate.

The results indicate that there exists an inverse relationship between infant mortality rate and labor force participation. The variable is significant at 1% level. The estimates show that 1 percent increase in the infant mortality rate is likely to decrease the labor force participation by 5 percent. That is the increasing IMR will reduce to the labor force participation in long run. The results imply that low IMR will have positive impact on the mothers' health and they will be able to contribute effectively in the production process of the country. The decline in the mortality rate of infants' express vital inference for labor force participation. Low rate of infants mortality has positive effect on health of mothers, so she can contribute in production through better labor force participation in more appropriate manners.

Another variable that represent the health status of individuals is life expectancy (Model 2). This variable has positive and significant relationship with labor force participation. More number of expected years of life may cause workers to participate for longer period in production activities and hence labor force participation will increase. That is, it may improve the productive capability of available resources, for example, by improving the health status of work force.

It has been found that GFCF has positive relationship with labor force participation. Another vital determinant of labor force participation magnitude of trade. It has positive relation with labor force participation. Similarly, public sector expenses has positive association with labor force participation in long run.

The results show that secondary school enrolment places positive but weak impact on labor force participation. This would be attributed to bra drain effect. That is, when more number of people leave the country after acquiring education to find high paid jobs abroad. This would leave less number of skilled labor forces in the country for taking part in domestic productive activities. Thus low labor force participation effect of education is observed. The research about positive relation of health status and education work force participation are reliable with the human capital theory and endogenous growth theory. This argues that improvement in human capital of individuals (for example market workers) improves the productivity and hence the contribution of labor force. Similar results were found by (Gondal 2003; Khan & Hafeez, 2017; Ahmad & Hafeez, 2007). According to Ahmad & Hafeez, (2007), the education level

is much more important in influencing the labour force participation decisions.

Moreover, volumes of trade and government expenditure are found to exert positive impact positive impact on labor force participation.

The results of Model 3 reveal that health expenditure also wields positive effect on the dependent variable (LFP rate). The result is supported by Mushtaq, Mohsin & Zaman (2013) that health expenses place positive effect on labor force participation. The remaining variables can be interpreted in a similar way as we have interpreted the results of above two models.

Table 5 presents the results for labor force participation in the short run.

Table 5

Short Run Results of Labor Force Participation Rate

Regressors	Infant Mortality Rate Coefficient (t-Ratio)	Life Expectancy Coefficient (t-Ratio)	Health Expenditure Coefficient (t-Ratio)
IMR	-0.553 (-3.445)*	-	-
LNLEXP	-	0.947 (1.677)***	-
LNHEXP	-	-	0.0070 (0.6636)
LNGFCF	0.086 (1.901)**	0.086 (1.509)	0.1153 (2.1023)*
LNVOT	0.045 (2.737)*	0.034 (2.310)*	0.0442 (2.6995)*
LNGGE	0.042 (1.883)**	0.038 (1.597)	0.0143 (1.6104)
LNSEC$_{edu}$	-0.006 (-0.163)	0.079 (2.486)*	0.0369 (1.2863)
CointEq(-1)	-0.526 (-4.805)*	-0.981 (-5.717)*	-0.752 (-4.740)*

*(**) *** indicate significance at 1 percent, 5 percent and 10 percent level correspondingly.*

The results in the short run indicate that infants mortality rate exert negative whereas life expectancy implies positive effect on the labor force participation rate. However, health expenditure is found to place positive but in-significant impact on the dependent variables. The results of remaining variables in the model can be interpreted earlier as explained in other two models.

The values of the error correction terms bear strong negative vales in all three models. The values of all coefficients are less than one. This reveals that an appropriate percentage of disturbances in equilibrium are corrected in current year for all three models

Conclusion

This study is conducted to analyze the impact of health status on labor force participation in Pakistan. The statistical investigation shows health indicator like infant mortality rate, life expectancy and expenditure of government on health sector exhibit positive association with labor force participation in Pakistan. Life expectancy and infant mortality rate are vital factors that determine of labor force participation. The human capital variable like secondary school enrollment also has increasing effect on the dependent variable. This indicates that education of the individuals

plays an important part to enhance the labor market supply of workers.

The other variables like gross fixed expenditure, trade volume and public sector spendings are also found as second strong determinant of labor force participation.

It has been found that presence of healthy workers is vital for greater contribution of individuals in labor market activities. Findings are consistent to the findings of Raza, Majeed & Islam (2013) and Adridi (2016).

It is suggested that government should devise policy to improve the focus on health status of individual women to reduce the infant mortality rate in the country. This would lead to increase the labor market productivity of married women.

References

Ahmad, E., & Hafeez, A. (2007). Labor supply and earning functions of educated married women: A case study of northern Punjab. *Pakistan Development Review, 46*(1), 45–62. https://www.jstor.org/stable/41260787

Afridi, A. H. (2016). Human Capital and Economic Grwoth of Pakistan. *Business and Economic Review, 8*(177-88). https://www.jstor.org/stable/41260728

Ali, Z., Iqbal, D., Kakakhel, D. J., Nadeem, D., & Saeed, D. (2017). Investment in human capital and economic growth nexus: Evidence from Pakistan. *Journal of management research, 3*(1). https://www.jstor.org/stable/41260728

Barro, R. J. (1996). *Health and Economic Growth.*

Becker, G. S. (1965) A Theory of the Allocation of Time. The Economic Journal 75, 299.

Benham (1980). Benefits of Women Education in Marriage, *Journal of Political Economy, 82*(2). https://mpra.ub.uni-muenchen.de/id/eprint/81832

Böheim, et al. (2023). The Impact of Health and Education on Labor Force Participation in Aging Societies: Projections for the United States and Germany from Dynamic, Micro-simulations, *Popul Res Policy Rev. 42*(3), 39. https://doi.org/10.1007/s11113-023-09781-3.

Fogel, R. W. (2004). Health, Nutrition, and Economic Growth. *Economic Journal and Cultural Change, 52.* https://www.jstor.org/stable/2565122

Grossman, M. (1972). The Demand for Health: A Theoretical and Empirical Investigation. NBER, 0-87014-248-8.

Gondal, A.H. (2003). Women's Involvement in Earning Activities: Evidence from Rural Pakistan. *Lahore J. Econ., 8,* 123–136. https://doi.org/10.35536/lje.2003.v8.i2.a7

Hafeez, A., & Ahmed, E. (2002). Factors determining the labor force participation decision of educated married women in a district of Punjab: *Pakistan Economic and Social Review,no 1,* 75-88. https://www.jstor.org/stable/25825237

Khan M. Z., & Hafeez A. Economic activities and unmarried labour, Economic Research, *Ekonomska Istraživanja 30* (1), 985-991. https/doi.org/10.1080/1331677X.2017.1305805.

Mushtaq, S., Mohsin, A., & Zaman, K. (2013). 'Effects of health on changing labor force participation in Pakistan', 2:610, http://www.springerplus.com/content/2/1/610.

Murad et al. (2023). Determinants of Neonatal, Infant and Under-Five Mortalities: Evidence from A Developing Country, Bangladesh, *Journal of Public Health Policy, 44*(2): 230–241, https://doi.org/10.1057/s41271-023-00413-w.

Pesaren, M. H., & Shin, Y. (1995). Long-run structural modelling.

Raza, K., Majeed, S., & Islam, M. (2013). The impact of health indicators in economic growth in Pakistan. *Pakistan Journal of Humanities and Social Sciences, 1*(1), 11-27. https://doi.org/10.30541/v47i4IIpp.487-500

Appendix

The results of bound tests are provided in Table 1, 2 and 3. The results of Table 1, Table 2 and Table 3 show that long run relation among variables through ARDL model can be tested.

Table 1

Results of Bound Test (infant mortality rate)

Parameters	95% Level		F-Statistic
	Upper bound	Lower bound	
5	3.79	2.62	5.2409

Table 2

Results of Bound Test (Life Expectancy)

Parameters	95% Level		F-Statistic
	Upper bound	Lower bound	
5	4.25	3.12	5.0486

Table 3

Results of Bound Test (Health Expenditure)

Parameters	95% Level		F-Statistic
	Upper bound	Lower bound	
5	4.25	3.12	5.4516

Diagnostic Test

The results are given in Table 4. The results show that relationship between variables are valid.

Table 4

Results of Diagonistic Tests

Breusch-Godfrey Serial Correlation lm Test			
F- STAT	0.502	Prob	0.613
T Value	2.175	Chi square	0.364
Heteroskedasticity Test: ARCH			
F-STAT	0.075	Prob	0.785
T-Value	0.080	Chi square	0.777
Normality Tests			
Jarque bera	0.932	Prob	0.627

The diagnostic tests are carried to test the likely presence of problems like serial correlation, hetroscadesticity and normality. The results indicate that there is no hetroscadicity and serial correlation in the models. The errors are normally distributed and relationship between variables is valid.