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Demographic Changes and Economic Growth in Pakistan: The Role of Capital Stock

ZAINAB JEHAN and FAIZA AZHAR KHAN

Pakistan has experienced a decrease in population growth since the early 1990s leading to an increase in the ratio of working age population, known as demographic dividend. The demographic dividend may lead to higher savings and investments, which spurs economic growth. Given this postulation, the study is the first of its kind to analyse the impact of demographic variables on economic growth through physical capital for Pakistan from 1960 to 2014. In this regard, the demographic change is captured by taking four alternate measures, namely population growth, young age dependency ratio, old age dependency ratio and working age population ratio. In order to examine the channel effect, first the direct impact of demographic changes on physical capital is estimated. Later, the impact of demographically induced capital stock on economic growth is estimated. By using the FMOLS technique, the study concludes that the total negative impact is highest in the case of old age dependency, which means that higher old age dependency is the most threatening demographic change for economic growth. The least harmful demographic change is young age dependency. Moreover, the empirical findings highlight the importance of capital stock as the mediating channel in the demographic change and economic growth relationship. The study recommends effective long-term policies to increase youth employment and to enhance savings for maximising the benefits of demographic dividend.

JEL Classification: J11; O47
Keywords: Direct and Indirect Impact, Demographic Transition, Demographic Age Structure, Capital Stock, FMOLS

1. INTRODUCTION

Demographic changes are a component vital in explaining the economic growth of a country. Over the course of time, researchers have debated on the probable impact of demographic changes on economic/income growth being either negative, positive or neutral, as explained by the pessimistic, optimistic and neutralism schools, respectively, with particular emphasis on population change and birth rates as indicators of demographic change.

The pessimistic view focuses on the *capital dilution effect*, the *dependency effect*, and the *savings effect* being plausible explanations for the negative relationship between population growth and income growth. The *capital dilution effect*, also known as the *solow effect*, suggests that increase in population increases the number of labourers and

Zainab Jehan <zainabjehan.fjwu@gmail> is Assistant Professor, Fatima Jinnah Women University (FJWU), Rawalpindi. Faiza Azhar Khan <faiza.fjwu@gmail.com> is Assistant Professor, Fatima Jinnah Women University (FJWU), Rawalpindi.

consequently reduces the capital per worker. Similarly, the *dependency effect* and the *savings effect* encompass a larger number of dependents and lower savings resulting from increasing birth rates respectively (Malthus, 1798; Coale and Hoover, 1958; Kelley, 1988; Barro, 1991; Brandner and Dowrick, 1994; Todaro and Smith, 1994; Ahituv, 2001; Lee and Mason 2010). However, according to Ashraf et al. (2013), the *dependency effect* is dominant in the initial decades while the *capital dilution effect* becomes important in later years.

In contrast, the optimistic view documents the positive impact of population growth on economic performance, underlining the importance of economies of scale and human capital stock due to an increase in population, (Boserup, 1965; Srinivasan, 1988; Kuznets, 1960; Simon, 1981). According to the optimists' view, increasing population can also help reduce the diminishing returns arising from an aging population (Coale and Hoover, 1958; Meier, 1995). Furthermore, Boserup (1965) suggests that population growth creates incentives for innovations in technology and institutions.

Finally, the third and most recent view is neutralism, which concludes that population growth has little or no significant impact on economic growth in the presence of other control variables (Bloom and Freeman, 1986; Kelley, 2001; Bloom and Williamson, 1998).

However, the aforementioned literature on the relationship between population growth and economic growth has ignored an important aspect of the relationship, which is the changing age structure of the population. Different age structures within similar population figures can have varying impacts on economic growth (Bloom et al. 2001). Countries with relatively higher young and old age populations may experience lower economic growth. The requirement of huge expenditures on this population in the areas of education and health is a contributing factor. In contrast, countries with a high proportion of a working age population have better economic performance.

The varying population age structure is a result of changing fertility and mortality rates over time, which can be linked to the demographic transition of countries. In the current phase of the demographic transition globally, most developing countries are experiencing declining mortality and fertility rates that may result in increasing the working age population as a percentage of the total population (Batini et al. 2006). This offers an opportunity for demographic dividend, provided these countries focus on the education and health needs of the younger population, keeping in mind that the labour market should have the capacity to absorb this population productively (Bloom et al. 2001; Bloom and Finlay, 2009).

Demographic dividends affect the economic performance of a country through increased labour supply, higher savings, and investments in human capital. All these factors have a positive impact on economic growth. For example, it is worth noting that these demographic dividend factors have substantially contributed to the East Asian growth phenomenon. (Bloom and Williamson, 1998).

As mentioned above, a considerable amount of literature focuses on the direct impact of various indicators of demographic changes on economic growth. However, the impact of demographic changes on economic growth is direct, but also conditional on various channels such as physical capital, employment and human capital. It is important to analyse how, and to what extent, the impact of demographic changes on economic growth varies through these channels.

Extensive literature on economic growth shows that the various factors necessary for economic growth. Some of them are physical capital, human capital, inflation rate, government consumption ratio, trade openness, institutional quality, democracy, and life expectancy etc. (Sala-i-Martin, 1997; Sala-i-Martin et al. 2004). The Harrod-Domar and Solow models of economic growth consider physical capital one of the most important determinants of economic growth for any country. Mankiw et al. (1992) and Barro and Sala-i-Martin (2004) in their famous studies on empirics of economic growth have underscored the significance of physical capital for economic growth. Therefore, we have selected physical capital stock as the mediating factor in the relationship of demographic change and economic growth.

Interestingly, scholars have pondered on the mechanics of the impact of demographic variables on physical capital. To begin with, the life cycle model of savings and investments asserts that household decisions about savings and investments depend on their age along with their income (Modigliani and Brumberg, 1954). Goyal (2004) is of the view that decisions about portfolio investment are also a function of age. Bakshi and Chen (1994) contributed life cycle investment hypothesis, and life cycle risk aversion hypothesis illustrating the relationship between investments and age. The former explains that as people get older their equity investment increases; while the latter documents that an increase in average age results in an increase in risk premium.

A study by Batini et al. (2006) concluded that an increase in population and labour force results in an increase in investment through changes in marginal product of capital and consumption, and saving decisions. Using the overlapping generation model (OLG), d'Albis (2007) corroborated a non-monotonic relationship between demographic changes and capital accumulation owing to the opposite signs of capital dilution and savings effects.

Presently Pakistan is going through a demographic transition with an increase in the ratio of working age population and a decline in dependency ratios (see Figure 1). Crude birth rates (CBR) were high in the 1970s and early 1980s, but decreased to 30 births per 1000 population by 2006, and 29 births per 1000 population by 2015. Similarly, the total fertility rate was 6.6 births per woman in 1960, and 5 births per woman in 1997, declining to 3.5 births per woman in 2015 (World Bank, 2017). The crude death rate was 15 in 1970 and dropped to 7 in 2015. As a result, the age dependency ratio as a percentage of working age population has declined from 88 in the 1980s and 1990s, to 65 in 2015 (World Bank, 2017). The annual population growth rate in Pakistan has been approximately 2 percent for the last decade.

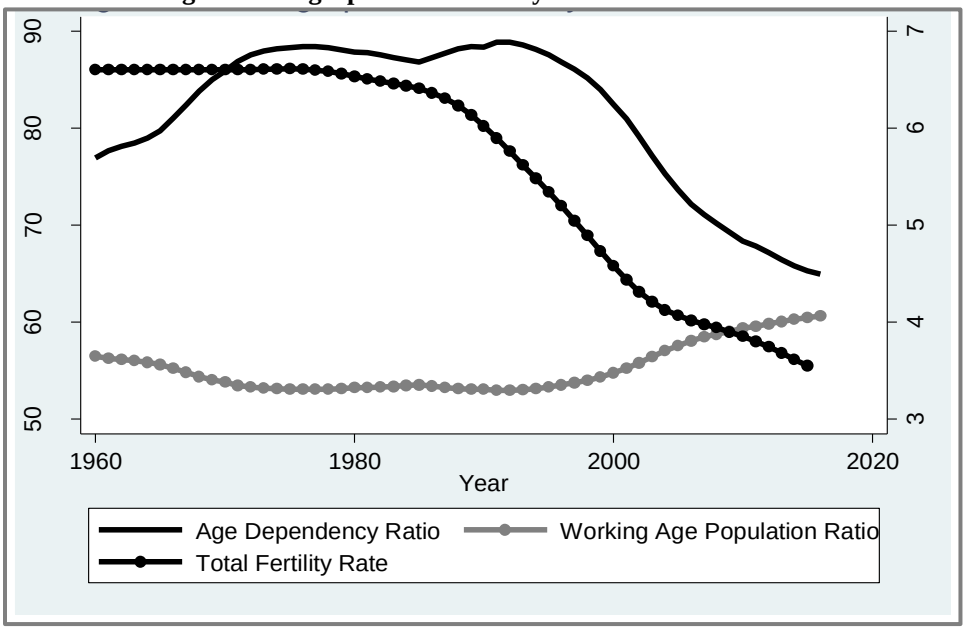
Figure 1 depicts a smoother decline in fertility rate as compared to the age dependency ratio. The latter, after declining in the early 1980s, started increasing again but eventually showed a consistent decline from the 1990s onwards. At the same time, the working age population ratio has shown a continuous increase. Moreover, since the beginning of the 1980s, the fertility rate has shown a sharp decline. Figure 1 shows the 1990s as the start of the demographic dividend period for Pakistan. According to Nayab (2008), the duration of demographic dividend in Pakistan is from 1990 to 2045 with its peak around the year 2000.

It is imperative to mention here the findings of the recent population census conducted in 2017 that reported a surprisingly high annual average population growth of 2.40 percent over the period 1998-2017 for Pakistan, given the previously reported

population growth rate of around 2 percent for this period (Pakistan Bureau of Statistics, 2018). According to the world development indicators, this percentage of population growth is parallel to the one in 1998. The age dependency ratios and working age population ratio may be different and thus lead to a lower demographic dividend then expected according to Figure 1. Therefore, it is important to study the implications of demographic changes in Pakistan.

This study aims to analyse the impact of demographic indicators on the economic growth of Pakistan. Some earlier studies have analysed the issue for Pakistan, (e.g. Hussain, et al. 2009, Choudhry and Elhorst, 2010 and Iqbal et al. 2015). However, the present study is unique in its attempt to estimate the direct and indirect impact of demographic variables on economic growth through the channel of physical capital, given the importance of physical capital in explaining economic growth. The study utilises the time-series data of Pakistan over the period 1960-2015 and applies FMOLS technique to estimate various models for measuring the direct and the indirect impact. Our empirical analysis is comprised of three steps.

Fig. 1. Demographic and Fertility Transition in Pakistan



In the first step, the direct impact of demographic changes on economic growth uses four indictors: (i) population growth; (ii) old age dependency ratio; (iii) working age population ratio; and (iv) young age dependency ratio, for estimations.

The second step computes indirect impact. This involves (a) estimating the direct impact of each demographic indicator on capital stock separately; (b) estimating the impact of demographically induced capital stock on economic growth; (c) computing the indirect impact by multiplying the coefficient of demographic change indicator (from a) with the respective capital stock coefficient (from b). Finally, the total impact is the sum of the direct and indirect impacts.

2. LITERATURE REVIEW

Numerous studies have underlined the significance of demographic variables, i.e. working age ratio, young age dependency ratio, and old age dependency ratio, in explaining economic growth and development (see Table A-1 for summary of literature review). Malmberg (1994) analysed the economic growth effects of changing age structures for the Swedish economy over the period 1950-89 and concluded that there were significant effects. Barro (1991) and Asian Development Bank (1997) in their cross-country growth regressions included the growth rate of an economically active population as an explanatory variable and concluded that it had a positive impact.

Later, Bloom and Williamson (1998) extended the analysis by also analysing the impact of growth rates of populations of under age 15, and over age 64, together with the growth rate of the dependent population on GDP per capita growth in separate regressions. Results have shown that populations under 15 years of age have a negative and significant impact on income growth; however, the coefficient of populations of over 64 years of age is insignificant. In a study specifically focusing on Asian countries, Bloom et al. (2001) ascribed most of the East Asian economic miracle to demographic transition and declining youth dependency ratios in these countries.

In a further study, Kelley and Schmidt (2005) reported a positive impact of a working age population on growth rates of output per capita and output per worker for a sample of 86 developing countries over the period 1960-95. Authors have also included age dependency ratio, and population size and density, as alternative demographic regressors, and have established that demographic change accounts for 20 percent change in per capita income growth. In a recent study on implications of age structures for economic growth, Prskawetz et al. (2007) have corroborated the negative impact of youth age dependency ratio on economic growth for a large panel of countries spanning the years 1960-95.

Similarly, Lindh and Malmberg (2009) analysed the relationship between different age structures and economic growth for EU-15 countries and concluded a hump-shaped relationship between age groups and GDP growth. In a related study, Choudhry and Elhorst (2010) concluded that child and old age dependency ratios negatively affected the per capita income growth, for the period 1961-2003 for seventy countries. Further, per capita income growth is also a positive function of the difference between the working age population growth and total population growth.

In studies related to Pakistan, Hussain et al. (2009) have analysed the impact of demographic variables on economic growth for the period 1972-2006. Both the infant mortality rate and total fertility rate have negatively affected the GDP growth of the country, while the growth rate of the labour force had an insignificant impact on economic growth. In another study, Choudhry and Elhorst (2010) concluded that population dynamics explain 25 percent of the changes in per capita GDP growth in Pakistan. Finally, Iqbal et al. (2015) have analysed the impact of demographic transition on economic growth of Pakistan over the period 1974-2011 and have reported a positive impact of demographic transition on economic growth in the long run but a negative impact in the short-run.

Focusing on the relationship between population growth and savings, Park and Shin (2011) have supported a positive relationship between population and savings and

argued that an increase in population implies more workforce and hence more savings. This positive effect of population on savings is termed the *growth effect* illustrating that higher population growth means a higher percentage of young population initially converting to a higher percentage of working age population later, thus leading to more savings.

The opposite effect is the *dependency effect* that showed a negative relationship between population growth and savings owing to an increased number of dependents (Prskawetz, 2007). Finally, Asongu (2011) is of the view that an increase in population may increase production through increases in consumption and labour supply. The opposite effect may also take place owing to an increase in unemployment creating a burden on the economy. In this situation, investors decrease their investments thus reducing economic growth.

Addressing the empirical evidence on the relationship between demographic changes and physical capital, Malmberg (1994) has analysed the macroeconomic effects of changing age structure for the Swedish economy over the period 1950-89 and produced a hump shaped relationship between age group and savings.

Recently, evidence on the relationship between demographic variables and physical capital was postulated by Goyal (2004), Bosworth and Chodorow-Reich (2006) and Batini et al. (2006) and Asongu (2011). Goyal (2004) analysed data from the U.S. and concluded that demographic variables have an important role in explaining aggregate investment and savings. Forecasting the effect of demographic transition over the next 80 years for USA, Japan and other developing countries, Batini et al. (2006) corroborated that a strong effect of demographic variables on savings, investment, and capital flows existed. Using panel data of 85 countries over the period 1960-2005, Bosworth and Chodorow-Reich (2006) have documented a hump shaped relationship between age groups and savings. Finally, Asongu (2011) has estimated a significant long-run relationship between population growth and investments for 38 African countries over the period 1977-2007. However, the size of the impact varies between public and private investments for various countries.

3. METHODOLOGY AND DATA

This study empirically examines the mediating role of physical capital stock in the relationship between demographic changes and economic growth. Alternatively, we intend to estimate the direct and indirect effects of demographic changes on economic growth by using the channel of physical capital stock. The empirical analysis, therefore, involves multiple steps. Firstly, for direct impact, we estimate the effect of demographic changes on economic growth in the following model.

$$GDP_t = \alpha_0 + \alpha_1 K_t + \alpha_2 HK_t + \alpha_3 TO_t + \alpha_4 FDI_t + \alpha_5 CPI_t + \alpha_6 DV_t + \varepsilon_t \quad \ldots \quad (1)$$

where t = 1960 to 2015

Here, GDP_t is log of real gross domestic product. K_t is physical capital stock measured as log of real gross fixed capital formation. HK_t is human capital index based on years of schooling and returns to education. TO_t is trade openness measured as trade as percentage of GDP. FDI_t is foreign direct investment (net inflows) as percentage of GDP. CPI_t is log of consumer price index. DV_t is the particular demographic variable i.e.

PG_t, population growth (annual percentage), working age population as a percentage of total population i.e. WAPOP, $OADR_t$, old age dependency ratio as percentage of working-age population and $YADR_t$, young age dependency ratio as percentage of working age population. The model is applied four times for each of the four different focused demographic variables.

The dependency ratio is expected to have an adverse impact on economic growth. Higher population growth puts pressure on economic and financial resources. As a result, resources are diverted from investment towards consumption (Kogel, 2003). The impact of population growth on economic growth is viewed as positive by population optimists while negative by population pessimists. According to pessimists, higher population growth creates pressure on economic resources, which hampers accumulation of capital, in turn decreasing economic growth.

On the other hand, optimists posit that higher population growth generates more labour force, which leads to economies of scale and innovation, and thus contributes towards economic growth. The working age population accelerates economic growth (An and Jeon, 2006; Nguyen, 2008; Bloom and Finlay, 2009; Choudhry and Elhorst, 2010) because it provides labour, reducing the dependency ratio, ultimately contributing to economic growth (Choudhry and Elhorst, 2010).

Following Halkos and Paizanos (2014), the indirect impact is analysed in two further steps: Initially, the impact of demographic change on capital stock is estimated through the model in Equation (2). The estimated value of capital stock from the latter is labeled "demographic-change-induced capital stock". Later, the impact of demographically induced capital stock on economic growth is estimated through the model given in Equation (3).

$$K_t = \delta_0 = \delta_1 K_{t-1} + \delta_2 GDP_t + \delta_3 HK_t + \delta_4 r_t + \delta_5 FD_t + \delta_6 FDI_t + \delta_7 RER_t + \delta_8 G_t + \delta_9 DV_t + \xi_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$GDP_t = \gamma_0 = \gamma_1 K_t^{DV} + \gamma_2 HK_t + \gamma_3 TO_t + \gamma_4 FDI_t + \gamma_5 CPI_t + \gamma_6 FDI_t + \varsigma_t \quad \ldots \quad (3)$$

Where FD_t is financial development measured through domestic credit to private sector as percentage of GDP. RER_t is log of real exchange rate. G_t is government consumption expenditures as percentage of GDP, and K_t^{DV} is demographic-change-induced capital stock estimated through Equation (2).

Demographic variables affect physical capital directly through investment, and indirectly through the savings channel. In this regard, life cycle theory supports the idea that saving decisions vary with age. Savings of young and old people are relatively lower when compared to the working age population. Moreover, a lower dependency ratio generally leads to higher savings by the working age group (Kogel, 2003). Therefore, the dependency ratio imposes an adverse impact on savings and investment (Hyung, 2013). Moreover, as explained by the Solow and endogenous growth models, high population growth has an adverse impact on economic growth (McMahon, 2001). High population growth leads to higher consumption, which reduces savings and investment (Park and Shin, 2011).

Human capital refers to a higher level of education and skills. Therefore, it ensures higher returns from investment and economies of scale, helping in accumulation of physical capital stock. Moreover, human capital stock not only helps in generating new

capital stock but also improves the absorptive capacity of the economy for new technology (Lopez-Bazo and Moreno, 2008). The impact of exchange rate changes can be explained both as favourable as well as harmful. For instance, exchange rate affects domestic investment and capital accumulation through cost of capital location. Depreciation in exchange rate accelerates domestic investment as it increases the gains from exports. In contrast, imports become more expensive, which may hamper domestic investment due to higher cost of imported raw material. Therefore, the impact of exchange rate on domestic investment is conditional on the strength of export and import channels.

Finally, we take the product of the coefficients of demographic change indicators from Equation (2) and coefficient of estimated capital stock from Equation (3) to identify the indirect impact of demographic change on economic growth (i.e. $\delta_8 * \gamma_1$). The computation of indirect and total effect is given as follows:

$$\frac{dG_t}{dDV_t} = \frac{dG_t}{dDV_t} + \frac{dG_{it}}{d K_t^{DV}} * \frac{dK_t}{dDV_t} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

The study covers 1960-2015. All the data is extracted from World Development Indicators by the World Bank and Penn World Tables (PWT) 9.0. Before carrying out the empirical analysis for the times series data, it is important to test the selected series for the stationarity properties. Among various available tests, Augmented Dickey Fuller test (ADF) developed by Dickey and Fuller (1979) is most widely recommended by existing literature. Therefore, the ADF test is used to examine the stationarity properties of the data.

For estimation, the present study employs Fully Modified Ordinary Least Squares (FMOLS) technique to estimate the impact of demographic change on the economic growth of Pakistan through the channel of physical capital. The FMOLS technique, proposed by Phillip and Hansen (1990), is a semi-parametric approach to co-integration. It is used to estimate the single equation co-integration relationship with the combination of variables that are integrated of order one. FMOLS modifies the conventional least squares to account for the serial correlation and test for endogeneity among the regressors that may arise due to the existence of co-integrating relationships (Rukhsana and Shahbaz, 2008).

4. RESULTS AND DISCUSSIONS

The descriptive statistics are presented in Table 1. The statistics show that the average population growth is 2.6 percent with a minimum value of 2 percent and maximum of 3.3 percent during the sample period. Among the dependency ratios, average young age dependency remains significantly higher than old age dependency which may be due to high population growth in the country. The average working age population is 54.67 percent of the total population. The highest variation is exhibited by YADR while lowest is observed in OADR. Among macroeconomic variables, GDP shows large variations as compared to investment. Notably, HK in the country is very low as observed from the mean value of HK. The average value of interest rate is 7 percent with a minimum of 2 percent while a maximum of 12 percent. TO and FDI both are considered an important source of technology diffusion and openness. By looking at the average values, we can observe that TO, on average, remains higher than FDI in Pakistan.

Table 1

Descriptive Statistics

Variable	No. of Obs.	Mean	Std.Dev.	Min	Max
GSP	54	28.754	0.8029	27.283	29.949
K	54	27.223	0.589	25.757	28.076
GEGDP	55	11.071	1.773	7.781	16.78
HK	54	1.496	0.271	1.166	2.029
PER	54	4.038	0.448	3.312	4.729
TO	47	32.484	4.287	19.932	38.909
FDI	44	0.757	0.832	-0.063	3.668
DC	54	23.559	4.000	11.148	29.786
PG	54	2.616	0.425	2.028	3.344
OADR	54	7.198	0.133	7.075	7.777
YADR	54	76.101	8.179	54.738	83.048
WAPOP	54	54.668	2.592	52.539	61.794
r	55	7.909	2.732	2.140	12.470

Before estimating the final model, the unit root properties are examined and their results are reported in Table A-2 in Appendix. These estimates identify that all the variables are stationary at the first difference and, therefore, are integrated of order one.

4.1. Direct Impact of Demographic Changes on Economic Growth

The first step of our empirical analysis is to estimate the impact of selected demographic change indicators on economic growth. In this regard, we estimated Equation (1) four times with four different demographic variables. The results of this step are reported in column 2-5 of Table 2.

According to empirical findings, the impact of demographic change indicators shows that two of the three indicators, namely old age dependency ratio (OADR) and young age dependency ratio (YADR), affect GDP growth adversely. Notably, the size of OADR is much higher than YADR. This finding suggests that the old age population is more burdensome for the economic growth of Pakistan. These findings are appealing as expenditures on young age populations are mainly on education and help increase the level of human capital stock, ultimately augmenting the development process of a country.

Although the increase in young age dependency reduces financial savings, it increases the spending on human capital. Since younger people spend more on human capital, the adverse impact of YADR is less as compared to the OADR (Park and Shin, 2011). Prskawetz et al. (2007) support this finding, explaining the negative impact of young age dependency ratio on economic growth. Similarly, Lindh and Malmberg (2009) report a negative impact of age group 65 years and above on GDP growth.

The third indicator of demographic change, population growth, however, has a positive effect. This finding explains the fact that higher population growth leads to a larger labour force, which in turn leads to higher GDP growth. Notably, this positive impact of population growth is less than the negative impact of other two indicators.

Table 2

Direct Impact of Demographic Changes on Economic Growth

Variable	Model 1 Coefficient (S.E)	Model II Coefficient (S.E)	Model III Coefficient (S.E)	Model IV Coefficient (S.E)
K_t	0.247***	0.207***	0.223***	0.192***
	(0.019)	(0.028	(0.014)	(0.054)
$OADR_t$	–0.084***	–	–	
	(0.026)			
$YADR_t$	–	–0.002**	–	
		(0.001)		
PG_t	–	–	0.017***	
			(0.003)	
WAPOP				0.013*
				(0.006)
TO_t	0.078***	0.068***	0.066***	0.079***
	(0.011)	(0.015)	(0.007)	(0.029)
FDI_t	–0.016***	0.004	–0.003*	0.001
	(0.002)	(0.004)	(0.002)	(0.007)
HK_t	0.519***	–1.23***	–0.611***	–1.715***
	(0.079)	(0.235)	(0.081)	(0.499)
CPI_t	0.023***	–0.099***	–0.107***	–0.153***
	(0.008)	(0.020)	(0.009)	(0.039)
C	3.289***	12.254***	12.889***	12.052***
	(0.347)	(1.265)	(0.601)	(0.029)
R^2	0.999	0.999	0.999	0.999

Note: Model I, Model II, and Model III, respectively, display the estimates for the model taking OADR, YADR, PG, and WAPOP as an indicator of demographic change.

***, **, *indicate statistical significance at 1 percent, 5 percent, and 10 percent level of significance, respectively.

The optimistic view endorses a favourable impact of population growth on economic growth. For instance, Boserup (1965) argues that population growth creates incentives for innovation and helps build up human capital, appearing favourable for economic growth. In a similar vein, Gerald and Meier (1995), Kuznets (1960), and Simon (1981) argue that higher population growth builds human capital stock and outweighs the adverse impact of the dependency of an aging population. More recently, Thuku et al. (2013) and Ali et al. (2013) also demonstrated a positive impact of population growth on economic growth. However, Ali et al. (2013) state that higher population growth generates a larger workforce that may be challenging for countries. Trimborn (2012), on the other hand, reports that the accelerating impact of demographic changes on technological progress and economic growth helps in the medium term, whereas in the long term, countries experience slower growth.

Finally, the fourth indicator of demographic changes, working age population, accelerates economic growth (An and Jeon, 2006; Nguyen, 2008; Bloom and Finlay, 2009; Choudhry and Elhorst, 2010) since it provides a labour force while reducing the dependency ratio, ultimately contributing to economic growth (Choudhry and Elhorst, 2010). Additionally, an increased working age population results in higher productivity growth. Furthermore, higher growth in the working age population is referred to as the "large-country" effect, which implies more people involved in productive work (Isaksson, 2007).

Turning towards the impact of other variables, we observe a statistically significant impact of all variables on economic growth. In particular, estimates reveal that trade openness has a significant impact on growth. Trade theories document a positive impact of trade openness on the economic growth of a country. The Endogenous Growth Theory developed by Frankel and Romer (1999), and Lucas (1998) implies that trade leads to competition, technology transfer and efficient allocation of resources ultimately fostering economic growth. Din et al. (2003) and Umer (2014) document that trade is an important policy instrument and has a positive and significant impact on output growth of Pakistan.

In contrast, our findings exhibit a statistically adverse impact of FDI on economic growth. Literature from Borensztein et al. (1998); Mencinger (2003); Omran and Bolbol (2003), also provides evidence for the negative impact of FDI on growth. Human capital signifies a positive impact on economic growth. Empirical studies such as Lucas (1998), Romer (1990), Barro (1991), Barro and Lee (1993) have considered human capital an important factor in explaining economic growth. Moreover, inflation rates also exert a favourable impact on economic growth.

Literature reports both negative and positive impact of inflation on economic growth. This finding supports the argument that inflation generates profit-earning opportunities for producers, which increases output level. Hussain and Malik (2011) also support this finding. However, Ayyoub et al. (2011) document that inflation is favourable to economic growth only below a certain threshold level and otherwise hurts economic growth.

4.2. Indirect Impact of Demographic Changes on Economic Growth

In order to estimate the indirect impact of demographic changes on economic growth, we proceed as follows: (i) estimate the impact of each indicator of demographic change on capital stock separately, and obtain the series of estimated capital stock. (ii) Use these estimated capital stock series, from the first step, to estimate its impact on growth. This exercise enables us to estimate the impact of each indicator of demographic change variable on economic growth through the channel of physical capital stock. In the following paragraphs, we discuss the findings of both of these steps.

The estimates for the direct impact of each demographic change indicator on capital stock are presented in Table 3. The selected set of regressors show theoretically expected signs in relation to the capital stock. In particular, for the demographic change indicators, Table 3 reports a negative impact of all the indicators of demographic change on investment. Particularly, the dependency impact measured through OADR and YADR decreases investment by 0.17 percent and 0.045 percent respectively. Once again, the adverse impact of OADR is more dominant than YADR.

Table 3

Direct Impact of Demographic Change on Capital Stock

Variable	Model V Coefficient (S. E)	Model VI Coefficient (S.E)	Model VII Coefficient (S.E)	Model VIII Coefficient (S.E)
K_{t-1}	0.552***	1.567***	0.398***	0.035***
	(0.026)	(0.044)	(0.032)	(0.014)
GDP_t	1.505***	2.436***	1.782***	0.509*
	(0.056)	(0.103)	(0.076)	(0.033)
HK_t	0.011	1.244***	1.598***	–1.106***
	(0.143)	(0.369)	(0.231)	(0.074)
r_t	–0.003***	–0.024***	–0.001	–0.006***
	(0.001)	(0.001)	(0.001)	(0.0005)
G_t	–0.014***	–0.032***	–0.011***	0.003***
	(0.001)	(0.002)	(0.001)	(0.0006)
FD_t	0.0004	–0.027***	0.013***	0.001***
	(0.0007)	(0.001)	(0.001)	(0.0004)
FDI_t	0.007**	–0.026***	–0.072***	0.053***
	(0.003)	(0.006)	(0.005)	(0.002)
RER_t	–0.147***	1.025***	–0.099***	–0.0005***
	(0.012)	(0.024)	(0.018)	(0.0001)
$OADR_t$	–0.171***			
	(0.045)			
$YADR_t$		–0.045***		
		(0.002)		
PG_t			–0.031**	
			(0.011)	
WAPOP				0.006*
				(0.003)
R^2	0.990	0.747	0.979	0.992

Note: Model VII, Model VIII, and Model IX, respectively, display the estimates for the impact of OADR, YADR, PG, and WAPOP on capital stock. The time-period for the study is 1960-2015.

***, **, * indicates statistical significance at 1 percent, 5 percent, and 10 percent level of significance, respectively.

The life cycle theory states that savings and investment decisions vary with age. For instance, young and old age groups, generally, save less in comparison to the working age group. Therefore, OADR and YADR exhibit a negative impact on investment level. Moreover, an increase in the overall dependency ratio decreases the savings of the working age group (Kogel, 2003). The empirical literature from Hyung (2013), and Kelly and Schmidt (2005), among others, also supports the negative impact of dependency ratios on investment. Moreover, Bakshi and Chen (1994) have formulated two hypotheses relating age structures and investment, namely the life cycle investment hypothesis, and the life cycle risk aversion hypothesis. The first explains that older people invest more in equities while the latter states that older people are more risk averse therefore they invest more in equities. Park and Shin (2011) considered that there is a direct relationship between age structure of population and investment.

The adverse impact of population growth on investment is the lowest (–0.03 percent) amongst three of the demographic change indicators. Theories based on the Solow growth model, and endogenous growth models, document an inverse impact of population growth on savings in an economy (McMahon, 2001). These theories argue that with an increase in population, a larger proportion of income is devoted to consumption and less is saved, which lowers the rate of investment since less funds are available. Our finding is in line with these theories and supported by Park and Shin (2011).

Similarly, the investment-diversion effect explains that public private expenditures are diverted from growth-oriented investment to social security projects because of high population growth in a country (Kelly and Schmidt, 2005). Finally, the impact of working age population on investment is observed as favourable. The working age population boosts savings and thus investment levels in the country. According to Bloom and Williamson (1998), a rising growth rate of the working age population leads to a decrease in the dependency ratio, which increases savings, and thus investment level in the country.

Focusing on the impact of other variables, GDP growth positively and significantly affects capital stock. The accelerator theory of investment confirms that an increase in overall output in a country is an indicator of a better economic performance of that country, which also attracts more investment (Anwer and Sampath, 1999). Moreover, human capital signifies a positive impact on physical capital stock. It shows that a higher level of skill and education of workers allows higher returns from investment. In addition, stock of human capital helps in generating more stock of physical capital as well as higher returns from investment and increased absorption of technology (Lopez-Bazo and Moreno, 2008).

Similarly, FDI helps to increase domestic investment. This implies that foreign investment provides a competitive environment to domestic investors leading to higher domestic investments. We also take interest rates as an indicator of the cost of borrowing to estimate its impact on physical capital stock. The IS-LM framework explains an inverse relationship between interest rates and investment. Our study suggests that a higher cost of borrowing leads to lower investment. This finding is supported by Joshua and Delano (1990) who also explain the adverse impact of interest rates on investment.

Interestingly, our report finds that government expenditures crowd out private investment. Pakistan, being a developing country, faces serious resource constraints. As such, high government expenditures put upward pressure on demand for loanable funds, which makes them expensive, thus lowering private investment by increasing the cost of borrowing. On the other hand, financial development appears to improve the channels through which funds are utilised in an economy. A developed financial system provides better financing and hedging opportunities, which helps in increasing the investment level. Reports on Pakistan suggest that financial development has a favourable impact on investment level. This finding is in line with King and Levine (1993) and Salahuddin et al. (2009).

In order to estimate the impact of demographically induced capital stock on economic growth, we re-estimate the economic growth model given in Equation (1) by

replacing capital stock with the estimated capital stock while the other regressors are the same. These estimates are presented in Table 4. The empirical findings for all the selected regressors are robust, as discussed above. Focusing on the impact of demographically induced capital stock on growth, the estimated capital stock, in all the models, shows a statistically significant and positive impact on GDP growth. Particularly, the magnitude of the impact of capital stock induced by OADR is the highest followed by population growth, YADR, and WAPOP respectively.

Table 4

Impact of Demographically Induced Capital Stock on Economic Growth

Variable	Model IX Coefficient (S.E)	Model X Coefficient (S.E)	Model XI Coefficient (S.E)	Model XII Coefficient (S.E)
GDP_{t-1}	0.321**	0.481***	0.302*	0.351***
	(0.157)	(0.032)	(0.171)	(0.113)
K_t^{OADR}	0.178***			
	(0.065)			
K_t^{YADR}		0.063***		
		(0.014)		
K_t^{PG}			0.151**	
			(0.067)	
K_t^{WAPOP}				0.013*
				(0.007)
TO_t	0.085**	0.108***	0.109**	0.079**
	(0.037)	(0.032)	(0.043)	(0.029)
FDI_t	0.008	0.013**	0.009	0.0009
	(0.005)	(0.006)	(0.006)	(0.007)
HK_t	–0.968**	–0.807**	1.077***	–1.715***
	(0.313)	(0.259)	(0.364)	(0.499)
CPI_t	–0.188***	–0.106**	0.138***	–0.253***
	(0.028)	(0.039)	(0.046)	(0.039)
C	13.882***	12.371***	14.506***	12.053***
	(3.165)	(2.193)	(3.543)	(2.597)
R^2	0.995	0.999	0.996	0.999

Note: Model IV, Model V, and Model VI, respectively, display the estimates for the impact of capital stock induced by the OADR, YADR, PG, and WAPOP on Economic Growth. The time-period for the study is 1960-2015.

***, **, * indicates statistical significance at 1 percent, 5 percent, and 10 percent level of significance, respectively.

Finally, we compute the indirect impact of demographic change on economic growth. As explained above, we take a product of the coefficient of the impact of each measure of demographic change indicator (δ_8) on capital stock with the coefficient of the estimated capital stock on economic growth (γ_1). These findings are displayed in column 3 of Table 5. This exercise reveals that the indirect impact of demographic change on GDP growth appears negative in all cases.

Interestingly, in accordance with the direct impact, the magnitude of the impact is highest for OADR while lowest for YADR. These findings suggest that young age dependency is the least harmful demographic change in Pakistan. Although population growth appears favourable for investment, it still has an adverse impact on GDP growth. Notably, the working age population maintains a favourable impact, both direct and indirect, on economic growth. This indicates that the working age population promotes economic growth through both direct and indirect channels.

Table 5

Total Impact of Demographic Change on Economic Growth

Variable	Direct Impact	Indirect Impact	Total Impact
OADR	–0.084	0.178 * (–0.171)	(–0.084) + (–0.030) = –0.114
YADR	–0.002	0.063 * (–0.045)	(–0.002)+ (–0.003) = –0.005
PG	0.017	0.151 * (–0.031)	(0.017) + (–0.004) = –0.013
WAPOP	0.013	0.381 *(0.006)	(0.013) + (0.002) = 0.015

Having dealt with direct and indirect impacts separately, we now compute the total impact of demographic change on economic growth in Pakistan. In doing so, we take the sum of the above two effects i.e. the direct and indirect impact. These estimates are given in column 4 of Table 5. We observe that the total impact of all the indicators of demographic change appear negative. The total negative impact is highest in case of old age dependency, which means that old age dependency is the most threatening demographic change for economic growth. The least harmful demographic change is the young age dependency.

By comparing direct and total impacts of demographic change indicators on economic growth, we may also conclude that the total impact, while considering the channel of capital stock, is different from simple direct impact. For instance, in the case of population growth and OADR, while the overall impact is lower than direct impact, it remains negative. Surprisingly, the overall impact of YADR is slightly higher than simple direct impact. Finally, the impact of working age population remains positive and the size of overall impact is substantially higher than direct impact. These findings provide a cautious conclusion that while discussing the impact of demographic changes on economic growth, it is important to consider the transmission channels through which demographic changes affect economic growth. Hence, simple direct impact may be understated or overstated and may lead to misleading conclusions.

5. CONCLUSIONS AND POLICY IMPLICATIONS

Many studies have established that demographic changes influence the economic performance of a country, particularly its economic growth. Theoretically, the optimistic, pessimistic and neutralist views project positive, negative and no-impact effects of population growth on economic growth respectively. Researchers have also studied implications of changing age structures for economic development, and linked these changing age structures with the transition of fertility and mortality rates and hence to demographic transition. According to these studies, changes in the age composition of a

country's population cause demographic transitions, which ultimately stimulate or impede economic growth.

During the first two stages of demographic transition, birth rates increase while death rates decline slowly. The third stage of demographic transition is specifically important for developing countries because the declining fertility and mortality rates offer an opportunity of demographic dividend in the form of an increasing ratio of working age population. Pakistan, like many other developing countries, is currently experiencing an increase in working age population and has the opportunity to use it to achieve broader development goals.

Demographic dividend affects the economic performance of a country through increased labour supply, higher savings, and investment in human capital, all of which have a positive impact on economic growth. Therefore, economic growth is affected directly and indirectly by demographic changes. Existing empirical literature mainly discusses the direct impact of demographic changes on economic growth but few studies has empirically investigated the indirect effect on it.

This study empirically examines the role of physical capital stock in the relationship between demographic changes and economic growth for Pakistan over the period 1960-2015, an indirect effect of demographic changes. Four indicators of demographic change namely, population growth, old age dependency ratio, working age population ratio and young age dependency ratio are used.

Our empirical analysis is comprised of four steps:

(i) Direct impact of demographic changes on economic growth is estimated,
(ii) Indirect impact computed by estimating the direct impact of each demographic indicator on capital stock, and analysing the impact of demographically induced capital stock on economic growth,
(iii) Computing the indirect impact by multiplying the former and the later coefficients.
(iv) Total impact is computed by summing the direct and the indirect impacts.
(v) The analysis is based on Fully Modified OLS technique.

Results have shown that the direct impact of each indicator of demographic change is different from its indirect effect. Among the focused demographic indicators, young age and old age dependency have an adverse impact on economic growth through the direct and indirect channels both. It is worth noting that old age dependency has a larger direct and indirect effect on economic growth. Interestingly, the direct impact of population growth on economic growth is positive but the indirect impact is negative, implying that population growth reduces physical capital through a decrease in savings. However, the working-age population ratio increases economic growth through both the direct and indirect impacts.

The total impact is higher, compared to direct impact, pointing towards the importance of studying the mediating role of physical capital in determining the impact of demographic changes on economic growth, without which the results may be misleading. The previous works tend to downplay the effect of population growth on economic development, which does not describe the urgency of the situation in Pakistan.

Firstly, the direct impact of old age dependency is more pronounced when compared with other indicators of demographic change. This highlights the insufficiency of publicly provided safety nets for the elderly, putting the burden of their care squarely on the shoulders of the working age population. As a result, we see that the impact of old aged dependency is rather high while the coefficient of working age population ratio is quite small. Further, the time cost of caring for the elderly may render a significant portion of the working age population unable to participate in the labour market, leading to reduced impact on economic growth. This signifies the need for government assistance in the form of pensions and subsidized healthcare provisions. In addition, subsidised at-home care facilities would enable labour force participation, contributing to economic growth.

The comparison of direct and indirect impact of population growth signifies that the direct impact in itself may be misleading, but once assessed through its negative influence on capital stock, the problem becomes more pronounced. This signifies the need to cater for the population explosion and its adverse impact through reducing birth rates. Policies to encourage family planning and birth control should be put in place. Increasing the opportunity cost of bearing children, instituting compulsory universal education, facilitating female labour force participation, penalising negligent parenthood and child marriages are additional methods to discourage large families. Most of these are already part of the current policy framework of the country but our results demonstrate a gross implementation gap.

Finally, Pakistan has the opportunity to capitalise on a bulging working age population that is being squandered for various reasons. Only by allotting due priority to the issue will the government be able to derive the potential benefits from a fortuitous situation. Given the results of the study and the 2017 census, the government should devise effective policies to reduce population growth, which will reduce young age dependency ratios. Moreover, to reap the benefits of the increasing working age population ratio in the form of higher economic growth, more employment opportunities should be created.

Table A-1

Summary of the Literature Review

Authors	Study Objective	Sample/Period	Results
Malmberg (1994)	Analyse the impact of age structures on economic growth and sources of growth	Sweden/ 1950-89	Shifts in age structure explain Swedish economic growth and there exists hump shaped relationship between age groups and savings
Barro (1991)	Analyse the impact of economically active population on income growth	98 countries/ 1960-85	Growth rate of economically active population has positive impact on real GDP per capita growth
ADB (1997)	Analyse the impact of economically active population on income growth	East and South East Asian Countries/ 1965-92	Growth rate of economically active population has positive impact on income growth
Bloom and Williamson (1998)	Study the impact of demographic variables on economic growth through accounting effect and behavioural effect	78 countries/ 1965-90	Growth rates of population and working age population has respective negative and positive impacts on GDP per capita growth. While population under 15 is also having negative impacts on income growth
Bloom et al. (2001)	Study the relationship between the economic growth and the demographic transition by focusing on various regions	Case studies of population change and growth for East Asia, Japan, North America and Western Europe, South-central and Southeast Asia	East Asian miracle can be explained by the demographic transition of East Asian countries
Kelley and Schmidt (2005)	Focuses on population's role in economic growth by developing a model for output per worker growth	1960-95, 86 countries	Declining births and declining deaths have contributed to rise in per capita income growth across the World, specifically, in Asia and Europe.
Prskawetz et al. (2007)	Impact of working age population ratio and youth dependency ratio on growth rate of output per worker	1965-90, 97 countries	Changes in age structures have important effects on economic growth
Lindh and Malmberg (2009)	Relationship between age structures and economic growth in EU15 countries	EU 15 countries, 1950-2004	Variations in the age distribution of the population has significant effect on economic growth and a hump shaped relationship exist between the two variables

Continued—

Table A-1—(*Continued*)

Choudhry and Elhorst (2010)	Analyse the impact of age dependency ratios on per capita income growth	70 countries/1961-2003 and Pakistan	negative impact of old and child age dependency ratios on per capita income growth in cross-country analysis, while, population dynamics explain 25% of changes in per capita GDP growth in Pakistan
Hussain et al. (2009)	Impact of demographic variables on economic growth	Pakistan/1972-2006	infant mortality rate and total fertility rate are having a negative impact on GDP growth
Iqbal et al. (2015)	Relationship between demographic transition and economic growth in the short and long run	Pakistan/1974-2011	positive impact of demographic transition on economic growth in the long-run but negative impact in the short-run
Park and Shin (2011)	relationship between population ageing on savings, capital accumu-lation, labour force participation and total factor productivity	12 Asian economies/1981-2010	Positive relationship between population growth and savings and in future population ageing will have adverse impact on economic performance
Asongu (2011)	Relationship between population growth and investment dynamics	Individual time-series analysis of African countries and for 38 African countries/1977-2007	In the long-run population growth has significant and sizeable effects on different types of investments: it can sometimes decrease or increase foreign, public, private and domestic investments in different countries.
Goyal (2004)	Relationship between population age structure and net outflows from the stock market and stock market returns	US/1926-198	Outflows are positively related with proportion of old age people and changes in proportion of middle age population negatively affect the outflows.
Batini et al. (2006)	Impact of demographic transition over the next 80 years	US, Japan and other industrial and developing countries	In advanced countries, population ageing will reduce per capita income growth while, in developing countries increase in working population can increase per capita income growth. Demographic variables have strong effect on savings, investment and capital flows
Bosworth and Chodorow-Reich (2006)	Relationship between population ageing and savings and investment	85 countries/1960-2005	Significant impact of population ageing on national rates of saving and investment but impact is different for different countries

Table A-2

Estimates of Unit Root Test

Variable	Level	1st Diff	Decision
GDP	–0.700	–6.260	
	(–3.497)	(–3.498)	I(1)
	–1.938	–4.494	
GFCF	(–3.498)	(–3.500)	I(1)
	0.626	–7.526	
LEMP	(–2.921)	(–2.922)	I(1)
	–2.456	–7.736	
TO	(–2.926)	(–2.928)	I(1)
	2.527	–5.309	
FDI	(–2.951)	(–2.945)	I(1)
	–1.125	–6.462	
LRER	(–2.917)	(–2.919)	I(1)
GFCF_OADR	–2.500	–4.158	I(1)
	(–2.945)	(–2.935)	
GFCF_PG	–2.524	–4.521	I(1)
	(–2.935)	(–2.935)	
GFCF_YADR	–2.103	–3.983	I(1)
	(–2.935)	(–2.935)	
IR	–2.547	–7.218	I(1)
	(–2.916)	(–2.917)	
LCPI	0.069	–3.348	I(1)
	(–2.919)	(–2.919)	
GEGDP	–1.989	7.118	I(1)
	(–2.916)	(–2.917)	
POPG	–1.595	–1.697	I(1)
	(–2.919)	(–1.948)	
OADR	–2.188	–3.781	I(1)
	(–3.498)	(–3.500)	
YADR	–0.555	–2.391	I(1)
	(–1.947)	(–1.948)	
WAPOP	–2.279	–2.941	I(1)
	(–2.924)	(–2.925)	
DC	–2.541	–6.098	I(1)
	(–3.508)	(–3.499)	

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Intergenerational Mobility in Educational Attainments

MALIK MUHAMMAD and MUHAMMAD JAMIL

This paper investigates intergenerational educational mobility, a non-monetary measure of socioeconomic status in Pakistan. Data from the Pakistan Social and Living Standards Measurements (PSLM-2012-13) are used for empirical analysis. Contingency tables and multinomial logit model are utilised. Results indicate strong evidence of intergenerational linkages in educational attainments between fathers and their sons. Although findings reveal some degree of upward mobility, opportunities are not equal for all. Chances for attainment of higher education for sons of fathers with education up to the secondary level only, are not as prevalent as for sons of highly educated fathers. Further, urban areas show higher mobility as compared to rural areas. Results also reveal that the affluent are more likely to attain higher levels of education than the financially disadvantaged. In addition, sons of affluent families in rural areas are less likely to attain higher levels of education compared to the sons of the affluent in urban areas. Our findings also support evidence in favour of the child quality-quantity trade-off as shown by negative impacts of family size on attainment of higher levels of education.

JEL Classification: C24, J24, L86, O43, O47
Keywords: Inequality of Opportunity, Education, Intergenerational Mobility

1. INTRODUCTION

Intergenerational mobility in socioeconomic status is the link between the socioeconomic status of parents and their children as adults. If this link is strong, there will be more persistence in society. On the other hand, a society is termed more mobile if the link between the socioeconomic status of parents and their children is weak. Due to various forms of discrimination, some specific social classes are excluded from the capability formation process and income earning opportunities. As a result, both current and future generations of these classes experience backwardness, deprivation, and increase in inequality and poverty.

The poor are excluded from wider participation in income generating activities because of their relatively weak financial position, while exclusion from capability formation opportunities due to low income also renders them poorly endowed in terms of human capital. This reduces the income of their next generation and thus the same status persists across generations. In less mobile societies, human skills and talents are more

Malik Muhammad <malikmuhammad@iiu.edu.pk> is Assistant Professor, IIIE, International Islamic University Islamabad. Muhammad Jamil <mjamil@qau.edu.pk> is Assistant Professor, School of Economics, Quaid-i-Azam University, Islamabad.

likely to be wasted, and talented members from poor families are likely to remain underdeveloped. Further, lack of equal opportunity may affect the motivation and efforts of individuals reducing the overall efficiency and growth potential of an economy.

Higher intergenerational mobility ensures placement of individuals in a society according to their competence rather than social origin. It increases the optimal utilisation of talented individuals, and enhances productivity and economic growth. Earnings, occupation, and education measure the socioeconomic status of an individual. Economists widely use income as a proxy for socioeconomic status.

Starting from contributions by Becker and Tomes (1979, 1986), and Loury (1981), economists have increasingly paid attention to the issue of inequality in income among families over generations and attempted to estimate intergenerational income mobility, producing diverse results over time and across regions. We find that income suffers from a number of problems. It is influenced by time and cycles. It is also affected by individual and aggregated temporary shocks. Moreover, income significantly varies over a life cycle. Patterns of income observed in a life cycle also vary from generation to generation. Therefore, it becomes quite difficult to find a link between incomes of parents and their children to evaluate the strength of intergenerational mobility on socioeconomic status.

However, education is less likely to be exposed to measurement errors, and unlikely to bias estimation by life cycle bias, as most individuals complete their education by their early or mid-twenties. The level of education reveals information about the life of an individual. Higher levels of education are associated with higher earnings, better health, longer lifespan and other economic outcomes (Solon et al. 1994; Blanden, 2009; Black & Devereux, 2011). Education increases the probability of upward occupational and income mobility. It produces mobility aspirations, socialises an individual for better work role and position. Therefore, it is a reasonable proxy to measure the overall socioeconomic status of individuals. Mobility of education, therefore, would mean mobility in overall socioeconomic status.

There is ample research on intergenerational mobility at the international level but Pakistan lacks similar in-depth study in this area. Social exclusion, income inequality, poverty, and low economic growth are quite prevalent in Pakistan. So far, researchers have focused on a particular "outcome" variable (e.g. earning, consumption, expenditure, or wealth) and determined how inequality in this variable has changed over time. However, in the context of Pakistan, no researcher has focused comprehensively on intergenerational mobility, addressing the extent to which the outcomes for the present generation influences the previous generations' characteristics.

In this paper, we try to fill the void in existing literature by exploring not only the level of educational attainment in Pakistan but also the degree of educational mobility. We also extend our analysis to urban and rural areas separately. We utilise the most comprehensive and representative data of Pakistan Social and Living Standards Measurements (PSLM-2012-13) which covers almost all the districts.

2. SIGNIFICANCE AND OBJECTIVES OF THE STUDY

Enhancing economic growth, and reducing inequality and poverty, are the main concerns of policy-makers throughout the world, as well as in Pakistan. Pakistan's growth rate remained below other countries in the region. It also has a lower per capita

income, high multidimensional poverty, and a low quality of human capital.[1] The average years of schooling are 4.7 years only, ranking Pakistan 150th in the world. Inequality in education is 44.4 percent, much higher than the global average of 26.8 percent. Pakistan spends 2.5 percent of GDP[2] on education, which makes it amongst the lowest in the world, ranking 147th out of 188 countries.

Most researchers and policy-makers focus at the macro dimensions of these indicators. For example, what are the determinants of economic growth and inequality? Which factors are most and least important? There seems to be little research available regarding inequality in opportunity via educational mobility in Pakistan. There is an increasing role of human capital in economic growth, which in turn affects fertility and mortality (Meltzer, 1992). Decisions about fertility and education depend on constraints faced by parents, as well as their preferences. This provides a strong basis for the role of family in the transmission of human capital in theories of intergenerational mobility.

In this study, our focus is on intergenerational mobility in educational attainments with reference to Pakistan. Due to the nature of available data, our analysis is limited to co-resident father-son only. Most females leave the parents' home after marriage so limited observations are available, especially for those over 25 years of age. Moreover, the number of educated females, especially those obtaining higher education, is very low. Of co-resident mothers, 83.36 percent never attended school. For these reasons, our analysis is limited to intergenerational mobility in educational attainments of co-resident father-son data only. Specific objectives of the study are:

- To examine structure of educational attainments in both fathers and sons generations.
- To investigate intergenerational mobility at the secondary and higher levels of education.
- To examine the differences in intergenerational mobility in education across urban and rural areas.

3. LITERATURE REVIEW

Intergenerational mobility is one of the most studied topics in social sciences. The first study dates back to Galton (1886), a biologist, who regressed heights of children on the heights of their parents. Leading economists started to evaluate income mobility in the latter half of the 20th century. Pioneering studies can be attributed to Soltow (1965), and Wolff and Slijpe (1973) for Scandinavia, and Sewell and Hauser (1975) for US. However, economists developed an interest in this topic after Becker and Tomes (1979, 1986) formally developed a model of the transmission of education, earnings, assets and consumptions from parents to children. Much research is available on the positive relationship between the level of education of parents and their children.

Mare (1980) shows that the impact of parental education and income declines as the child progresses to higher education. Lillard and Wallis (1994) found that educational effects moved along gender lines in Malaysia where a mother's education had a strong effect on her daughter's education, and a father's education had a relatively higher impact

[1] Ranked as 147th out of 188 countries with HDI value of 0.538 (UNDP-2015).
[2] This figure is for year 2014.

on his son's educational level. However, in general, for educational attainments of children, a father's education is more important as compared to their mother's. Burns (2001) shows that a child with a poorly educated mother and a highly educated father has the same schooling outcomes as having two well-educated parents.

Spielaure (2004) observes higher mobility at higher levels of education for Australia, which varies across regions and gender. Hertz et al. (2007) observe significant regional differences in educational mobility in a sample of 42 countries with Latin America being the lowest and the Nordic countries the highest. In Switzerland, Bauer and Riphahn (2009) show a positive impact of early enrolment on educational mobility, which, according to authors, is because once children are in school, inequalities in family background have a lesser impact on their education.

Van Doorn et al. (2011) found that industrialisation, female participation in the job market, and increase in educational expenditure positively influences intergenerational educational mobility. In China, apart from parental education, Labar (2011) finds a significantly positive affect of income, and being located in an urban area, on education of a child. Parental characteristics increase in importance at a higher level of education.

In India, Azam and Bhatt (2015) find upward mobility in educational attainments and show that mobility has a strong association with the per capita spending on education at the state level. Moreover, Assad and Saleh (2016) show a significant impact of public school supply on intergenerational mobility in education in Jordan. The study also finds that daughters are more mobile compared to sons, especially in the current cohorts. Nguyen and Getinet (2003) show that in the U.S. an increase in the number of children in a family dilutes the resources of parents and thus reduces educational mobility.

Researchers studying this topic for Pakistan include Havinga et al. (1986), Cheema and Naseer (2013), and Javed and Irfan (2014). Havinga et al. (1986), in a sample from 10 major industrialised cities, finds that 31 percent of the sons have a higher income than their fathers, with 60 percent of the sons owning more wealth than their fathers did. For rural Sargodha, Cheema and Naseer (2013) show an increase in intergenerational mobility in education as grandfather-father pairs show more rigidity than father-son pairs. Their results also indicate that mobility in non-propertied groups is less than in propertied groups, and is much higher among *zamindar*(landlords) than in *artisan* and *historically depressed quoms* (sects).

Using data from the Pakistan Panel Household Survey (2010), Javed and Irfan (2014) show a strong persistence in educational attainments. Particularly, this persistence is higher in older cohorts as compared to younger cohorts. They also find more persistence in low status occupations and downward mobility in high status occupations. Further, a higher persistence at the lowest income quintile is evident. Regression results of their study suggest that income mobility in urban areas is higher than in rural areas, with older cohorts being more mobile than younger cohorts are.

4. THEORETICAL FRAMEWORK

We utilise models developed by Becker and Tomes (1979), and Becker et al. (2015), in which parents are assumed to be altruistic. They not only care about their own utility, but also care about the "quality" and "economic success" of their children in the form of income as given by the following utility function:

$$V(Y^P) = u(c) + \alpha Ev(Y^{ch}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where Y^P and $V(Y^P)$ are income and total utility of parents respectively, $u(c)$ is the utility that parent derive from consumption (c), α is the degree of altruism which ranges from 0 to 1. $Ev(Y^{ch})$ is the expected utility a child derives from income (Y^{ch}) in future. Let Y_H is the amount invested in the human capital formation (education) of a child by parent and τ is the cost of consumption forgone against each unit of Y_H, then budget constraint of parents can be written as

$$C + \tau Y_H = Y^P \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

By assuming that value of each unit of human capital accumulated in children is equal to w_1, the present value of this investment can be expressed as:

$$\tau Y_H = \frac{w_1 Y_H}{1+r} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

Total income of a child is equal to the sum of income earned from "human capital (Y_H)", "endowed capital (K)" and "labour market luck (g)" (Becker and Tomes, 1979) and can be expressed by the following equation:

$$Y^{ch} = w_1 Y_H + w_2 K + w_3 g \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Putting Equations (4) and (3) into Equation (2), we get the budget constraint

$$C + \frac{Y^{ch}}{1+r} = Y^P + \frac{w_2 K}{1+r} + \frac{w_3 g}{1+r} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Parents maximise utility (1) subject to budget constraint (5). This provides the basis for intergenerational linkages between parental characteristics and the human capital of children.

Parental education influences the level of education of their children through different mechanisms:

(1) Highly educated parents generally have higher incomes, which relaxes their budget constraints and may positively affect educational attainment of their children.
(2) Educated parents may be more efficient in child rearing activities, which results in higher educational attainment by the child.
(3) Parents that are more educated may be more successful in directing expenditures towards child-friendly activities and investments.
(4) Educated parents may have a greater concern for the education of their children as compared to uneducated parents[3] and are more likely to help children with homework, being able to guide them better with their schooling.

With this background, our general model is

$$ED_{ij}^{ch} = f(ED_{ij}^{P}, Y_i^P, \mathrm{X}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

where ED_{ij}^{ch} is the j^{th} level of education of an i^{th} child, ED_{ij}^{P} is the j^{th} level of education of parent of an i^{th} child , Y_i^P is income of the parent of an i^{th} child and X is the vector of other control variables.

[3]Guryan et al. (2008) in their American Time Survey show that average time spent with children by educated parents is larger than with uneducated parents.

Along with education and income of parents, some additional factors to consider:

- ***Wealth*** influences education attainment of a son. More wealth in the form of durables means that the family has already met its needs and more income is available for the children's education. Moreover, wealth, especially land, is available as collateral for a loan to finance education in case parents are facing financial constraints.
- ***Additional children*** the amount of time, money, and patience that each child receives from parents are diluted and may strain the parents' finite resources. Therefore, the chance for a child to achieve higher social status, for example, through higher level of education is reduced (Downey, 1995; Maralani, 2008).
- ***Age of a child*** is another factor that is a control variable. As the age of a child increases, we expect an increase in his/her level of education.
- ***Geographic location*** may be capturing, for example, availability and quality of schools across different provinces, and across urban-rural areas. It captures peer effects as well as the environmental effects.

With these parameters we can write Equation (6) as:

$$ED_{ij}^{ch} = f(ED_{ij}^{P}, Y_i^P, W_i^P, HS_i, A_i^{ch}, R_R, P_p, P_S, P_B) \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Where W_i^P is the wealth of parent of i^{th} child, HS_i is the household size where i^{th} child lives, A_i^{ch} is the age of i^{th} child, R_R equal to "1" if a child belongs to rural region and equal to "0" otherwise. P_p, P_S and P_B are dummies for provinces Punjab, Sindh and Balochistan respectively. Province Khyber Pakhtunkhwa (KPK) is used as reference province. In stochastic form, Equation (7) can be written as:

$$ED_{ij}^{ch} = \beta_0 + \beta_1 ED_{ij}^{P} + \beta_2 Y_i^P + \beta_3 W_i^P + \beta_4 HS_i + \beta_5 A_i^{ch} + \beta_6 (A_i^{ch})^2 + \beta_7 R_R + \beta_8 P_p + \beta_9 P_S + \beta_{10} P_B + e_i \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

$(A_i^{ch})^2$ is the square of age of *i*th child. Error term "e_i" captures the effects of all other omitted variables.

5. DATA

We utilise PSLM (2012-13) survey data, which covers urban and rural areas of all districts of the four provinces of Pakistan. However, there are some issues and limitations of the PSLM survey data:

(1) PSLM survey focuses on co-resident children-parents pairs only and misses information regarding younger generations who are living out of the parents' residence.
(2) Survey does not report information regarding the fathers of married women, who constitute the majority of women.
(3) In our co-resident data, 84.36 percent of the mothers have never attended schools and their frequency in the "postgraduate" category is zero. For this reason, our analysis is restricted to co-resident father-son pairs only. We extracted information on 39989 co-resident father-son pairs, with sons of age 16 years and above, who have completed their education and are not currently enrolled in any

educational institution. Once we identified father-son pairs then data on relevant variables were obtained. These variables are discussed below.

Originally, 21 categories of *Levels of Education* are framed, including "no education" in the PSLM data. We drop category "other" which consists of mixed levels of education such as short diploma, short certificate, religious education etc. The remaining 20 categories are re-coded into 7 categories: (1) Never attended school (2) Up to Primary (3) Up to Middle (4) Matriculation (5) Intermediate (6) Graduate (7) Post-Graduate.

Income of father is the sum of all types of income he receives from various sources. This includes salary, wages, pension, remittances, and rent from property. We construct a wealth index for variable ***wealth*****,** which includes twenty durables,[4] access to two public utilities,[5] four housing characteristics,[6] source of cooking fuel, type of phone used for communication (land line, mobile or both), personal agricultural land, poultry, livestock, non-agriculture land, and residential / commercial property. This set of assets is selected due to their availability in PSLM survey. We use Principal Component Analysis (PCA) for the construction of wealth index**.**

Household size means the number of individuals living in a household. Information on household size is taken from the roster of PSLM. *Age of a son* is reported in years. *Region effects* are captured through dummy variables. For rural-urban areas, we introduce a dummy variable which takes value "1" if rural and "0" otherwise. For provinces, we introduce three dummy variables for Punjab, Sindh and Balochistan. KPK is taken as reference province.

6. RESULTS AND DISCUSSION

To understand the structure of educational attainments we compute percentage distribution of sons and fathers falling in different levels of education. This is useful for further analysis of educational mobility. Table 1 summarises the results.

Table 1

Percentage Distribution of Different Levels Education

	Father			Son		
Level of Education	Pakistan	Urban	Rural	Pakistan	Urban	Rural
Never Attend School	58.4	39.9	67.0	27.6	15.2	33.3
Primary	17.5	19.7	16.5	22.6	17.9	24.7
Middle	9.4	13.5	7.4	20.7	23.7	19.3
Matric	9.0	15.6	6.0	16.6	21.1	14.7
Intermediate	2.8	5.3	1.6	6.8	10.7	5.1
Graduate	1.4	2.7	0.8	3.2	6.0	1.8
Post Graduate	1.5	3.3	0.7	2.5	5.5	1.1
Average Years of Education	3.5	5.3	2.5	6.2	7.9	5.3

Source: Author's own calculations based on PSLM (2012-13).

[4] Possession of iron, fan, sewing machine, chair/table, radio or cassette player, watch, TV, VCR/ VCP/VCD, refrigerator/freezer, air cooler, air conditioner, computer/ laptop, phone or mobile, bicycle, motor cycle, car, tractor/ truck, cooking range, stove and washing machine.

[5] Water and electricity.

[6] Number of sleeping rooms, quality of floor material, quality of wall material and toilet facility.

Percentages in the lower levels of education are higher for both fathers and sons. For example, in Pakistan overall, 85.3 percent of fathers fall below matric and only 14.7 percent fall in the matric and higher levels of education. The same figures for sons are 70.9 percent below matric, and 29.1 percent in matric and higher levels of education.

Results also reveal that the rural population is skewed towards low levels of education as compared to the urban population.[7] However, the percentages of sons in matric and higher levels of education (43.3 percent in urban areas and 22.7 percent in rural areas) are greater than the percentages of fathers (26.9 percent in urban areas and 9.1 percent in rural areas) in the same levels of education. Finally, the average years of schooling in the sons' generation is higher than the average years of schooling in the fathers' generation in Pakistan overall (6.2 vs. 3.5), in urban (7.9 vs. 5.3) and rural (5.3 vs. 2.5) areas. The average years of schooling in urban areas are higher than the average years of schooling in rural areas, for both generations, indicating that the urban population is more educated than the rural population.

These results indicate that most of the population in Pakistan, rural and urban, either never attends school, or falls in the lower levels of education. In addition, the percentage of sons in higher educational levels is greater than fathers'. Conversely, the percentage of sons in lower educational levels is less than the fathers'. This gives some insights into upward mobility in educational attainments of the sons' generation.

When we talk about educational mobility, we first determine whether a son falls in the educational category of his father or otherwise. If he does then the educational status of a son depicts persistence or immobility. However, if he does not, then there is educational mobility either upwards or downwards. For this purpose we compute contingency tables—Table 2.

Values of Pearson Chi square in all three cases indicate the existence of significance correlation between levels of education for fathers' and sons'. Results of the data for Pakistan show that (a) frequencies of sons in the levels of education where fathers fall are highest, or , (b) highest in the higher levels of educations than the fathers' levels of education and, (c) lower for intermediate where the majority of sons fall in matric. A similar pattern can be observed in the data for urban areas. However, in the data for rural areas, we can observe that frequencies of sons whose fathers fall in the intermediate and graduate levels of education are highest in matric. These results indicate persistence in the level of education, with upward mobility at low levels, and downward mobility at college and university levels. From the above contingency table, we compute conditional probabilities of sons in Table 3 below. Each row of the table shows the chances of sons to attain different levels of education given the level of education of their fathers.

[7]90.9 percent of the fathers and 77.3 percent of the sons fall in below matric level of education in rural region as compared to 73.1 percent of the fathers and 56.8 percent of the sons in the same categories in urban region.

Table 2

Contingency Table

	Educational Levels of Sons							
	Overall Pakistan							
Educational Levels of Fathers	Never attend School	Primary	Middle	Matric	Inter-mediate	Graduate	Post Graduate	Total
Never Attend School	8679	5334	4042	2868	889	293	199	22304
Primary	1031	1635	1665	1352	542	206	126	6557
Middle	371	636	1231	1034	432	180	133	4017
Matric	230	406	896	1284	604	395	314	4129
Intermediate	50	81	187	351	271	192	159	1291
Graduate	28	34	66	173	149	188	221	859
Post Graduate	18	17	42	97	162	170	326	832
Total	10407	8143	8129	7159	3049	1624	1478	39989
Pearson		chi2(36) = 14000				Probability = 0.00		
		Urban				Total		
Never Attend School	1560	1209	1290	922	343	120	83	5527
Primary	265	521	672	565	255	128	60	2466
Middle	155	271	576	517	227	105	88	1939
Matric	112	206	445	718	364	269	222	2336
Intermediate	25	31	110	198	181	143	110	798
Graduate	13	13	26	101	93	143	182	571
Post Graduate	8	5	21	55	103	132	262	586
Total	2138	2256	3140	3076	1566	1040	1007	14223
Pearson		chi2(36) = 5300				Probability = 0.00		
		Rural				Total		
Never Attend School	7119	4125	2752	1946	546	173	116	16777
Primary	766	1114	993	787	287	78	66	4091
Middle	216	365	655	517	205	75	45	2078
Matric	118	200	451	566	240	126	92	1793
Intermediate	25	50	77	153	90	49	49	493
Graduate	15	21	40	72	56	45	39	288
Post Graduate	10	12	21	42	59	38	64	246
Total	8269	5887	4989	4083	1483	584	471	25766
Pearson		chi2(36) = 6100				Probability = 0.00		

Table 3

Conditional Probabilities

	Overall Pakistan						
Educational	Educational Attainments of Sons						
Attainments of Fathers	Never attend School	Primary	Middle	Matric	Intermediate	Graduate	Post Graduate
Never Attend School	38.91*	23.91*	18.12*	12.86*	3.99*	1.31*	0.89*
Primary	15.72*	24.94*	25.39*	20.62*	8.27*	3.14*	1.92*
Middle	9.24*	15.83*	30.64*	25.74*	10.75*	4.48*	3.31*
Matric	5.57*	9.83*	21.7*	31.1*	14.63*	9.57*	7.6*
Intermediate	3.87*	6.27*	14.48*	27.19*	20.99*	14.87*	12.32*
Graduate	3.26*	3.96*	7.68*	20.14*	17.35*	21.89*	25.73*
Post Graduate	2.16*	2.04*	5.05*	11.66*	19.47*	20.43*	39.18*
			Urban				
Never Attend School	28.23*	21.87*	23.34*	16.68*	6.21*	2.17*	1.5*
Primary	10.75*	21.13*	27.25*	22.91*	10.34*	5.19*	2.43*
Middle	7.99*	13.98*	29.71*	26.66*	11.71*	5.42*	4.54*
Matric	4.79*	8.82*	19.05*	30.74*	15.58*	11.52*	9.5*
Intermediate	3.13*	3.88*	13.78*	24.81*	22.68*	17.92*	13.78*
Graduate	2.28*	2.28*	4.55*	17.69*	16.29*	25.04*	31.87*
Post Graduate	1.37*	0.85**	3.58*	9.39*	17.58*	22.53*	44.71*
			Rural				
Never Attend School	42.43*	24.59*	16.4*	11.6*	3.25*	1.03*	0.69*
Primary	18.72*	27.23*	24.27*	19.24*	7.02*	1.91*	1.61*
Middle	10.39*	17.56*	31.52*	24.88*	9.87*	3.61*	2.17*
Matric	6.58*	11.15*	25.15*	31.57*	13.39*	7.03*	5.13*
Intermediate	5.07*	10.14*	15.62*	31.03*	18.26*	9.94*	9.94*
Graduate	5.21*	7.29*	13.89*	25.00*	19.44*	15.63*	13.54*
Post Graduate	4.07*	4.88*	8.54*	17.07*	23.98*	15.45*	26.02*

Note: * P < 0.01, ** P < 0.05, *** P < 0.1.

High persistence can be observed in educational attainment, as values in the principal diagonal are higher than the values of off diagonal in most cases. This persistence is highest for the extreme categories. A son of a father who is in "never attend school" has a 38.91 percent chance of falling in the same "never attend school" category. His chance to move to the highest level of education (postgraduate) is only 0.89 percent. Similarly, high rigidity can be observed in the "postgraduate" level where the probability of a son to attain "postgraduate" level of education is 39.81 percent given that his father has also attained "postgraduate" level of education, and his probability to fall in "never attend school" is only 2.16 percent.

A panoramic view of the results suggests that although there is persistence in educational attainment, on average the chances of a son to achieve the same level of education as his father did, or more, are higher than his chances to lag behind his father's educational level.[8] Similarly, from the figures in the columns we can observe that when a father is switching to higher levels of education, the probability of the son to remain in lower levels of education decreases while his probability to attain high levels of education increases. Our findings comply with the earlier findings by Javed and Irfan (2014). Results of Labour (2011) for China also depict a similar pattern, but relatively more mobility is observed for the lowest category (primary level of education), in this study.

Rural and urban area data present a slightly different pattern. While rigidity is greater at a higher level of education in urban areas, a higher persistence can be observed in the lower levels of education in rural areas.[9] Urban data reflect an upward mobility in the "Graduate" category, while rural data exhibit downward mobility for the same level of education. Here, our results contradict Javed and Irfan (2014) who find a larger persistence in rural areas, and more downward mobility in urban areas at the "Graduate" level.

Quartile distributions of sons' education over fathers' education are presented in Figure 1 and Figure 2 (Appendix-A) for overall data, and for urban-rural areas respectively. Figures reflect persistence in education as levels of education of sons increase, with the increase in levels of education of their fathers. Figure 1 also reflects upward mobility at low levels and downward mobility at high levels of education in the overall data for Pakistan. However, a comparison of the urban and rural population exhibits more downward mobility at college and university levels of education (Figure 2).

We conclude from the above results that chances of a son attaining high (low) level of education increase when the father also has a high (low) level of education. This shows a sort of persistence in educational attainments; sons imitate fathers. Results also reveal that on average, sons get a higher level of education as compared to their fathers and thus on average the status of sons increases in terms of educational attainment as compared to their fathers.

[8] We have also computed overall downward mobility, immobility and upward mobility for overall Pakistan as well as for urban and rural regions given in Table-A1 in Appendix-A

[9] In urban region, the probability of a son to remain in "never attend school" category is 28.23 percent if his father is also in "never attend school" while the same probability is 42.43 percent in rural regions. On the other hand, probabilities of sons to attain the "post graduate" level of education given that father also attains "post graduate" are 44.71 percent and 26.02 percent in urban and rural regions, respectively.

Therefore, we have related the educational level of a son to the educational level of his father to find mobility without bringing the role of other variables into the picture. To find the impact of other variables with the educational level of a father[10] we estimate Equation (8) using multinomial logit model (MNLM). Results are in Table 4 below.

Table 4

Marginal Effects (overall Pakistan)

	NAS_S	PMY_S	MDL_S	MTC_S	INT_S	GRD_S	PGR_S
PMY_F	**-0.1619***	**0.025***	**0.042***	**0.0523***	**0.0264***	**0.0113***	**0.0048***
	(0.0054)	(0.006)	(0.006)	(0.0056)	(0.0037)	(0.0025)	(0.0022)
MDL_F	**-0.1767***	**-0.033***	**0.065***	**0.0779***	**0.0401***	**0.0160***	**0.0104***
	(0.0072)	(0.0074)	(0.0075)	(0.0071)	(0.0047)	(0.0030)	(0.0026)
MTC_F	**-0.2061***	**-0.072***	**0.0143****	**0.1296***	**0.0644***	**0.0432***	**0.0268***
	(0.0074)	(0.0074)	(0.0075)	(0.0078)	(0.0052)	(0.0036)	(0.0028)
INT_F	**-0.2241***	**-0.1012***	**-0.0183**	**0.1163***	**0.1186***	**0.0683***	**0.0404***
	(0.0127)	(0.0125)	(0.0126)	(0.0134	(0.0103)	(0.0067)	(0.0048)
GRD_F	**-0.1873***	**-0.109***	**-0.0701***	**0.0845***	**0.0948***	**0.1024***	**0.0851***
	(0.0208)	(0.0178)	(0.0155)	(0.0172)	(0.0123)	(0.0096)	(0.0075)
PGR_F	**-0.1902***	**-0.139***	**-0.0843***	**0.0200**	**0.1410***	**0.1047***	**0.1475***
	(0.0248)	(0.0191)	(0.0173)	(0.0173)	(0.0158)	(0.0106)	(0.0103)
Income	**-0.0042***	**-0.002**	**0.0022***	**0.0025***	**0.0009***	**0.0002*****	**0.0002***
	(0.0012)	(0.0011)	(0.0008)	(0.0006)	(0.0003)	(0.0001)	(0.0001)
Wealth	**-0.010***	**-0.0027***	**0.0023***	**0.0043***	**0.0022***	**0.0016***	**0.0022***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
H. Size	**0.0026***	**0.0032***	**0.00005*****	**-0.0030***	**-0.0012***	**-0.0006****	**-0.0011***
	(0.0006)	(0.0006)	(0.0006)	(0.0005)	(0.0004)	(0.0003)	(0.0002)
Age	**-0.0193***	**-0.0172***	**-0.0065***	**0.0102***	**0.0088***	**0.0113***	**0.0128***
	(0.0016)	(0.0017)	(0.0018)	(0.0017)	(0.0012)	(0.0010)	(0.0010)
Age Sq.	**0.0003***	**0.0002***	**0.0001*****	**-0.0001***	**-0.0001***	**-0.0002***	**-0.0002***
	(0.00003)	(0.00003)	(0.00003)	(0.00003)	(0.00002)	(0.00002)	(0.00002)
Rural	**-0.0369***	**-0.0019**	**0.0044**	**0.0202***	**0.0087***	**0.0001**	**0.0054***
	(0.0053)	(0.0051)	(0.0046)	(0.0043)	(0.0030)	(0.0022)	(0.0021)
Punjab	**0.0276***	**0.0664***	**0.0405***	**-0.0574***	**-0.0328***	**-0.0134***	**-0.0308***
	(0.0058)	(0.0057)	(0.0061)	(0.0056)	(0.0038)	(0.0027)	(0.0028)
Sindh	**0.0609***	**0.0287***	**-0.0805***	**-0.0336***	**0.0280***	**0.0133***	**-0.0168***
	(0.0063)	(0.0060)	(0.0062)	(0.0064)	(0.0048)	(0.0034)	(0.0033)
Baloch	**0.0190***	**0.0548***	**-0.0652***	**0.0135*****	**-0.0113****	**0.0083****	**-0.0191***
	(0.0063)	(0.0064)	(0.0066)	(0.0072)	(0.0050)	(0.0042)	(0.0040)
Constant	**0.2602***	**0.2036***	**0.2033***	**0.1790***	**0.0762***	**0.0406***	**0.0370***
	(0.0019)	(0.0020)	(0.0019)	(0.0019)	(0.0013)	(0.0009)	(0.0008)

Note: * P < 0.01, ** P < 0.05, *** P < 0.1. Standard errors are in parentheses. NAS=never attend school**,** PMY = Primary school, MDL=Midlle, MTC = Matric, INT = Intermediate, GRD = Graduate, PGR= Post Graduate, _F= father, _S= son.

Marginal effects, calculated from multinomial logit estimates, show that the probability of a son to remain in low levels of education decreases, and his probability to attain high levels of education increases, when his father switches from lower to higher

[10]Model was estimated first by ordered logit method but assumption of parallel regression required for ordered logit was rejected by Brant test. Further, results of Hausman test given in Table-A2 of Appendix-A, support the assumption of "Independence of Irrelevant Alternatives" (IIA), which is required for the validity of MNLM. Likelihood Ratio (LR) test given at the lower panel of the Table-A2, shows that overall model fits significantly better than a model with no explanatory variable.

levels of education. [11] Overall results exhibit elements of persistence (immobility) as well as mobility in educational levels. On average, when a father moves to a higher level of education, the increase in the probability of a son in the levels of education where both fathers and sons fall are higher, showing immobility or persistence. We also observe an increase in probabilties of sons to attain higher levels of education than their fathers indicating upward mobility.

Our results are consistent with the findings of Azam and Bhatt (2015) for India. However, they use education as a continuous variable in their analysis. Our results contradict the findings of Girdwood and Leibbrandt (2009) for South Africa. They find relatively more mobility except at the highest level of education. We find more persistence at the highest level of education while Girdwood and Leibbrandt (2009) results show downward mobility at that highest level of education.

Results also reveal that children of affluent families have a greater chance to move to higher levels of education as indicated by the positive signs of the income and wealth variable with the middle to high level of education. Their chances to remain in the *never attend school* catergory or in the *primary school* category decrease with an increase in income and wealth of the family.

Household size confirms the resource dilution hypothesis. The negative sign for middle and higher level education shows that the probability of getting higher level education decreases with an increase in household size. Since money does not affect the primary and middle level of education as much, with the increase in the number of children, the probability of a son to attain primary and middle level of education increases, as is evident from the positive sign of the marginal effect with the variable of household size against the primary and middle levels of a son's education. Similarly, the probability of *never attend school* also increases with the increase in family size. Similar results are found by Nguyen and Getinet (2003) for the U.S.

The positive signs of marginal effects of age at matric and higher, and negative sign for below matric levels of education, show that increase in age of a son increases his probability to move to higher levels of education, reducing the chances to stay in the lower levels.

Regional variables: rural and urban areas, and provinces, are used to control for regional hetrogeniety as educational facilities, policies and priorities vary from province to province. Results also confirm that changes in probabilities vary considerably across the regions. For the sake of comparison of educational mobility in urban and rural areas, we estimate separate regressions for both areas and present the results in Table-A3 and Table-A4 of Appendix-A. Results show the following differences between urban and rural areas:

(1) Increase in probability of levels of education where both son and father fall, is higher in rural areas relative to urban areas up to the intermediate level. The

[11]for example if father switches from"never attend school" to "primary school", the probability of a son to remain in "never attend school" decreases by 16.19 percentage points and probabilities to attain primary, middle, matric, intermediate, graduate and post graduate levels increase by 2.51, 4.2, 5.23, 2.63, 1.13 and 0.48 pecentage points, respectively. Similaly, when father moves to Post Graduate the probability of a son to achieve Post Graduate level of education increases by 14.75 percentage points while his probability to remain in lowest category of education decreases by 19.02 percentage points.

same probability is higher in urban areas relative to rural areas for graduate and postgraduate levels of education.

(2) In urban areas, when a father is moving from "never attend school" to any higher level of education, the increase in probability for his son is either the maximum in levels of education where both son and father fall, or an increase in the probability that the son will fall in the higher level of education category than his father. In rural areas, the probability is at maximum that the son will fall in lower levels of education than the father will, when the father is moving from "never attend school" to intermediate, graduate or postgraduate levels of education.

(3) When the father is advancing from "never attend school" to college or university levels of education, the increase in probability that the son will also attain college or higher levels of education is higher in urban than in rural areas. These results indicate that although there is strong persistence in educational level, upward mobility is also observed. This mobility is stronger in urban areas as compared to rural areas. In rural areas, downward mobility can be observed at college and university levels of education.

Affluent families in urban areas are more likely to get a higher level of education as compared to the families in rural areas, as indicated by the larger increases in probabilities of college and university education, due to an increase in income and wealth in urban areas. In both urban and rural areas, the chance of a son going forward to higher education decreases with an increase in family size. Magnitudes of the marginal effects of age variables indicate that sons in urban areas are more likely to complete various levels of education earlier than sons in rural areas. Finally, province dummies show significant differences in educational mobility across the provinces.

7. CONCLUSION AND POLICY IMPLICATIONS

Intergenerational mobility in socioeconomic status represents the equality of opportunities available to individuals in a country. It affects productivity of individuals and thereby overall inequality and economic growth of a country. As the level of education determines the income and other socioeconomic outcomes, we used it as a proxy to calculate the overall socioeconomic status of an individual. We examined intergenerational educational mobility in Pakistan, comparing the differences in urban and rural areas as well.

We used data of PSLM survey of 2012-13. Our results reveal that percentages of both father and son generations are high in primary education in Pakistan overall, as well as in urban and rural data. However, percentages of sons having higher education are higher than the percentages of fathers. Further, results of contingency tables and MNLM revealed strong rigidity. Fathers are more likely to transmit the same level of education to their sons. Sons of less educated fathers are more likely to remain less educated and the sons of highly educated fathers are more likely to get higher levels of education. While persistence in education is strong at the lower levels in urban areas, there is more persistence at higher education levels in urban areas.

Our research showed upward mobility due to educational attainment, with urban areas showing higher upward mobility than rural areas. We also found that higher education positively affected increase in income and wealth of households. However, a

larger family was found to hinder mobility. Further, the chance to get college and university education was higher for sons in urban areas, with them more likely to reach educational levels earlier than sons in the rural areas were.

Although overall results suggest an upward mobility trend, Pakistan still lags behind the developed world with an average schooling of 4.7 years only. There is an urgent need for further increase in educational mobility. Government programmes to provide funding for higher education to underprivileged students will go a long way towards improving mobility and raising the educational levels of Pakistan's work force.

Some policies that would help achieve the above stated objective:

- Government should require mandatory enrolment of children in primary school at a specific age. This will ensure that schooling starts at an early age.
- Financial constraints of families tend to have less of an effect on the education of children once they are enrolled in school (Bauer and Riphahn, 2009). Early enrolment should specially be ensured in rural areas where students tend to complete their schooling later than their counterparts in urban areas.
- A carefully thought out policy of family planning to limit family size is required. Limiting family size would affect middle-income groups only. Since low-income families have a lack of resources to begin with, having more children will not have the negative effect of resource dilution on this section of the population (Steelman et al., 2002; Van Bavel, 2011).

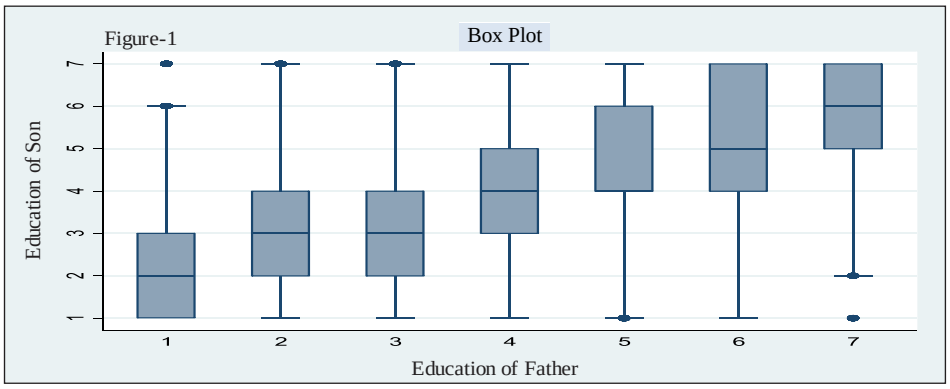
Finally, opportunities for children stem from family support and ideology, so reliance upon the education system solely to increase mobility may be an overly optimistic strategy. Institutional reforms and behavioural changes are required to improve educational mobility and thereby the socioeconomic status of the current generation.

APPENDIX

Table A1

Educational Mobility: Summary of Transition Matrices

Region	Downward Mobility	Immobility	Upward Mobility
Pakistan Overall	12	36	52
Urban Overall	16	29	55
Rural Overall	10	39	51



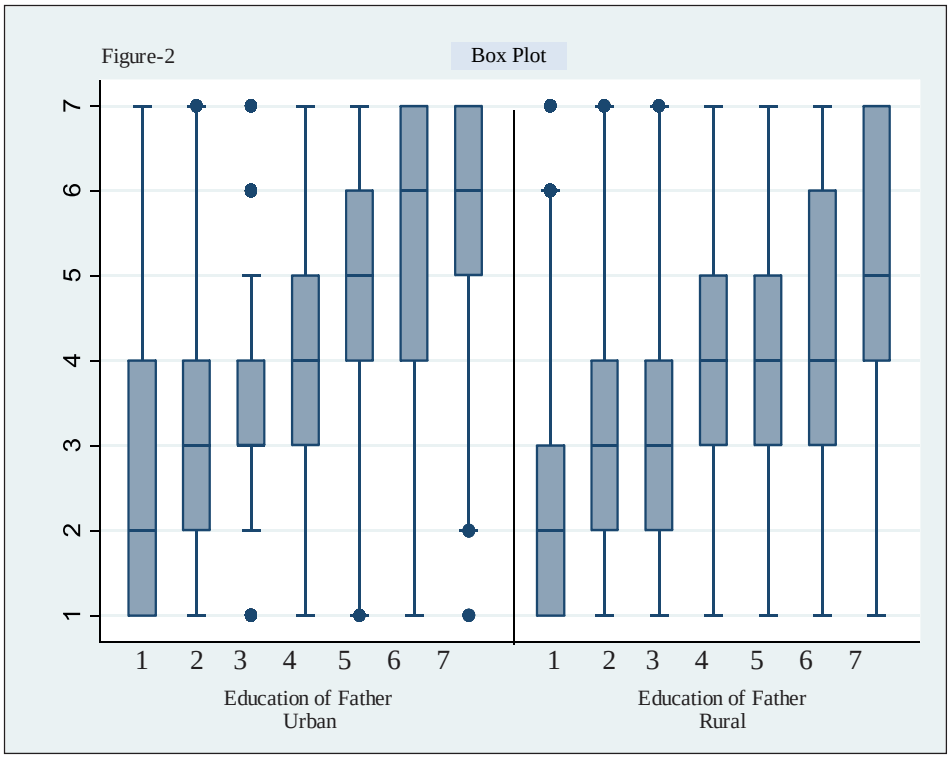


Table A2

Statistical Tests for Testing Validity of Multinomial Logit Model

	Hausman Test of IIA		
Education of Son	chi2	d.f.	P>chi2
NAS	49	75	0.99
Primary	80	74	0.31
Middle	60	75	0.90
Matric	–24	74	–
Intimidate	61	74	0.87
Graduate	–38	74	–
Post Graduate	28	74	1.00
	LR chi2(84)	=	22512.31
	Prob> chi2	=	0.00
	Pseudo R2	=	0.1604

Table A3

Marginal Effects of Educational Mobility (Urban)

	NAS_S	PMY_S	MDL_S	MTC_S	INT_S	GRD_S	PGR_S
PMY_F	**-0.1207***	***0.007****	***0.0141***	***0.0380****	***0.0286****	***0.0290****	***0.0040***
	(0.0076)	(0.0090)	(0.0105)	(0.0105)	(0.0079)	(0.0061)	(0.0053)
MDL_F	**-0.1226***	***-0.0365****	***0.034****	***0.0549****	***0.0286****	***0.0209****	***0.0207****
	(0.0088)	(0.0098)	(0.0118)	(0.0115)	(0.0084)	(0.0060)	(0.0059)
MTC_F	**-0.1426**	***-0.0663****	***-0.041****	***0.0950****	***0.0519****	***0.0611****	***0.0420****
	(0.0085)	(0.0094)	(0.0109)	(0.0115)	(0.0083)	(0.0064)	(0.0056)
INT_F	**-0.1445***	***-0.1096****	***-0.0564****	***0.0598*****	***0.1062****	***0.0941****	***0.0502****
	(0.0143)	(0.0138)	(0.0171)	(0.0177)	(0.0144)	(0.0110)	(0.0083)
GRD_F	**-0.1258**	***-0.1102****	***-0.1497****	***0.0443*****	***0.0712****	***0.1432****	***0.1271****
	(0.0224)	(0.0200)	(0.0185)	(0.0230)	(0.0169)	(0.0155)	(0.0127)
PGR_F	**-0.1371***	***-0.1445****	***-0.1405****	***-0.0377*****	***0.1091****	***0.1431****	***0.2076****
	(0.0245)	(0.0184)	(0.0216)	(0.0215)	(0.0197)	(0.0164)	(0.0160)
Income	**-0.0037***	***-0.0054****	***0.0046****	***0.0026****	***0.0011****	***0.0004*****	***0.0004*****
	(0.0019)	(0.0019)	(0.0011)	(0.0009)	(0.0004)	(0.0002)	(0.0002)
Wealth	**-0.0078***	***-0.0047****	***-0.0003***	***0.0029****	***0.0032****	***0.0026****	***0.0041****
	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0002)
H.Size	**0.0025***	***0.0057****	***0.0001***	***-0.0030****	***-0.001*****	***-0.0020****	***-0.0022****
	(0.0007)	(0.0008)	(0.0009)	(0.0009)	(0.0007)	(0.0006)	(0.0005)
Age	**-0.0197***	***-0.0223****	***-0.0172****	***0.0113****	***0.0119****	***0.0161****	***0.0199****
	(0.0021)	(0.0024)	(0.0029)	(0.0030)	(0.0024)	(0.0022)	(0.0021)
Age Sq	**0.0003***	***0.0003****	***0.0002****	***-0.0002****	***-0.0002****	***-0.0002****	***-0.0003****
	(0.00004)	(0.00004)	(0.00005)	(0.00005)	(0.00004)	(0.00003)	(0.00003)
Punjab	**0.0028**	***0.0659****	***0.0333****	***0.00003***	***-0.0349****	***-0.0229****	***-0.0442****
	(0.0083)	(0.0086)	(0.0111)	(0.0107)	(0.0084)	(0.0071)	(0.0071
Sindh	**0.0227****	***0.0194*****	***-0.0672****	***0.0139***	***0.0277****	***0.0112***	***-0.0276****
	(0.0089)	(0.0089)	(0.0113)	(0.0114)	(0.0094)	(0.0077)	(0.0075)
Baloch	**-0.0261***	***0.0429****	***-0.0963****	***0.0563****	***0.0119***	***0.0287****	***-0.017*****
	(0.0097)	(0.0110)	(0.0129)	(0.0151)	(0.0123)	(0.0114)	(0.0105)
Constant	**0.1503***	**0.1586***	**0.2208***	**0.2163***	**0.1101***	**0.0731***	**0.0708***
	(0.0027)	(0.0029)	(0.0034)	(0.0034)	(0.0026)	(0.0021)	(0.0019)

Note: * P < 0.01, ** P < 0.05, *** P < 0.1. Standard errors are in parentheses. NAS=never attend school**,** PMY = Primary school, MDL=Midlle, MTC = Matric, INT = Intermediate, GRD = Graduate, PGR= Post Graduate, _F= father, _S= son.

Table A4

Marginal Effects of Educational Mobility (Rural)

	NAS_S	PMY_S	MDL_S	MTC_S	INT_S	GRD_S	PGR_S
PMY_F	**-0.1829***	***0.0362****	***0.0578****	***0.0578****	***0.023****	***0.0031***	***0.005****
	(0.0072)	(0.0079)	(0.0073)	(0.0067)	(0.0040)	(0.0021)	(0.0020)
MDL_F	**-0.2119***	***-0.0290****	***0.0788****	***0.0896****	***0.051****	***0.0155****	***0.006****
	(0.0103)	(0.0104)	(0.0097)	(0.0093)	(0.0063)	(0.0035)	(0.0025)
MTC_F	**-0.2513***	***-0.0796****	***0.0559****	***0.1471****	***0.073****	***0.0356****	***0.0192****
	(0.0110)	(0.0108)	(0.0107)	(0.0111)	(0.0074)	(0.0047)	(0.0033)
INT_F	**-0.2832***	***-0.0844****	***0.0006***	***0.1509****	***0.1162****	***0.0559****	***0.044****
	(0.0181)	(0.0198)	(0.0188)	(0.0205)	(0.0156)	(0.0099)	(0.0078)
GRD_F	**-0.2345***	***-0.1005****	***0.0126***	***0.0965****	***0.1004****	***0.0759****	***0.049****
	(0.0312)	(0.0276)	(0.0272)	(0.0252)	(0.0184)	(0.0133)	(0.0097)
PGR_F	**-0.2272***	***-0.1184****	***-0.0350***	***0.049*****	***0.1509****	***0.0762****	***0.104****
	(0.0389)	(0.0320)	(0.0292)	(0.0270)	(0.0249)	(0.0152)	(0.0150)
Income	**-0.0046***	***-0.0001***	***-0.0004***	***0.0038****	***0.0011****	***0.00001****	***0.0003****
	(0.0016)	(0.0014)	(0.0011)	(0.0008)	(0.0004)	(0.0003)	(0.0001)
Wealth	**-0.0112***	***-0.0016****	***0.0034****	***0.0049****	***0.0021****	***0.0012****	***0.0012****
	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0001)	(0.0001)	(0.0001)
H.Size	**0.0031***	***0.0015***	***0.0004*****	***-0.0031****	***-0.0014****	***-0.0001****	***-0.0004****
	(0.0008)	(0.0008)	(0.0007)	(0.0006)	(0.0004)	(0.0002)	(0.0002)
Age	**-0.0194**	***-0.0144****	***-0.0008***	***0.0095****	***0.0075****	***0.0084****	***0.0093****
	(0.0023*	(0.0023)	(0.0022)	(0.0020)	(0.0014)	(0.0010)	(0.0010)
Age Sq	**0.0003**	***0.0002****	***0.00002***	***-0.0001****	***-0.0001****	***-0.0001****	***-0.0001****
	(0.00004	(0.00004)	(0.00004)	(0.00004)	(0.00002)	(0.00002)	(0.00002)
Punjab	**0.0397***	***0.0633****	***0.0454****	***-0.0828****	***-0.0339****	***-0.0096****	***-0.0221****
	(0.0079)	(0.0075)	(0.0073)	(0.0064)	(0.0039)	(0.0022)	(0.0023)
Sindh	**0.0795***	***0.0334****	***-0.0963****	***-0.0574****	***0.0299****	***0.0177****	***-0.0068*****
	(0.0086)	(0.0082)	(0.0074)	(0.0078)	(0.0059)	(0.0039v	(0.0034)
Baloch	**0.0366***	***0.0603****	***-0.0541****	***-0.0079***	***-0.0198****	***0.0011***	***-0.0162****
	(0.0083)	(0.0081)	(0.0077)	(0.0080)	(0.0049)	(0.0033)	(0.0030)
Constant	**0.3209***	**0.2285***	**0.1936***	**0.1585***	**0.0576***	**0.0227***	**0.0183***
	(0.0026)	(0.0026)	(0.0024)	(0.0022)	(0.0014)	(0.0009)	(0.0008)

Note: * P < 0.01, ** P < 0.05, *** P < 0.1. Standard errors are in parentheses. NAS=never attend school**,** PMY = Primary school, MDL=Midlle, MTC = Matric, INT = Intermediate, GRD = Graduate, PGR= Post Graduate, _F= father, _S= son

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The Impact of Political Regime and Institutions on Government Size in Middle-Income Countries

SAIMA NAWAZ and IDREES KHAWAJA

This study analyses the impact of political regimes and institutions on government size while controlling for socio-economic factors for a group of 56 middle income countries over the period 1986-2014. The empirical analysis shows that the institutional quality index has a negative impact on government size. Furthermore, institutions have a positive impact on "productive" government spending, while having a negative impact on "unproductive" government spending. The analysis also shows that institutional democracy, political regime and stability of political system are the key political determinants of government size. A stable democratic system backed by well-defined institutions could help to manage government size. It ensures transparency and political contestability which leads to control over the use of public resources. The analysis further shows that the GDP per capita has a positive and significant impact on government size at all stages of development. It implies that there is a natural growth of government size due to economic development. This analysis provides useful insights for policy makers to manage government size. A stable political system supported by good quality institutions is a prerequisite to managing scarce public resources.

JEL Classification: E13, O43, O47
Keywords: Political Regime, Institutions, Government Size, Middle Income Countries

1. INTRODUCTION

The role of government to stabilise an economy and generate employment has been advocated by Keynes and remained the focus of consideration in the era of Adam Smith. Recent economic turmoil has generated new discussion about the role of government to restore long-term growth and stability. Promising arguments to restore growth and generate employment induced a substantial increase in the size of government. On average, government size (expense) has increased from 19.6 percent of GDP in 1973 to 28 percent of GDP in 2015 globally, with a similar increase across developed and developing countries[1] (WB, 2017). The increasing magnitude of government size persuades researchers to investigate its association with economic growth.

Saima Nawaz <saima.nawaz@comsats.edu.pk> is Assistant Professor, COMSATS University, Islamabad. M. Idrees Khawaja <idreespide1@gmail.com> is Head of Department, Air University School of Management, Air University, Islamabad.

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[1]Similarly, government consumption expenditures have increased from 14.9 percent of GDP to 17.1 percent of GDP during the same time period.

Available literature is inconclusive about what contributes to government size. Several studies have confirmed a positive association between government size and economic growth (Agell, Lindh, & Ohlsson, 1997; Hsieh & Lai, 1994), while other studies have established a negative relationship between government size and economic growth (Butkiewicz & Yanikkaya, 2011; Fölster & Henrekson, 2001; Hansson & Henrekson, 1994; Landau, 1983, 1986; Nawaz & Khawaja, 2016).

Bergh and Henrekson (2011), based on a survey of the literature, concluded that a 10 percent increase in government spending is associated a 0.5 percent to 1 percent decrease in annual growth rate. What are the underlying factors responsible for a substantial increase in government size, despite a consensus on its negative association with growth?

Recent literature emphasises the role of institutional framework and political setup of the country in explaining the increasing trend of government size.[2] In the early 1960s, Peacock and Wiseman (1961) argued that economic, political and social differences need to be considered while explaining the behaviour of government expenditure. Various studies have attempted to analyse the impact of institutions and political systems on public policy (Milesi-Ferretti, Perotti, & Rostagno, 2002; Persson & Tabellini, 2005; Woo, 2011). However, further investigation is required in quantifying the role of institutions, and political regimes, in shaping government size, in four dimensions.

(1) Existing studies are primarily confined to corruption as an institutional measure, paying no attention to other dimensions of institutions (Mauro, 1998). Further investigation is required to look at the contribution of different types of institutions such as rule of law, government stability and democratic accountability. Additionally, in existing literature, quality of democracy is used to measure the impact of democracy on government size (Adsera & Boix, 2002; Profeta et al. 2013; Sanz, 2017).

(2) These studies ignore key aspects that influence government size. Firstly, government size is highly linked with the type of regime i.e. democratic or autocratic regime. Both have different implications for government size. Secondly, weak democracy has a different impact as compared to strong democracy (Iqbal & Daly, 2014). Thirdly, a stable political regime, whether democratic or autocratic, has a different impact on government size as compared to an unstable political regime. For example, India has a stable democratic system while Pakistan has an unstable system. India observes smooth growth pattern while Pakistan has cyclical growth trajectory. Similarly, the political regime of China is totally different from India but both are growing rapidly (Nawaz, 2015).

(3) It is also evident that composition of government varies across developed and developing economies. Subsidies and other transfers have increased

[2]Over the few decades, institutions have received paramount consideration in determining the growth paths of nations. Institutions favour economic growth by promoting a favourable political environment and by increasing the effectiveness of policies (Acemoglu, Johnson, Robinson, & Thaicharoen, 2003). A majority of literature has supported these arguments (Acemoglu, Johnson, & Robinson, 2005; Acemoglu & Robinson, 2010; Nawaz, 2015; Nawaz & Khawaja, 2016; Rodrik, Subramanian, & Trebbi, 2004).

from 22 percent to 32 percent of total expense in developing countries with the growth rate of 3.2 percent, while the same has increased from 41 percent to 45 percent of total expense in developed countries with the growth rate of 0.65 percent in the last fifteen years (WB, 2017). It shows public resources are diverted to unproductive sectors especially in developing countries.

Moreno-Dodson (2008) argues that different public spending components have different impacts on growth. In this study, overall spending is divided into "productive" and "unproductive" expenditures based on *a priori* assumption about their contribution to growth. Productive expenditures could sharply increase with improved institutional quality and quality of political democracy, as large financial resources are spent on quality education and quality healthcare for all citizens. This would also contribute to higher growth as the labour force becomes healthier, better trained and hence more productive, and there is greater social cohesion as citizens develop a stake in the system.

(4) These dimensions deserve further in-depth analysis to determine the role of institutions in shaping government size at different stages of development and various types of expenditures. Mulligan, Gil, and Sala-i-Martin (2004) argue that a comparative analysis of democracy and autocracy may enhance the understanding of democratic institutions in establishing the efficacy of public policies.

The objective of this paper is to understand how political regime and institutional framework shape government size, while controlling for socioeconomic differences in middle income countries. This group of economies shows considerable heterogeneity in institutional quality and launched a process of development and reforms, but are still in a transition phase (Iqbal & Daly, 2014). More specifically, this study investigates the impact of types of political regime, and quality and stability of political system on government size. In addition, the impact of six different types of institutions on government size is examined at various stages of development. This study also examines the impact of institutions on "productive" and "unproductive" expenditures.

The study contributes to the literature in various ways: First, it provides new insights on the implications of different types of political regimes in determining government size. Second, it highlights the relative importance of various forms of institutions in shaping government expenditures. Third, it gives new evidence on the contribution of institutions across productive and unproductive expenditures. Finally, on the policy front, this study provides new insights on the importance of political regimes and institutional framework in managing government size.

The remaining paper is presented as follows:

Section 2: A literature review
Section 3: The econometric model, data and estimation methodology
Section 4: Results and discussion
Section 5: Concluding remarks with policy framework

2. LITERATURE REVIEW

Various theoretical arguments are used to explain the nexus between political regime, institutional setup and government size. Generally, "constraints that human beings impose on themselves" are termed as institutions (North, 1990). The institutional school of thought argues that institutions frame government policy by ensuring the right allocation of public resources. Institutions enhance the productivity of government expenditures by allocating public resources in productive sectors (Gupta, De Mello, & Sharan, 2001; Mauro, 1998). Poorly defined institutions provide room for exploitation of public money by politicians and government officials for their own interest. Weak institutions create opportunities for rent seeking (Dethier, 1999).[3] An inefficient law and order framework, unclear and/or no property rights, and a weak democratic setup are the main sources of rent seeking in the system. These inefficiencies allow for exploitation of public resources.

North (1990) argues that rent seeking activities impose very high social and economic costs by distorting the allocation of resources, particularly shifting resources from productive to unproductive sectors (Cole & Chawdry, 2002; Iqbal & Daly, 2014). Rent seekers, particularly in developing countries, resist the implementation of reforms in economic and institutional frameworks because they are positioned at key decision making posts in both public and private sectors (Fischer, 2007). The scope of unproductive public investment depends on the strengths and weaknesses of institutions.

Bleaney, Gemmell, and Kneller (2001), and Moreno-Dodson (2008) divide expenditures into "productive", which include education, health, general public services, transport, and communication, and "unproductive", which include social security, welfare, recreation, and economic services. These studies show that productive expenditures have a positive impact on economic growth while unproductive expenditures have a negative impact on economic growth.

Weak institutions fail to resist the rent seeker pressure groups (Tollison, 2001), while a well-designed institutional system may not be manipulated by the interest group to allocate public resources in their own favour (Pradhan, 1996). This implies that prevailing institutional quality determines the composition and magnitude of government size. Rent seekers (politicians and government officials) plan the composition of expenditures so as to offer lower allocations in certain categories such as education and health and higher spending for categories such as defense and other major capital projects (Mauro, 1998).

Political regimes have a strong link with government size. It is argued that political competition limits the size of government (Eterovic & Eterovic, 2012). Tonizzo (2008) argues that a democratic setup faces stronger constraints than an autocratic environment, which allows an autocratic setup to consume more resources. This study finds that a marginal improvement towards democracy causes a 0.14 percent decrease in average government consumption. Aidt and Eterovic (2011) analyse the impact of political

[3]Rent seeking "usually implying the expenditure of scarce resources, to cause and capture artificially-created rents as well as transfers which are not part of society's intended income redistribution" (Fischer, 2007). Iqbal and Daly (2014) defined as "any activity through which public power is exercised for private gain; this may involve misuse of public resources or, more generally, any attempted capture and commodification of state, social or commercial authority by politicians, public officials, elites and private interests" as rent seeking.

competition on government size in Latin America. This study shows that political competition is negatively related with government size.

Plümper and Martin (2003) find a non-linear relationship between the level of democracy and government size. This study concludes that the level of democracy is correlated with government size in a U shape. Under a weak democratic system, government size is large to meet the demands of rent by the elites. On the other hand, with high levels of democracy, spending is high to meet popular demand for public goods. The median voter model also predicted the same relation. For medium levels of democracy, none of these pressures exist and government size is at its minimum (Tonizzo, 2008). However, Mulligan, et al. (2004) show that the political regime, democratic or non-democratic, has no impact on government size.

Persson (2002) finds that presidential regimes are linked with smaller government size as compared to parliamentary regimes. Alesina and Wacziarg (1998) and Epifani and Gancia (2009) find that democracy has a positive and significant impact on size of government. Shelton (2007) also supports this relationship by arguing that democracy influences not only the size of government, but also its composition. On the other hand, Adsera and Boix (2002) find a negative association between democracy and government size.

Albalate, Bel, and Elias (2012) investigated the impact of democracy, electoral rules and parliamentary structure on military spending for a group of 157 countries over the period 1988-2006. This study finds that democracies based on the presidential form of government spend more on defense than parliamentary systems. In addition, majority voting systems increase the burden of defense more than proportional representation systems. This study concludes that institutions, especially democratic ones, may not have the same effect on the supply of public goods and services.

Profeta et al. (2013) analyse the relationship between political institutions and public spending in developing countries using data from 1990 to 2005. To measure political institutions, this study employs two indicators, namely political strength of democratic institutions, and protection of civil liberties. This study concludes that political institutions are not significantly related to public spending when controlling the country's fixed effects. This study concludes that democracy has a weak negative relation with government size.

Shonchoy (2016) examines the role of political institutions and governance structure for shaping public spending for developing countries using panel data of 97 economies over the period 1984-2004. This study finds that political institutions like democracy and governance indicators, like a control over corruption, have a positive and significant association with government consumption spending in developing countries.

These studies provide conflicting results. Therefore, more research is needed to produce reliable results. There could be three possible reasons for conflicting results, namely the range of institutional variables, the choice of sample countries, and using the estimation technique. This study extends the literature by covering six different dimensions of institutions, by looking at different types of political systems and by controlling econometric issues. This study further examines the impact of these indicators at different stages of development.

3. EMPIRICAL FRAMEWORK

3.1. The Model

Following Shonchoy (2016), empirical assessment is carried out using following model:

$$GE_{i,t} = \alpha_1 + \alpha_2 PR_{i,t} + \alpha_3 INS_{i,t} + \gamma Z_{i,t} + \varepsilon_{i,t} \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where $GE_{i,t}$ is the total government expenditures, $PR_{i,t}$ represents political regime, $INS_{i,t}$ represents the institutions for country i at time t and . Expected signs of democracy variables are negative, implying $\alpha_2 < 0$. The literature suggests that institutions have a positive impact on government size for productive sectors and negative in the case of unproductive sectors (Funk & Gathmann, 2011). This implies that the expected contribution of institutions is ambiguous and depends on the structure of government expenditure. Expected sign of institutions is positive ($\alpha_3 < 0$) for productive expenditures and negative ($\alpha_3 < 0$) for unproductive expenditures.

Z matrix consists of socioeconomic factors which includes GDP per capita, physical capital, urbanisation, openness and inflation. It is assumed that that per capita income has a positive impact on government size (Cameron, 1978; Pham, Carmignani & Kler, 2017; Shonchoy, 2016). The positive relationship between GDP per capita and public expenditure is supported by the Wagner law. According to the Wagner law, the demand for public goods and services is income elastic indicating that increase of public spending is impacted by the economic development of the country (Cameron, 1978; Lamartina & Zaghini, 2011).

Trade openness has a positive relationship with government size (Cameron, 1978; Rodrik, 1998; Shelton, 2007; Shonchoy, 2016) as envisioned in the 'compensation hypothesis' initially proposed by Cameron (1978) and later developed by Ruggie (1982) or an insignificant impact on government size (Benarroch & Pandey, 2012). Ruggie (1982) argues that openness leads to an increase in the size of government. Rodrik (1998) further develops the compensation hypothesis by saying that greater trade liberalisation can stimulate spending in the form of redistributive spending to overcome the risks caused by the international market.

Inflation can have a positive impact on public spending (Neck & Schneider, 1988) or have a negative impact on government size (Lin, 1992). It is expected that physical capital has a positive relationship with government size. $\varepsilon_{i.t.}$ is the idiosyncratic error term.

3.2. Data Description

This study uses a set of panel data for 56 countries collected from the World Bank's "middle income" category over the period 1986-2014. The choice of economies is based primarily on data availability for required variables used in analysis. The sample is divided into two sub-groups, namely developed and developing; depending on their per capita GNI. Countries in lower-middle income (LMI) group are termed as developing countries and upper-middle income (UMI) countries are termed as developed countries.[4]

[4]There are four income groups categories in the World Bank dataset based on per capita GNI 2016 including: (i) "low income ($1,005 or less)"; (ii) "Lower-Middle Income ($1,006 to $3,955)"; (iii) "Upper-Middle Income ($3,956 to $12,235)"; and (iv) "High Income ($12,236 or more)". There are 109 countries in LMI and UMI group (for list of countries used in analysis, see Appendix Table 1).

Various data sources are used to collect data. A brief description of each variable along with construction methodology and source is given below:

Government size (GE): The dependent variable government size is measured using the "General government final consumption expenditure % of GDP" available in the World Development Indicator (WDI) data sets published by the World Bank. This measure is frequently used in the literature to find the determinants of government size (Bergh & Henrekson, 2011; Pham et al. 2017; Shonchoy, 2016). This study also uses "total central government expenditure % of GDP" from Government Finance Statistics (GFS) published by the International Monetary Finance (IMF). The GFS also gives expenditure by functions of government[5] include expenditures on (i) general public services (GPS); (ii) defense (DEF); (iii) public order & safety (POS); (iv) economic affairs (ECA); (v) environment protection (ENP); (vi) housing & community amenities (HCA); (vii) health (HEL); (viii) recreation, culture, & religion (RCR); (ix) education (EDU); & (x) social protection (SOP). Following Moreno-Dodson (2008), expenditure by functions of government can be divided into two categories, productive spending includes GPS, HEL, EDU, HCA and ENP and unproductive spending includes DEF, POS, ECA, RCR, and SOP.

Institutions (INS): Following Nawaz (2015) and Nawaz and Khawaja (2016), this study constructed an institutional quality index to measure institutional quality using six different measures of institutions; namely (i) "government stability" (GS); (ii) "investment profile" (IP); (iii) "control over corruption" (CC); (iv) "law and order" (LO); (v) "democratic accountability" (DA) and vi) "bureaucratic quality" (BQ). The data on these measures are taken from the ICRG (International Country Risk Guide) collected by the PRS (Political Risk Services) group.[6] The range of each indicator is different; for example, GS and IP range from 0 to 12, while CC, LO and DA range from 0 and 6 and BQ from 0 to 4. Low value (0) indicates poor quality and high value indicates good quality. All measures are readjusted to define the range from 0 to 100. INS is defined as:

$$INS_{i,t} = (1.4 \times \mathrm{GS})_{\mathrm{i,t}} + (1.4 \times \mathrm{IP})_{\mathrm{i,t}} + (2.8 \times \mathrm{CC})_{\mathrm{i,t}} + (2.8 \times \mathrm{LO})_{\mathrm{i,t}} + (2.8 \times \mathrm{DA})_{\mathrm{i,t}} + (4.2 \times \mathrm{BQ})_{\mathrm{i,t}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

Political Regime (Democ): Political regime is defined in three ways using data from POLITY IV.

(i) Quality of institutional democracy (DEM_Q): Quality of democracy (DEM_Q) is measured using the democracy index where $DEM_Q \in [0,10]$. It captures institutional democracy and is measured by "competitiveness of political participation, competitiveness of executive recruitment, openness of executive recruitments and constraints on the chief executive". The higher values represent a higher degree of institutionalised democracy. The country is weakly democratic if $DEM_Q \leq \overline{DEM_Q}$, and strongly democratic if $DEM_Q > \overline{DEM_Q}$.

[5]https://data.imf.org/?sk=5804C5E1-0502-4672-BDCD-671BCDC565A9

[6]For further details on definition of these variables see Nawaz (2015). In addition, Nawaz and Khawaja (2016) also argue that the ICRG data is comprehensive than other data on institutions such as the World Governance Indicators (WGI) of the World Bank due to a long time period and more indicators.

(ii) Type of political regime (DEM_T): $Polity2 \in [-10, +10]$ provides an information on the type of a political regime. Where +10 represents a strongly democratic system and –10 a strongly autocratic system. $DEM_T = 1\ if\ Polity2 > 0$ representing democratic regime and $DEM_T = 0\ if\ Polity2 \leq 0$ indicating autocratic regime.

(iii) Stability of political system (DEM_S): $Polity2 \in [-10, +10]$ is used to measure the stability of political system. If $Polity2$ observes less than 3 changes in score over the last three decades, the political system is termed as stable otherwise it is unstable. To measure this, first we calculate number of changes in the score as $\Delta DEM_S = 1\ if\ Polity2_{it} \neq Polity2_{it-1}, \forall t$. Using this information, we define $DEM_S = 1\ if\ count\ (\Delta DEM_S) \leq 3\ for\ i$ and $DEM_S = 0\ if\ count\ (\Delta DEM_S) > 3\ for\ i$.

Control Variables: Per capita GDP (Y) is taken at constant US$ (2010). Trade openness/liberalisation (TRD) is quantified as trade (% of GDP). Inflation (INF) as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. Urbanisation (Urban) is measured as share of urban population to the total population. The "gross fixed capital formation (% of GDP)" is used to measure physical capital. The data on all these variables are taken from WDI.[7]

3.3. Estimation Methodology

To estimate the proposed model, this study uses a panel data estimation technique. This method allows us to control country and time specific heterogeneities. Two techniques, namely the "fixed effects" model (FEM) and "random effects" model (REM) are commonly used to estimate panel models. The FEM is the most common technique for estimation of linear panel regression. The FEM captures the time effects by introducing time dummies, one for each time interval, just like the dummy variable to account for cross-sectional effects. In the case of REM, it is assumed that intercept is random variables instead of fixed as in FEM. To decide between FEM and REM, this study uses the "*Hausman test"*. According to this test, rejecting the null hypothesis implies FEM is preferred estimation technique (the alternative hypothesis).

The literature argues that institutions are endogenous and the problem becomes complicated when other economic variables such as human capital are included in the model with the institutions (Nawaz & Khawaja, 2016). The possibility of endogeneity undermines the robustness of the fixed effect models. Shonchoy (2016) argues that instrumental variables estimation technique provides an ideal way to deal with endogeneity. The possibility of endogeneity undermines the robustness of the fixed effect models. To resolve this issue and establish robustness, this study uses the "system GMM" recommended by Arellano and Bover (1995) and Blundell and Bond (1998). The system GMM tackles endogeneity among all explanatory variables in the model (Arellano & Bond, 1991; Bond, Bowsher, & Windmeijer, 2001; Caselli, Esquivel, & Lefort, 1996). It is a widely used method in the recent literature to produce robust results (Iqbal & Daly, 2014; Nawaz, 2015; Nawaz, Iqbal, & Khan, 2015; Nawaz & Khawaja, 2016).

[7]Descriptive Statistics are available in Appendix Table 2 and Correlation Matrix in Appendix Table 3.

4. EMPIRICAL RESULTS AND DISCUSSION

The impact of political regime and institutions on government size is estimated using the *FEM* because the *Hausman tests* favour the *FEM* specifications as compared to the *REM* specifications. To test the robustness of results we have also estimated the models using the "system GMM". Various diagnostic tests have been used to confirm that models are well specified. The F-Statistics confirms that *FEM* specifications are well defined. Wald Chi-Square statistics test also confirms that "system GMM" specifications are well defined. AR1 and AR2 tests confirm validity of instruments in case of system GMM.

The empirical analysis shows that the institutional quality index (INS) has a negative impact on GE across the full sample. The estimated coefficients are significant in most cases, especially for fixed effect estimation (model 1-4). In case of sys-GMM, the coefficients are weakly significant (model 5-7), which suggests that the variable might be subject to omitted variable bias and hence should be treated cautiously. The estimated coefficients range from 0.034 to 0.15 (in absolute number) in different specifications (Table 1). This implies that an increase in institutional quality by one percentage point reduces overall government spending from 0.034 to 0.15 percentage points. This indicates that the better the quality of institutions, the lower the size of government.

The main argument for the negative association between institutional quality and public spending stems from rent seeking behaviour in the public sector (Fischer, 2007). Rent seeking is the biggest problem in allocating public resources. In developing countries, public resources are diverted to the unproductive sector, where politicians and public officials have more opportunities to earn commissions. In these countries, systems do not have controls that ensure proper implementation of development projects. Dethier (1999) also supported this viewpoint by arguing that politicians and government officials use their discretionary power to extract rent from development projects owing to weak institutional setup.

The impact of various types of political variables on government size is examined. First, this study examines the impact of institutional democracy (DEM_Q). The empirical analysis shows that DEM_Q and government size are negatively associated (see models 2 & 5 in Table 1). This shows that the higher the quality of institutional democracy, the lower the size of government. This finding, again, is linked with the accountability of the system. Well-defined democratic institutions ensure the accountability of politicians and reduce opportunities for rent seeking. This ultimately requires fewer resources to meet public demand. Various studies have found similar results (Funk & Gathmann, 2011; Sanz, 2017; Tonizzo, 2008).

Secondly, the association of political regime (DEM_T) with government size is examined. The empirical analysis shows that DEM_T has a negative impact on government size in both models (see models 3 & 6 in Table 1) but is only significant in case of sys-GMM (model 6), hence the association should be inferred cautiously. A democratic regime leads to lower government size as compared to an autocratic regime.

Thirdly, this study examines the role of political stability (DEM_S) in determining the size of government. The analysis reveals that a stable political system favours lower government size as compared to an unstable system (see model 4 in Table 1). Under an unstable political environment, politicians prefer larger public resources to earn high

rents and spend on mega projects to gain popularity to renew their term in office. Again, the outcome is not robust due to a weak association with government size. The impact of (DEM_S) is negative but insignificant in the case of sys-GMM estimation.

Three different measures help to infer the association between democracy and government size. It can be argued that to some extent, well-defined and stable democratic institutions will help to manage government size. Rent seeking can be controlled with institutional reforms as it increases transparency and political contestability which leads to control over the use of public resources (Fischer, 2007; Iqbal & Daly, 2014).

One of the frequently used determinants of government size is real GDP per capita. Empirical estimates show that real GDP per capita has a positive impact on government size. The estimated coefficients range from 0.98 to 3.62 in different specifications (Table 1). This implies that a 1 percent increase in GDP per capita would lead to 0.98 percent to 3.62 percent increase in government size. The association remains significant in many cases. It shows the existence of the Wagner law. Various studies have shown similar results. Shonchoy (2016) shows similar results to argue that rising GDP per capita, particularly in developing economies seems to increase their spending on consumption due to growing pressure on demand for goods and services available to the public. Pham et al. (2017) also supported the same findings for a panel of 62 countries. This study argues that richer countries have a bigger government size.

Trade openness/liberalisation has a positive and significant impact on government size in case of sys-GMM (Table 1) implying that the "compensation hypothesis" proposed by Cameron (1978) and Ruggie (1982) can hold in middle income countries. Again, it is important to mention that the impact remains insignificant in a few cases, especially in case of fixed effects estimation owing to omitted variable bias and endogeneity. Furthermore, the impact of trade openness mainly remains positive and significant at different stages of development. Again, in some cases the estimated impact shows negative and insignificant association with government size especially for countries with weak democracies. Recently, Benarroch and Pandey (2012) found similar results. This study finds no evidence of a causal relationship between trade liberalisation and public expenditure in the full sample and for sub-samples of low-income and high-income countries.

Inflation is used to measure the stability of a country's macroeconomic framework. Empirical results show that inflation has a positive and significant impact on government size across the full sample (Table 1). The estimated coefficients show that a 1 unit increase in inflation would lead to 0.01 percent increase in government size. Inflation measures the price variability in the economy. Its impact on government size is channeled in many ways: First, increasing prices should be accompanied by increased public spending mainly in the development sector. The effect of prices is favoured by rising public spending, especially in developing countries, where inflation mainly remains high. Second, non-development expenditure such as employee compensation and transfer payments are indexed to inflation. Government increases these expenditures every year to adjust inflationary pressure. Finally, inflation induces uncertainty in the market which increases the cost of investment. Inflation reduces real returns on savings which causes an informational friction afflicting the financial system. These financial market frictions results in credit rationing and thus limit the availability of investment.

Table 1

Impact of Political Regime and Institutional Quality on Government Size

	Fixed Effect				Sys-GMM			
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
INS	–0.034	–0.034	–0.040	–0.037	0.051	–0.156	0.053	–0.055
	(0.01)**	(0.01)**	(0.01)***	(0.01)***	(0.04)	(0.06)**	(0.04)	(0.03)*
DEM_Q	–0.062	–0.067			–0.215			
	(0.06)	(0.04)*			(0.11)*			
DEM_T			0.302			–9.569		
			(0.33)			(4.90)*		
DEM_S				5.774			–4.918	
				(2.76)**			(6.26)	
Y	1.693	1.693	1.822	1.771	3.621	1.684	0.976	1.011
	(0.78)**	(0.78)**	(0.78)**	(0.78)**	(3.28)	(1.01)*	(1.32)	(0.36)***
TRD	–0.006	–0.006	–0.006	–0.005	0.033	0.032	0.047	0.075
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)**	(0.02)	(0.03)*	(0.01)***
INF	0.001	0.001	0.001	0.001	0.001	0.001	0.001	–0.004
	(0.00)**	(0.00)**	(0.00)**	(0.00)**	(0.00)***	(0.00)***	(0.00)***	(0.01)
Urban	–0.046	–0.046	–0.055	–0.051	–0.044	–0.009	0.020	0.167
	(0.04)	(0.04)	(0.04)	(0.04)	(0.08)	(0.06)	(0.07)	(0.02)***
PC	–0.042	–0.042	–0.041	–0.042	–0.057	–0.157	–0.036	–0.200
	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.10)	(0.06)	(0.02)***
Income_Group		–13.091			–3.540			
		(1.50)***			(4.54)			
Constant	5.423	18.514	4.547	4.832	–13.635	–0.530	2.372	16.076
	(5.33)	(5.47)***	(5.34)	(5.32)	(18.66)	(8.80)	(8.39)	(2.97)***
Observations	1,449	1,449	1,459	1,459	1,449	1,449	1,449	174
No. of Countries	55	55	55	55	55	55	55	19
R-squared	0.699	0.699	0.701	0.701				
F/Wald Chi2 Value	106.0	106.0	108.7	109.4	42.57	39.21	28.58	462.5
Hausman test	23.14	23.52	22.50	18.19				
(Prob>chi2)	(0.00)	(0.00)	(0.00)	(0.00)				
AR1 P value					0.202	0.172	0.195	0.076
AR2 P value					0.906	0.969	0.883	0.454

Note: "General government final consumption expenditure % of GDP" (GE) is dependent variable in case of models 1 to 7 and "total central government expenditure % of GDP" in case of model 8. Robust standard errors are reported in parentheses. [*, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively].

To further support the main argument of a negative association between institutions and government size, this study divides total government expenditures into "productive" and "unproductive" categories and re-examines the impact of institutions. The results are reported in Table 2. The results show that institutions have a positive and significant association with productive spending while they have a negative and significant association with unproductive spending (Table 2). This implies that institutions are supportive to increase productive spending while helpful to reduce unproductive spending for a given set of countries. This indicates that prevailing institutional quality determines the size and composition of government spending. Well-defined institutions offer more allocation in the productive sector while a rent seeking economy with a weak institutional framework prefers higher allocation in unproductive sector.

Table 2

Impact of Institutional Quality on Government Size: Productive vs. Unproductive Expenditures (Sys-GMM)

Variables	(1) P_Exp	(2) U_Exp
INS	0.133	–0.188
	(0.02)***	(0.02)***
Y	0.468	0.490
	(0.28)*	(0.26)*
TRD	0.006	0.078
	(0.01)	(0.00)***
INF	0.016	–0.020
	(0.00)***	(0.00)***
Urban	–0.046	0.214
	(0.02)***	(0.01)***
PC	–0.262	0.045
	(0.02)***	(0.02)***
Constant	14.463	3.196
	(2.37)***	(2.20)
Observations	197	197
No. of Countries	19	19
Wald Chi2 Value	462.5	300.3
AR1 P value	0.0750	0.00184
AR2 P value	0.199	0.643

Note: Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively.

Component-wise analysis shows that institutions have a positive and significant impact on various productive components including general public services (GPS), public order & safety (POS), environment protection (ENP), health (HEL) and education (EDU) (Table 3). Health and education are considered two core productive components of government spending. The analysis supports the main argument that institutions divert resources from unproductive to productive spending.

The empirical findings show that institutions have a negative impact on unproductive spending like economic affairs (ECA) and recreation, culture, & religion (RCR). Rent seekers (politicians and government officials) plan the composition of expenditures so as to offer less allocation in certain categories like education and health, and higher spending for categories such as defense and other major capital projects (Mauro, 1998).

The impact of institutions on defense expenditures remains insignificant which deserves further analysis. In many countries, especially developing countries, the share of defense expenditures is very high, as in India and Pakistan. It is also interesting to note that institutions have a negative and significant impact on housing and community amenities (HCA) component of government spending, a productive part of government spending. Further analysis is required to uncover the contribution of institutions by expanding sample size.

Table 3

Impact of Institutional Quality on Government Size: Component Wise Analysis (Sys-GMM)

Variables	(1) GPS	(2) DEF	(3) POS	(4) ECA	(5) ENP	(6) HCA	(7) HEL	(8) RCR	(9) EDU	(10) SOP
INS	0.091	0.003	0.009	-0.028	0.018	-0.012	0.034	-0.007	0.006	-0.177
	(0.02)***	(0.00)	(0.00)***	(0.02)*	(0.00)***	(0.00)***	(0.01)***	(0.00)***	(0.00)***	(0.02)***
Y	0.288	0.090	0.378	0.045	0.007	0.379	0.512	0.050	0.593	0.021
	(0.27)	(0.04)**	(0.03)***	(0.21)	(0.02)	(0.06)***	(0.08)***	(0.02)***	(0.07)***	(0.21)
TRD	0.031	0.013	0.007	0.000	-0.000	0.003	0.025	0.002	0.017	0.070
	(0.00)***	(0.00)***	(0.00)***	(0.00)	(0.00)	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
INF	0.011	0.005	-0.005	0.004	-0.001	0.002	0.001	0.001	-0.004	-0.018
	(0.00)***	(0.00)***	(0.00)***	(0.00)	(0.00)*	(0.00)**	(0.00)	(0.00)***	(0.00)***	(0.00)***
Urban	-0.028	-0.005	-0.002	0.027	0.001	-0.019	0.013	-0.000	-0.007	0.188
	(0.01)*	(0.00)**	(0.00)	(0.01)**	(0.00)	(0.00)***	(0.00)***	(0.00)	(0.00)*	(0.01)***
PC	-0.143	-0.017	-0.040	0.106	0.001	0.001	-0.058	-0.006	-0.048	-0.006
	(0.02)***	(0.00)***	(0.00)***	(0.01)***	(0.00)	(0.00)	(0.00)***	(0.00)***	(0.00)***	(0.01)
Constant	5.951	3.901	-1.030	1.742	-0.837	0.134	-4.516	0.717	9.314	2.121
	(2.25)***	(0.36)***	(0.25)***	(1.75)	(0.16)***	(0.49)	(0.64)***	(0.15)***	(0.55)***	(1.71)
Observations	197	197	197	197	192	197	197	197	197	197
No. of Countries	19	19	19	19	19	19	19	19	19	19
Wald Chi2 Value	160.1	413.1	1015	82.99	195.4	111.8	707.6	99.31	754.9	956.8
AR1 P value	0.000164	0.0305	0.0766	0.449	0.000230	0.00769	0.000122	0.0845	0.229	0.00136
AR2 P value	0.869	0.690	0.445	0.984	0.945	0.589	0.242	0.879	0.103	0.0648

Note: Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively.

To further study the impact of institutions on government size, this study divides the full sample into; (i) developed (upper-middle income) UMI vs. developing (lower-middle income) LMI countries; (ii) weakly vs. strongly democratic; (iii) stable vs. unstable political systems. The estimation results are presented in Table 4 and Table 5.

Table 4

Impact of Political Regime and Institutional Quality on Government Size (Fixed Effect)

	Level of Development		Type of Democratic Regime		Stability of Political System	
Variables	LMI	UMI	Weakly	Strongly	Unstable	Stable
INS	0.042	-0.063	-0.006	-0.046	-0.049	-0.058
	(0.03)	(0.01)***	(0.03)	(0.01)***	(0.02)**	(0.02)***
DEM_Q	0.085	-0.024				
	(0.10)	(0.01)**				
Y	4.358	0.151	2.732	-0.169	4.390	-0.025
	(1.49)***	(0.62)	(0.94)***	(1.10)	(1.51)***	(0.77)
TRD	0.017	-0.015	0.016	-0.003	0.037	-0.025
	(0.02)	(0.01)*	(0.02)	(0.01)	(0.02)	(0.01)***
INF	0.002	-0.001	-0.000	0.001	-0.001	0.001
	(0.00)***	(0.00)***	(0.00)	(0.00)	(0.00)	(0.00)***
Urban	-0.069	-0.118	-0.212	0.008	-0.162	-0.039
	(0.08)	(0.04)***	(0.07)***	(0.04)	(0.08)**	(0.05)
PC	-0.055	-0.036	-0.068	-0.067	-0.082	0.030
	(0.06)	(0.03)	(0.05)	(0.03)**	(0.05)	(0.04)
Constant	-17.853	19.909	2.536	15.143	-11.120	19.041
	(8.68)**	(3.96)***	(7.34)	(7.60)**	(10.87)	(7.69)**
Observations	707	742	616	843	635	824
No. of Countries	27	28	43	41	23	32
R-squared	0.714	0.759	0.764	0.747	0.709	0.720
F/Wald Chi2 Value	75.24	65.60	52.29	55.65	52.27	82.35
Hausman Test	36.35	10.98	52.95	14.18	19.66	12.10
(Prob>chi2)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: "General government final consumption expenditure % of GDP" (GE) is dependent variable. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively.

Estimation results show that institutions and democratic systems complement each other in controlling government size. Institutions have a significant negative impact on government size in UMI countries and strongly democratic countries. The impact is statistically significant in UMI countries, but insignificant in LMI countries. This implies that institutions play an important role in controlling public spending at higher stages of economic development but are not effective at the early stages of economic development. At initial stages of development, the quality of institutions is very poor, so it does not produce the desired results. Furthermore, institutions perform better under a stable political system compared to an unstable system.

The estimation results further show that real GDP per capita has a positive and significant impact on government size at various stages of development i.e. developed vs. developing and under different political regimes, either weak or strong. The association, however, remains weakly significant or insignificant in some cases. The GDP per capita turned out to be the key determinant of government size. It is the key factor behind increase in government size in many situations.

Table 5

Impact of Political Regime and Institutional Quality on Government Size (Sys-GMM)

	Level of Development		Type of Democratic Regime		Stability of Political System	
Variables	LMI	UMI	Weakly	Strongly	Unstable	Stable
INS	0.006	0.048	-0.001	-0.053	-0.016	0.050
	(0.04)	(0.04)	(0.07)	(0.03)*	(0.07)	(0.04)
DEM_Q	-0.315	-0.087				
	(0.17)*	(0.13)				
Y	1.562	3.513	0.237	2.236	2.593	1.043
	(2.20)	(1.85)*	(2.24)	(1.13)**	(1.97)	(1.58)
TRD	0.073	-0.002	0.044	0.036	0.093	0.012
	(0.04)*	(0.01)	(0.04)	(0.01)**	(0.04)**	(0.02)
INF	0.002	-0.000	0.001	0.002	0.000	0.002
	(0.00)***	(0.00)	(0.00)***	(0.00)	(0.00)	(0.00)***
Urban	0.015	-0.148	0.024	-0.060	-0.090	0.009
	(0.10)	(0.07)**	(0.12)	(0.05)	(0.09)	(0.09)
PC	-0.103	-0.104	-0.058	-0.071	-0.156	0.014
	(0.11)	(0.07)	(0.09)	(0.06)	(0.11)	(0.06)
Constant	-0.822	-6.256	9.389	-5.145	-4.610	1.355
	(11.72)	(11.27)	(10.99)	(7.20)	(9.79)	(8.50)
Observations	707	742	616	843	635	824
No of Countries	27	28	43	41	23	32
F/Wald Chi2 Value	350.5	12.48	18.21	15.26	11.88	77.81
AR1 P value	0.205	0.648	0.269	0.403	0.339	0.197
AR2 P value	0.771	0.348	0.432	0.628	0.593	0.203

Note: "General government final consumption expenditure % of GDP" (GE) is dependent variable. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively.

To further establish the robustness of the institutions-government size nexus, this study quantifies the impact of individual indicators of institutions on government size. Table 6 shows that most of the institutional indicators have a negative and significant impact on government size. The impact of "government stability" (GS) is negative and significant on government size. The GS indicator shows the ability of the government to remain in office and carry out their planned activities through government unity, legislative power, and public support. This implies that government expenditures are sensitive to government stability.

The results show that the "investment profile" (IP) has a negative and significant impact on government size. A better quality of investment profile reduces investment risks, including contractual vitality and expropriation, repatriation of profits, and payment delays. The results show that improving the quality of investment environment by reducing uncertainties in contractual bargaining and expropriation, repatriation of profits and delayed payments causes a reduction of public spending.

Results show that "control over corruption" (CC) has a negative impact on government expenditure. The main explanation for this is that "corruption control" reduces losses and, consequently, government expenditure is declining. Numerous studies such as Mauro (1998), Murphy, Shleifer, and Vishny (1993) and Tanzi and Davoodi (1998) essentially support this viewpoint. The impact of control on corruption continues to be negative for both developed and developing countries when examined at sub-sample level. Low-quality institutions allow rent seeking activities that drive resources to an unproductive sector.

Results show that "law and order" (LO) has a negative impact on government expenditure. Explanation of the significant results is substantially like the one presented above; observance of the "rule of law" reduces the chances of rent seeking activities hence corruption. This limits losses (leakages) and reduces the level of public spending. The impact of law and order remains negative and significant in developing countries, but insignificant for developed countries.

Table 6

Impact of Institutions on Government Size: Indicator Wise Analysis[8]

	Full Sample		LMI		UMI	
Indicators	Fixed Effect	Sys-GMM	Fixed Effect	Sys-GMM	Fixed Effect	Sys-GMM
GS	–0.310	0.025	–0.331	0.160	–0.190	0.224
	(0.07)***	(0.10)	(0.13)***	(0.22)	(0.07)***	(0.16)
IP	–0.311	–0.239	–0.369	–0.616	–0.193	0.265
	(0.09)***	(0.22)	(0.16)**	(0.53)	(0.07)***	(0.21)
CC	–0.355	–1.140	–1.620	–1.923	–0.317	0.316
	(0.15)**	(0.39)***	(0.27)***	(0.68)***	(0.16)*	(0.62)
LO	–0.622	0.320	–0.738	0.145	–0.173	0.509
	(0.13)***	(0.39)	(0.26)***	(0.57)	(0.13)	(0.56)
DA	0.116	–0.235	–0.589	–0.701	–0.279	0.059
	(0.10)	(0.28)	(0.17)***	(0.58)	(0.11)***	(0.46)
BQ	–0.042	0.226	–0.770	0.027	–0.520	0.446
	(0.15)	(0.46)	(0.29)***	(0.86)	(0.17)***	(1.04)

Note: "General government final consumption expenditure % of GDP" (GE) is dependent variable. Robust standard errors are reported in parentheses. *, ** and *** denote significance at the 10, 5 and 1 percent levels, respectively.

Results show that "democratic accountability" (DA) has a negative impact on government expenditure. Democratic accountability ensures that the government is responsible for its people. Nawaz (2015) argues that a weak democratic framework allows politicians and public officials to misuse power and facilitates in rent seeking activities. While well-defined and enforced institutions put a limit on use of public resources in the unproductive sector, it leads to a smaller government size. It also allows citizens to expel the government that engages in rents seeking activities. Democratic accountability is more effective in LMI countries than UMI countries. The estimated coefficient is higher for LMI compared to UMI. Profeta et al. (2013) found similar results in case of new economies of the EU.

The "bureaucratic quality" (BQ) has a negative impact on government expenditure in aggregate analysis, which implies that an efficient bureaucracy helps to reduce government size. The impact remains the same in both LMI and UMI countries. Nawaz (2015) argues that a well-defined bureaucratic structure acts as a shock absorber to minimise frequent policy changes and thus reducing rent seeking activities.

5. CONCLUDING REMARKS AND POLICY IMPLICATIONS

This study empirically analysed the impact of political regime and institutions on government size while controlling for socioeconomic differences for a group of middle

[8]Summary of results for different institutional indicators is reported in Table 4 to avoid duplications. The detailed results are available with authors.

income countries over the period 1986-2014. To estimate the model, this study used fixed effects and system GMM estimation techniques. This study has developed an index of institutional quality using six different indicators, including *'government stability'*, *'investment profile'*, *'control over corruption'*, *'law and order'*, *'democratic accountability'* and *'bureaucratic quality'*. Political regime has been defined in three different ways including quality of democracy, type of political regime, and stability of political system. The impact of institutions on government size is also examined at different stages of development, i.e. lower-middle income (developing) and upper-middle (developed) countries.

Empirical analysis has shown that institutions have a negative impact on government size. Furthermore, institutions have a positive impact on "productive" spending while they have a negative impact on "unproductive" spending. Health and education are considered two core productive components of government spending. The analysis supports the main argument that institutions divert resources from unproductive to productive spending. Rent seekers plan the composition of expenditures to offer less allocation in certain categories like education and health, and higher spending for categories such as defense and other major capital projects. Empirical evidence also shows that institutional democracy, political regime, and stability of political system are core political determinants of government size. These outcomes lead to the conclusion that stable democratic systems backed by well-defined institutions could help to manage government size.

Empirical analysis has shown that GDP per capita has a positive significant impact on government size. This finding supports the existence of Wagner's law, which shows that economic activities have had a positive effect on government size. The results also show that the increase in GDP per capita has a relatively greater influence on government expenditure in LMI countries than UMI countries. This has an important implication for policy makers. There is a natural growth of government size linked with the overall economic development of a country. Trade liberalisation has a positive significant impact on government size, implying that the 'compensation hypothesis' may hold in middle income countries.

Various key lessons emerged from the empirical analysis:

- First, the institutional framework should be well-defined and enforced to control government size. This helps to minimise the leakages and unproductive use of public resources.
- Second, a stable democratic system is a pre-requisite to managing government size.
- Third, a country's development frameworks should also be considered while making decisions on the magnitude and composition of public spending.

The existence of Wagner's Law requires constant increase in public spending. This indicates that increase in government size cannot be stopped. The only way to manage government size is to develop institutions and ensure stable democratic systems.

Future research may look at the natural growth rate of government size at different stages of development, keeping in view the growth trajectory of a country. Living standards, population growth, and urbanisation could be key determinants in establishing

the natural growth rate of government size. The impact of institutions on defense expenditures remains insignificant which deserves further analysis especially for developing countries like Pakistan. Future research may also expand the sample size to obtain more robust results, especially to analyse the role of institutions across productive and unproductive expenditures.

APPENDIX

Appendix Table 1

List of Countries Included in Full Sample

1	Albania	20	Gabon	39	Nigeria
2	Algeria	21	Ghana	40	Pakistan
3	Angola	22	Guatemala	41	Panama
4	Argentina	23	Honduras	42	Paraguay
5	Armenia	24	India	43	Peru
6	Bangladesh	25	Indonesia	44	Philippines
7	Bolivia	26	Iran, Islamic Rep.	45	Russian Federation
8	Botswana	27	Iraq	46	Serbia
9	Brazil	28	Jamaica	47	South Africa
10	Bulgaria	29	Jordan	48	Sri Lanka
11	Cameroon	30	Kazakhstan	49	Syrian Arab Republic
12	China	31	Kenya	50	Thailand
13	Colombia	32	Malaysia	51	Tunisia
14	Congo, Rep.	33	Mexico	52	Turkey
15	Costa Rica	34	Moldova	53	Ukraine
16	Dominican Republic	35	Mongolia	54	Venezuela, RB
17	Ecuador	36	Morocco	55	Vietnam
18	Egypt, Arab Rep.	37	Namibia	56	Yemen, Rep.
19	El Salvador	38	Nicaragua		

Source: Author's own.

Appendix Table 2

Descriptive Statistics

	Full Sample			Upper Middle Income			Lower Middle Income		
Variables	Obs.	Mean	SD	Obs.	Mean	SD	Obs.	Mean	SD
GE	1,564	14.06	5.86	777	13.70	6.77	787	14.41	4.77
Y	1,561	7.98	0.78	765	7.39	0.52	796	8.55	0.51
TRD	1,565	72.04	35.89	781	73.19	33.08	784	70.90	38.48
INF	1,576	70.48	511.06	783	81.83	642.77	793	59.27	333.47
Urban	1,620	53.62	17.45	812	45.48	15.87	808	61.80	14.98
PC	1,531	22.17	6.86	762	21.51	6.81	769	22.83	6.86
DEM_Q	1,570	4.92	3.56	793	4.10	3.54	777	5.76	3.39
DEM_T	1,624	0.57	0.50	812	0.48	0.50	812	0.66	0.47
DEM_S	1,624	0.59	0.49	812	0.54	0.50	812	0.64	0.48
INS	1,558	53.44	10.51	769	51.52	10.21	789	55.31	10.46
GS	1,558	7.60	2.07	769	7.66	2.14	789	7.54	2.01
IP	1,558	6.86	1.99	769	6.68	1.84	789	7.04	2.10
CC	1,558	2.48	0.92	769	2.41	0.83	789	2.56	1.00
LO	1,558	3.03	1.15	769	2.93	1.17	789	3.13	1.12
DA	1,558	3.58	1.29	769	3.35	1.28	789	3.81	1.26
BQ	1,558	1.84	0.76	769	1.69	0.74	789	1.98	0.76

Source: Author's own.

Appendix Table 3

Correlation Matrix

Variables	Full Sample	Lower Middle Income	Upper Middle Income
GE	1.000	1.000	1.000
Y	0.1641*	0.2829*	0.0439
TRD	0.2572*	0.4061*	0.1046*
INF	0.1393*	0.2293*	-0.0922*
Urban	0.0762*	0.2175*	-0.1828*
PC	0.0178	0.0419	-0.0289
DEM_Q	-0.0867*	-0.1805*	0.0164
DEM_T	-0.0525*	-0.1627*	0.0781*
DEM_S	0.0796*	-0.0602	0.2695*
INS	0.1019*	0.0327	0.1755*
GS	0.0404	-0.0097	0.1206*
IP	0.0116	-0.1339*	0.1754*
CC	0.1826*	0.2535*	0.1018*
LO	0.0877*	0.0603	0.1138*
DA	-0.0036	-0.0313	0.0058
BQ	0.0530*	0.0098	0.0851*

Source: Author's own.

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Institutions, Regional Integration and Bilateral Trade in South Asia: PPML Based Evidence

SAIMA NAWAZ

This paper empirically investigates the role of institutional framework in promoting bilateral trade through a regional trade agreement (RTA), namely the South Asian Free Trade Area (SAFTA), using an institutions-augmented gravity model. Poisson Pseudo Maximum Likelihood (PPML) estimation technique is used (performed) for a panel of 11 countries over the period 1996-2015. The initial estimation results suggest that this RTA is not effective in promoting regional trade in South Asia. Further empirical analysis reveals that SAFTA contributes significantly to bilateral trade when the impact of institutions is controlled for. The key policy lesson emerging from the analysis is that, given weak institutional structure, a regional agreement may not produce the desired results. Successful trade reforms depend on the institutional framework of the countries involved. Therefore, government should develop institutions to reap the potential benefits of RTAs.

Keywords: Institutions, Regional Integration, Bilateral Trade, South Asia, PPML

1. INTRODUCTION

Recent debate emphasises institutional reforms and regional integration as a means to achieve long term sustainable development. Appropriate institutions can lead to higher development by promoting investment in human and physical capital, and also by inducing innovations through trade (Nawaz, 2015). Regional integration is often considered an effective strategy to stimulate intra-regional trade and economic development. It creates larger markets and new business opportunities for producers and generates a greater level of domestic and foreign investment. It is a way to support the reallocation of resources and the development of regional production networks, which in turn support regional connectivity (Islam, Salim, & Bloch, 2016; Jouanjean, te Velde, Balchin, Calabrese, & Lemma, 2016). It allows free access to regional markets, ensures reduction of tariff and non-tariff barriers, promotes intra-regional trade and investment, and hence, economic development (Akhter & Ghani, 2010; Iqbal & Nawaz, 2017; Jaumotte, 2004; Kubny, Mölders, & Nunnenkamp, 2011).

These arguments have created an exponential increase in regional trade agreements (RTAs) in recent decades.[1] According to the World Trade Organisation

Saima Nawaz <saima.nawaz@comsats.edu.pk> is Assistant Professor, COMSATS University Islamabad (CUI), Pakistan.

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[1]RTAs are reciprocal trade agreements between two or more partners. They include partial scope agreements (PSAs), free trade agreements (FTAs) and customs unions (CUs).

(WTO), around 459 RTAs are notified and implemented across the world as of August 2018.[2] The most successful RTAs are the European Union (EU), the Association of Southeast Asian Nations (ASEAN) and the North American Free Trade Agreement (NAFTA). These regions have shown a significant increase in intra-regional trade after signing these agreements. For example, a 25 percent increase in intra-regional trade among the ASEAN countries, and a 60 percent increase within the EU, is noted.[3] These successful RTAs provide a basis for recommending regional integration in developing regions like South Asia.

South Asian economies established a platform for regional cooperation, called South Asian Association for Regional Cooperation (SAARC), to promote regional prosperity and trade.[4] The SAARC members signed South Asian Free Trade Area (SAFTA) in 2004, enforced in 2006, to boost bilateral trade. Apart from SAFTA, numerous bilateral trade agreements have been signed among member countries. However, it is evident that South Asia fails to reap the potential benefits of regional integration, despite signing multilateral and bilateral trade agreements. South Asia, with 21 percent of the world population, is the least economically integrated part of the world, despite shared history, culture, and trade potential. Intra-regional trade here constitutes less than 5 percent of total trade volume compared to East Asia's 35 percent and Europe's 60 percent, while intra-regional investment is smaller than 1 percent of overall investment (Kathuria & Shahid, 2017). Recent studies have also shown that SAFTA failed to create any significant increase in regional trade in the South Asian region (Dembatapitiya & Weerahewa, 2015; Iqbal & Nawaz, 2017). This begs the question "What are the underlying factors that make SAFTA ineffective?"

Recent literature shows that political differences and weak regulatory framework have had a negative impact on intra-regional trade in South Asia (Kathuria & Shahid, 2017). Iqbal and Nawaz (2017) argue that regional integration becomes effective if and only if RTAs are supported by democratic institutions. This also highlights the role of institutions in ensuring the effectiveness of free trade policies.

Institutions can promote trade and development through multiple channels. Good quality institutions induce specialisation, competitiveness, market expansion and technological advancement through reduced transaction costs. Transaction costs are incurred by the entrepreneur in terms of time, effort, and resources to define, protect and enforce agreements and property rights (Nawaz & Khawaja, 2018; North, 1990). Lack of information is an obstacle to establishing and expanding businesses. Well defined institutions ensure the accessibility of relevant information. Better quality institutions, such as contract enforcement and law and order, lead to lower transaction costs, hence more economic development and better trade opportunities through specialisation and competitiveness. Lower transaction costs provide a conducive environment for business expansions through innovation and adoption of new technologies.

This study argues that institutional framework is the main factor which defines the effectiveness of regional/bilateral trade agreements. These factors lead to greater trade

[2]http://rtais.wto.org/UI/Charts.aspx

[3]http://www.worldbank.org/en/news/infographic/2016/05/24/the-potential-of-intra-regional-trade-for-south-asia

[4]Member states are: (i) Afghanistan, (ii) Bangladesh, (iii) Bhutan, (iv) India, (v) Maldives, (vi) Nepal, (vii) Pakistan and (viii) Sri Lanka.

and development. Intra-regional trade is limited due to mistrust, political tension, and cross-border conflicts; hence, an integrated institutional framework is required to boost trade stemming from regional economic cooperation and integration. However, the scope of that study is relatively limited in that only democratic institutions are considered. Existing literature suggests that a variety of institutions may support trade and development (Nawaz, 2015).

A detailed study is therefore required to examine the role of different institutions in promoting bilateral trade. The available literature primarily uses ordinary least square (OLS) with fixed effects to estimate gravity models. However, recent literature has argued that standard OLS technique may produce upward-biased estimates, while the Poisson Pseudo Maximum Likelihood (PPML) estimation technique may produce more reliable and robust results (Silva & Tenreyro, 2006, 2010, 2011).

To fill the gaps in existing literature, the present study investigates the role of the institutional framework in promoting bilateral trade within SAFTA, using an institutions-augmented gravity model. This study extends the standard gravity model by incorporating institutions as well as the presence/absence of SAFTA in an augmented gravity model. Different types of institutions are used to explain the nexus between regional trade agreements and bilateral trade. The empirical analysis is performed using the PPML estimation technique for a panel of 11 countries over the period 1996-2015. The PPML estimation technique produces reliable and robust results compared to OLS with fixed effects (Afesorgbor, 2017; Silva & Tenreyro, 2006).

The paper is presented as follows:

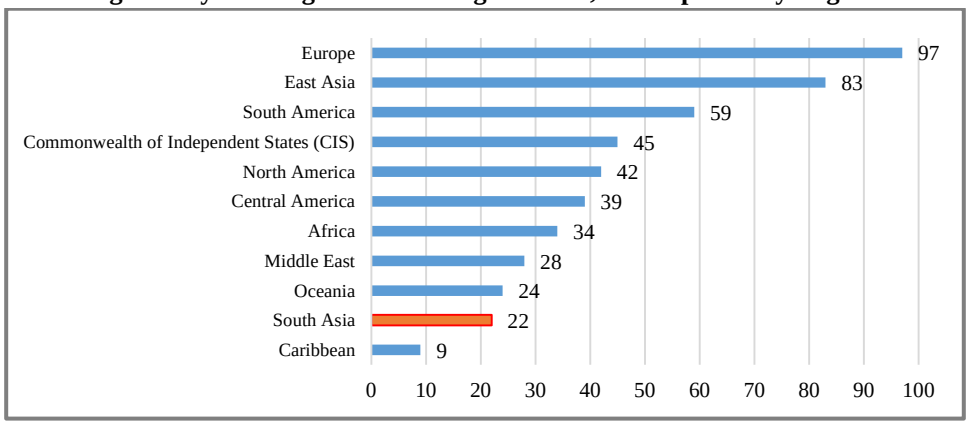
Section 2: Stylised facts
Section 3: A brief overview of existing literature
Section 4: The modelling framework
Section 5: Data and estimation procedure
Section 6: Empirical results and discussion
Section 7: Conclusion with policy recommendations.

2. REGIONAL INTEGRATION AND INSTITUTIONAL FRAMEWORK: STYLISED FACTS

This section provides a comparative analysis of regional trade and institutional framework. According to the WTO, out of 673 RTAs signed as of August 2018, around 459 RTAs are notified and implemented. The WTO counts RTAs based on notification rather than on the physical number of RTAs. For an RTA that includes both goods and services, WTO counts two notifications, i.e. one for goods, and one for services, despite it being physically one RTA.

Around 287 “physical” RTAs are signed and implemented. The notion “Physical” RTA regroups them according to which goods and services aspects are notified separately. This includes both active RTAs—those still in force, and inactive RTAs–those that concluded in the past and are no longer in force. Figure 1 shows that every region in the world has signed physical RTAs. South Asian countries have signed 22 physical RTAs with different countries and regions.

Fig. 1. Physical Regional Trade Agreements, Participation by Region[5]



Source: (WTO, 2018).

We find that intra-regional trade is high among East Asia & Pacific countries (50.2 percent exports and 50.3 percent imports), Europe & Central Asia (69.8 percent exports and 67.1 percent imports), and North America (30.7 percent exports and 18.7 percent imports). The overall intra-regional trade volume in South Asia, however, remains very low in spite of signing SAFTA. The region remains relatively un-integrated compared to other regions of the world despite shared history, culture, and borders. The regional trade share is very low, falling from 3 percent to 5 percent of total trade. Table 1 indicates that bilateral trade between South Asian countries remains low. India's exports to South Asia are 6.7 percent only, while Pakistan has 12.8 percent exports. Similarly, imports are very low from other South Asian countries (Table 1). The major export destinations and import sources are located outside the region, comprising of both developed countries and fast-growing countries in East Asia. The USA, UAE, and China are three major export destinations for South Asian countries.

Table 1

Regional Trade Analysis (Within in Region)

Region/Country	Exports	Imports
East Asia & Pacific (EAP)	50.2	50.3
Europe & Central Asia (ECA)	69.8	67.1
Latin America & Caribbean (LAC)	15.6	13.9
Middle East & North Africa (MENA)	13.0	10.0
North America	30.7	18.7
Sub-Saharan Africa (SSA)	29.6	16.7
Others	0.4	3.0
South Asia	7.0	2.4
Trade in South Asia		
India	6.5	0.7
Pakistan	12.8	4.6
Afghanistan	70.8	11.5
Sri Lanka	9.9	21.8
Maldives	11.5	19.7

Source: (World Bank, 2018a).

[5]For composition of regions, see http://rtais.wto.org/userguide/User%20Guide_Eng.pdf. RTAs involving countries/territories in two (or more) regions are counted more than once.

Why have South Asian economies failed to develop bilateral trade despite shared history, culture, borders and regional integration initiatives? Apart from tariff and non-tariff barriers, an unsatisfactory institutional framework may be a major hurdle to boosting trade. Table 2 shows how various regions and the individual South Asian countries rank among all the countries in the world according to several governance indicators. The highest rank is 100 indicating the highest quality, while the lowest is zero indicating the lowest quality. It is evident that South Asian economies ranked very low as compared to other regions of the world, especially East Asia & Pacific, North America, and Europe & Central Asia.

Table 2

Worldwide Governance Indicators [Percentile Rank (0-100)]

Region	Voice and Accountability	Political Stability and Absence of Violence	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
EAP	66	65	53	51	57	56
ECA	54	60	69	70	66	64
LAC	66	60	54	55	50	54
MENA	25	27	44	42	44	44
North America	90	79	92	88	89	91
SSA	33	32	26	28	30	31
South Asia	36	30	37	29	36	34
Afghanistan	21	1	10	7	4	3
Bangladesh	31	10	25	22	31	21
Bhutan	45	83	70	27	68	83
India	59	14	57	41	52	47
Maldives	26	60	41	35	36	29
Nepal	39	19	20	24	20	24
Pakistan	29	1	29	27	20	19
Sri Lanka	43	50	45	51	54	48

Source: (World Bank, 2018b).

This discussion reveals the possibility that institutional bottlenecks may be the source of low trade volumes among South Asian countries despite their having numerous bilateral and multilateral trade agreements. These bottlenecks undermine the trade potential and divert trade to other regions and countries.

3. AN OVERVIEW OF EXISTING LITERATURE

In this section, we provide a snapshot of existing literature discussing the relationship between institutions, RTAs, and bilateral trade with reference to the South Asia region, especially SAFTA. Numerous studies have investigated the welfare gains and trade creation under RTA regimes for different parts of the world.

Kurihara (2011) investigated the impact of RTAs on bilateral trade for OECD and non-OECD countries. This study finds that RTAs are more effective in OECD countries, as compared to non-OECD countries, in promoting trade. This study further argues that the potential effects of RTAs on bilateral trade vary among different regions and depend on the institutional arrangements of the participating economies.

Bureau and Jean (2013) argue that bilateral trade can increase considerably through RTAs. This study finds that RTAs have a significant impact on pre-existing trade flows as well as on new trade flows. Carrere (2006) examined the impact of RTAs on

trade using a gravity model for 130 economies (developed and developing) for the period 1962-1996 and found positive associations between RTAs and bilateral trade.

Baier and Bergstrand (2007) find that a free trade agreement (FTA) doubles bilateral trade between member countries after a period of 10 years. Recently, Afesorgbor (2017) examined the trade creation effects of African RTAs using meta-data analysis approach based on gravity model. This study concludes that African RTAs have a positive impact of about 27 percent-32 percent on trade.

In the case of South Asia, various studies have shown that regional integration can be beneficial for all countries especially for India and Pakistan (Govindan, 1996; Pigato et al. 1997). Qamar (2005) says that Pakistan can benefit by entering a large market for its exports, while improving reserves significantly, by replacing relatively costly imports from the rest of the world with imports from India, under the Most Favoured Nation (MFN) status.

Various studies argue that SAFTA is instrumental in boosting regional trade (Shaikh & Rahpoto, 2009; Shaikh, Syed, Shah, & Shah, 2012). Shaikh and Rahpoto (2009) show that under the SAFTA arrangement, Pakistan can enjoy consumer surplus in exports of products like food items, cotton garments, dates, and leather. Using Computable General Equilibrium (CGE), Shaikh et al. (2012) also found similar results. Recently a study shows that SAFTA is associated with an increase in bilateral trade flows within its member countries as well as between member and non-member countries (Regmi, Devkota, & Upadhyay, 2017).

On the other hand, some studies have argued that SAFTA is not effective in promoting regional trade. They argue that SAFTA fails to expand regional trade, because SAFTA member economies are comparatively small. Furthermore, non-tariff restrictions among the member countries of SAFTA may cause trade diversion. Member countries are trading with countries that are not part of SAFTA, mainly developed regions like the USA, the EU and the Middle East (Baysan, Panagariya, & Pitigala, 2006).

Akhter and Ghani (2010) find a negative association between SAFTA and bilateral trade using a gavity model approach. This study concludes that SAFTA may not be benefical in the short run but would be beneficial in the long run. Dembatapitiya and Weerahewa (2015) measure the impact of various bilateral and multilateral trade agreements especially SAFTA and EU on bilateral trade using a gravity model. This study finds that SAFTA has an insignificant impact on bilateral trade in contrast with the EU, which has had a significant impact on bilateral trade (Dembatapitiya & Weerahewa, 2015).

Recently, Iqbal and Nawaz (2017) examined MFN and SAFTA on bilateral trade in South Asia. This study is based on a panel of eight countries from South Asia covering the period of 1975-2013. Standard gravity model is estimated using fixed effect model. This study finds that SAFTA and MFN have a positive but insignificant impact on bilateral trade.

As to why RTAs are effective in a developed region like the EU and ineffective in developing regions like South Asia, the literature indirectly points to the ability of institutional arrangements to channel trade among member countries. Poor quality institutions act as a binding constraint on trade volumes. Anderson and Marcouiller (2002) empirically show that well defined institutions significantly increase trade in Latin

American countries. This study shows that high levels of corruption and the weak enforcement of contracts reduces international trade. Inefficient institutions constrain trade as much as tariffs do. Cross-country variations in the effectiveness of institutions offer reasons for disproportionate trade among developed and developing economies.

De Groot, Linders, Rietveld, and Subramanian (2004) analyse the impact of institutions on trade. This study uses a gravity model to assess the impact of institutions on trade and finds that a better quality of formal institutions promotes bilateral trade. The estimates show that an increase in quality of institutions of one standard deviation causes an increase of around 30 percent to 44 percent in bilateral trade among trading partner countries (De Groot et al. 2004).

Dutt and Trace (2010) measure the impact of corruption by the customs officials on bilateral trade using a corruption-augmented gravity model. This study finds a dual role of corruption in term of extortion and evasion and concludes that corruption acts as a hidden tax on trade when customs officials in the importing countries demand bribes from exporters. This so-called extortion effect reduces bilateral trade. On the other hand, if tariffs are high, corruption may induce bilateral trade when corrupt public officials allow exporters to escape tariffs by paying bribes ("evasion effect").

De Jong and Bogmans (2011) examine the relationship between institutions (institutional quality) and bilateral trade using the standard gravity model approach. This study finds that corrupt institutions decrease trade volume. Wu, Li, and Samsell (2012) investigate the effect of a country's governance structure on trade. For this purpose, this study divides countries into three types based on mode of governance: (i) rules-based, (ii) relations-based, and (iii) family-based. This study finds that both rules-based and relations-based modes of governance impact positively on trade volumes, with rules-based governance being the more effective(Wu, Li, & Samsell, 2012).

Naanwaan and Diarrassouba (2013) analyse the impact of institutions, measured using an economic freedom index, on bilateral trade among 33 African countries, using an unbalanced panel and employing an augmented gravity model. The study found that improvement in both exporter and importer economic freedom indexes tends to generate more intra-regional bilateral trade. They argue that economic freedom comprises institutional arrangements that reduce transaction costs associated with international trade. The improvement in the quality of economic institutions helps to remove barriers that hamper intra-regional trade (Naanwaab & Diarrassouba, 2013).

Francois and Manchin (2013) find that good-quality institutions have a significant positive impact on bilateral trade; showing that trade is linked with the institutional framework of the country. de Mendonça, Lirio, Braga, and da Silva (2014) investigate the impact of differences in institutional quality among economies on bilateral trade flows of agricultural products. This study applies the standard gravity model approach to a sample of 59 countries for the period 2005-2010 and concludes that institutions are important in explaining differences in trade volumes (de Mendonça, Lirio, Braga, & da Silva, 2014).

The available literature clearly shows the importance of institutional parameters in promoting bilateral trade. Countries with well-defined and effective institutions can reap the potential benefits of regional integration. This current paper extends the existing literature by studying the role of institutions in a comprehensive way. Various institutional dimensions are used to establish the association between institutions, regional integration and bilateral trade.

4. THE MODEL

The theoretical framework to explain bilateral trade is based on a gravity model. The standard gravity model, introduced by Tinbergen (1962), is used to estimate the impact of economic development measured by GDP, and transaction costs measured by distance, on bilateral trade. The model predicts that bilateral trade among economies is positively linked with GDP (development/growth) and negatively related to costs of trade (Bergstrand, 1989). Anderson and van Wincoop (2003) and Helpman, Melitz, and Rubinstein (2008) provide comprehensive descriptions of the gravity model. The basic gravity model is as follows:

$$X_{ij} = G\frac{Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}}\eta_{ij} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where X_{ij} is volume of trade from country i to country j; Y_i and Y_j represent GDP of countries i and j, respectively; D_{ij} denotes the distance in kilometres between the capital cities of two countries and η_{ij} indicates the error term with expectation equal to one. The standard approach of estimation for this equation is to take logs on both sides:

$$\ln(X_{ij}) = \beta_0 + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) + e_{ijt} \quad \ldots \quad \ldots \quad (2)$$

Apart from D_{ij}, common borders (CB_{ij}), common language (CL_{ij}) and the condition of being landlocked (LL_i) are also used to comprehend trade cost. After adding these factors, the expanded version is as given below:

$$\ln(X_{ijt}) = \beta_0 + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) + \beta_4 \ln(PCY_{it} - PCY_{jt}) + b_1(CB_{ij}) + b_2(CL_{ij}) + b_3(LL_i) + e_{ijt} \quad \ldots \quad \ldots \quad (4)$$

where $(PCY_{it} - PCY_{jt})$ measures difference in GDP per capita of reporter and partner countries uses to test the existence of the Linder hypothesis, which is also called the "demand-similarity" hypothesis. The Linder hypothesis argues that the more similar the demand structures of countries, the more they will trade with one another (Borkakoti, 1998; Linder, 1961). *CB* is a dummy variable indicating a common border; *CL* is a dummy for common language; and *LL* is a dummy for being landlocked. Following the existing literature, this study incorporates institutions and regional integration in the model to quantify the impact of the institutional framework and regional integration on bilateral trade (Anderson & Marcouiller, 2002; De Groot et al. 2004; De Jong & Bogmans, 2011; de Mendonça et al. 2014; Dutt & Traca, 2010; Francois & Manchin, 2013; Iqbal & Nawaz, 2017; Naanwaab & Diarrassouba, 2013). This study argues that institutions may have direct as well as indirect impact on bilateral trade (Yu, 2010). Literature shows that well defined and enforced institutions can promote trade indirectly by ensuring the implementation of free trade agreements like SAFTA (Iqbal & Nawaz, 2017).

The augmented gravity model is as follows:

$$\ln(X_{ijt}) = \beta_0 + \beta_1 \ln(Y_{it}) + \beta_2 \ln(Y_{jt}) + \beta_3 \ln(D_{ij}) + \beta_4 \ln(PCY_{it} - PCY_{jt}) + b_1(CB_{ij}) + b_2(CL_{ij}) + b_3(LL_i) + \theta_1(RI_{ijt}) + \theta_2 \ln(INS_{it}) + \theta_3 \ln(INS_{jt}) + \varphi_1(RI_{ijt}) * \ln(INS_{it}) + \varphi_2(RI_{ijt}) * \ln(INS_{jt}) + e_{ijt} \quad \ldots \quad \ldots \quad (4)$$

where (RI_{ijt}) is a dummy variable for the existence of a RTA between two countries i.e. reporter i and partner j, namely SAFTA; (INS_{it}) and $\left(INS_{jt}\right)$ measure institutional quality index for the reporter country and the partner country respectively. This proposed model (Equation 4) is used to examine the impact of regional integration after controlling for institutional quality. It is expected that $\forall\theta > 0$ implying that regional integration and institutions have a positive impact on bilateral trade.

To examine the complementarity between regional integration and institutions, an interactive term is also used. The coefficient φ captures the impact of regional integration after interacting with institutions. The Equation 4 shows that the marginal impact of regional integration on bilateral trade now explicitly depends on the value of institutions implying that:

(i) $\Delta\ln(X_{ijt}) = \theta_1 + \varphi_1\ln(INS_{it})$ in case of reporter countries only

(ii) $\Delta\ln(X_{ijt}) = \theta_1 + \varphi_2\ln\left(INS_{jt}\right)$ in case of partner countries only

On the other hand, the impact of institutions on bilateral trade depends on the value of regional integration dummy which can take two forms i.e. $\left(\frac{\partial\ln(X_{ijt})}{\partial(INS)}\middle|RI_{ijt} = 1\right) = \theta + \varphi$ and $\left(\frac{\partial\ln(X_{ijt})}{\partial(INS)}\middle|RI_{ijt} = 0\right) = \theta$; $\forall\theta$ and $\forall\varphi$.

5. DATA DESCRIPTION AND ESTIMATION METHODOLOGY

5.1. Data Description

To estimate the impact of regional integration on bilateral trade, this study uses a panel of eleven countries. The focus of this study is limited to assessing the impact of SAFTA; hence, the choice of countries is primarily limited to SAFTA members and their close trading partners.[6] The data span covers 1996-2015. The data on bilateral trade volumes are taken from the International Monetary Fund (IMF)'s Direction of Trade Statistics (DOTS). Following the literature, data on bilateral trade are taken in current US$ (Carrere, 2006, Iqbal & Nawaz, 2017). The data on the Gross Domestic Product (GDP) at current US$ and GDP per capita in current US$ are retrieved from the World Bank's World Development Indicators (WDI) database available online. The data on distances between countries, common borders, common language and being landlocked are taken from the "*Centre d'Etudes Prospectives et d'Informations Internationales (CEPII)"*[7]. The data for institutional quality are taken from the Worldwide Governance Indicators (WGI).

To measure the impact of regional integration (RI_{ijt}), this study uses dummy variable of SAFTA which is constructed as 1 if both reporting and partner countries are member of SAFAT and otherwise 0. Numerous studies have used similar method to construct regional integration variable (Iqbal & Nawaz, 2017; Jugurnath, Stewart, & Brooks, 2007).

[6]The list of countries, with SAFTA members italicised, includes: (i) *Afghanistan*; (ii) *Bangladesh*; (iii) China; (iv) Indonesia; (v) *India*; (vi) Iran; (vii) *Sri Lanka*; (viii) *Maldives*; (ix) Malaysia; (x) *Nepal*; and (xi) *Pakistan*. Bhutan is excluded due to non-availability of data on bilateral trade.

[7] http://www.cepii.fr/cepii/en/bdd_modele/bdd.asp

The institutional quality index (INS) is developed using the World Governance Indicators (WGI) dataset. This data provides six different dimensions to capture institutional quality. These include: (1) "Control of corruption" (CC); (2) "Government effectiveness" (GE); (3) "Political stability and absence of violence/terrorism" (PA); (4) "Regulatory quality" (RQ); (5) "Rule of law" (RL) and (6) "Voice and accountability" (VA). Each dimension falls within the range of –2.5 and +2.5. Where lower value means weak institutions and vice versa. Two types of institutional quality index are developed with two steps procedure. In first step, each indicator is normalised with range from 0 to 1. In step two, following formula is used to construct final index:

$$INS_S = \frac{1}{6}(\mathrm{CC} + \mathrm{GE} + \mathrm{PA} + \mathrm{RQ} + \mathrm{RL} + \mathrm{VA}) * 100$$

To establish the robustness of results, weighted average series are also used to construct institutional quality index. Weights are calculated using the Principal Component Method (PCM). The first principal component that explains the maximum amount of variation is used to find the weight of each dimension. Following formula is used to construct final weighted institutional quality index:

$$INS_w = [(CC * 0.183) + (GE * 0.185) + (PA * 0.160) + (RQ * 180) + (RL * 0.189) + (VA * 103)] * 100$$

The economic development is measured using Gross Domestic Product (GDP) and GDP per capita in current US$. Differences in GDP per capita in current US $ between reporting and partner countries is used to measure the impact of Linder Hypothesis. The landlocked (LL) is a dummy variable set equal to 1 for landlocked countries otherwise 0. The common border (CB) is a dummy variable indicating 1 for common border otherwise 0. The common language (CL) is a dummy for common language; 1 if both countries have same language, otherwise 0. The distance (D) is defined as the distance in kilometre between the capital cities of two countries. The dependent variable is bilateral trade. It is defined as total bilateral trade volume in current US$. The log transformation is applied on all continuous variables. The descriptive statistics of all variables are reported in Table 3.

Table 3

Summary Statistics

Variables	Mean	Std. dev	Max	Min	Skewness	Kurtosis
$LN(X_{ij})$	18.72	3.34	25.39	4.44	-0.80	4.03
$LN(Y_i)$	25.18	2.22	30.03	19.93	-0.25	2.65
$LN(Y_j)$	25.18	2.22	30.03	19.93	-0.25	2.65
$D(LN(PCY))$	7.14	1.36	9.27	1.09	-0.93	3.85
$LN(D)$	7.93	0.63	8.91	5.93	-1.12	3.91
LL	0.18	0.39	1.00	0.00	1.65	3.72
CL	0.05	0.23	1.00	0.00	3.92	16.39
CB	0.20	0.40	1.00	0.00	1.50	3.25
RI	0.19	0.39	1.00	0.00	1.57	3.47
INS_s	3.58	0.37	4.11	2.05	-1.75	7.31
INS_w	3.59	0.38	4.13	2.05	-1.72	7.14

Source: Author's own calculation.

5.2. Estimation Methodology

To estimate the proposed institutions augmented gravity model, this study has used a panel data estimation method. The use of panel technique in estimating effects is considered an effective procedure as it helps to enhance sample size and control unobservable factors and individual heterogeneity (Iqbal & Daly, 2014; Nawaz, 2015; Nawaz, Iqbal, & Khan, 2014; Nawaz & Khawaja, 2018). The standard method to estimate log-linearized gravity model is ordinary least squares (OLS). However, recent literature argues that interpretation of parameters of log-linearized model estimated by OLS as elasticities can be highly misleading in the presence of heteroscedasticity (Silva & Tenreyro, 2006, 2010, 2011).

This literature proposes Poisson Pseudo Maximum Likelihood (PPML) estimator to estimate robust and reliable estimates of nonlinear gravity model. Based on this, the empirical analysis is performed using the Poisson Pseudo Maximum Likelihood (PPML) estimator. In log-linearised models, the PPML estimator produces more reliable and robust results than OLS with fixed effects; the PPML estimator provides consistent elasticity estimates even in the presence of heteroscedasticity. PPML estimators are robust to heteroscedasticity because the second or higher moment conditions are absent from the estimation procedure. PPML is consistent in the presence of fixed effect dummies and has several advantages over other estimators: it tackles heteroscedasticity, model misspecifications and zeros in data (Prehn, Brümmer, & Glauben, 2016).

The PPML estimator is exactly equivalent to running a type of nonlinear least squares on the original equation, hence produces consistent estimates of the original nonlinear model. Empirical literature confirms that the PPML estimator produces robust estimates, even in the case of over dispersion and when the dependent variable has a large number of zeros (Silva & Tenreyro, 2006).

To meet the Poisson model assumption of the conditional mean being proportional to the conditional variance, it is assumed that weights are proportional to the value of their observations and set $\exp(X\beta)\, X = X$. These weights are attached to the residuals of country pairs. This assumption coincides with the first-order conditions of the Poisson Maximum Likelihood (ML). This shows that there are no distributional assumptions; therefore, the dependent variable does not have to be Poisson distributed. This approach simplifies the first-order conditions to ease estimation and so to approximate the objective, therefore the name "pseudo" (or quasi). The Poisson model is given as:

$$Pr(Y = k|x) = \frac{\exp(-\lambda)}{k!} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

for $Y \geq 0$. Where $\lambda = exp(X\beta)$. The ML estimation is given as:

$$\hat{\beta} = \underbrace{\arg max}_{\hat{\beta}} \sum[-exp(X\beta) + Y(X\beta) - lnY!] \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

with first-order conditions:

$$\frac{\partial \hat{\beta}}{\partial \beta} = \sum[Y - exp(X\beta)]X = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

These are not the real first order conditions of the log likelihood function, hence are "pseudo", but they easier to calculate as the second factor is simplified. Furthermore, these estimators are consistent and asymptotically normal (Magerman, Studnicka, & Van Hove, 2016).

6. RESULTS AND DISCUSSION

Estimation begins with a basic gravity model that includes only GDP, inter-country distance, and dummies for common border, common language, and being landlocked. This basic gravity model is estimated by applying the PPML method and OLS with and without time and/or cross-section fixed effects. The use of various estimators and model specifications helps to ensure robustness of results. The results of the basic model are reported in Table 4.

Table 4

Basic Gravity Model

	(1)	(2)	(3)	(4)	(5)
Variables	OLS	FE	FE	FE	PPML
$LN(Y_i)$	0.915	1.029	0.260	1.714	0.089
	(0.03)***	(0.03)***	(0.05)***	(0.22)***	(0.01)***
$LN(Y_j)$	1.031	1.119	1.117	1.124	0.060
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.00)***
$D(LN(PCY))$	–0.285	–0.238	–0.688	–0.732	–0.039
	(0.03)***	(0.03)***	(0.04)***	(0.04)***	(0.00)***
$LN(D)$	–1.239	–1.441	–1.925	–1.971	–0.108
	(0.07)***	(0.08)***	(0.08)***	(0.08)***	(0.00)***
LL	–1.970	–1.608	–1.738	–4.390	–0.218
	(0.16)***	(0.15)***	(0.30)***	(0.53)***	(0.03)***
CL	–0.419	–0.569	–1.017	–1.051	–0.064
	(0.20)**	(0.21)***	(0.19)***	(0.19)***	(0.01)***
CB	–0.046	–0.372	–0.287	–0.312	–0.021
	(0.08)	(0.09)***	(0.08)***	(0.08)***	(0.00)***
Constant	–20.279	–23.143	–3.148	–32.411	0.244
	(0.92)***	(0.95)***	(1.29)**	(4.45)***	(0.25)
Observations	1,983	1,983	1,983	1,983	1,983
R-squared	0.754	0.775	0.818	0.823	0.795
Year FE	NO	YES	NO	YES	YES
Country FE	NO	NO	YES	YES	YES

Source: Author's own calculation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The estimation results reveal that the GDP has a positive and significant effect on bilateral trade among the given panel of countries. This shows that domestic progress i.e. economic development of the country is one of the major determinants of its trade volume. The PPML-estimated coefficients, which are elasticity estimates, are 0.089 and 0.060 for reporting and partner countries, respectively. The estimated coefficients are significant at the 1 percent level (Table 4). The results reveal that a 10 percent increase in GDP of reporting and partner countries would lead to 0.8 percent and 0.6 percent increase in bilateral trade among sample countries, respectively. Various other studies have reported similar outcomes (Dembatapitiya & Weerahewa, 2015; Gul & Yasin, 2011; Iqbal & Nawaz, 2017).

The distance variable has a negative and significant impact on bilateral trade. The PPML-estimated coefficient is –0.108 and is significant at the 1 percent level implying that 10 percent increase in distance between two trading countries would lead to 1 percent reduction in bilateral trade. Numerous studies have reported similar results (Dembatapitiya & Weerahewa, 2015; Gul & Yasin, 2011; Iqbal & Nawaz, 2017). The estimated elasticity is in accordance with existing studies. Disdier and Head (2008), using meta-data analysis approach based on 1,467 estimates from 103 papers, conclude that the size of the distance effect is close to 0.9.

The per capita income differences variable is used to study the comparative existence of the Linder hypothesis with reference to the Heckscher Ohlin proposition. The results show that per capita GDP difference variable has a significant negative impact on bilateral trade. The findings of a negative and statistically significant effect of differences in per capita income provide evidence in favour of the Linder hypothesis. The results indicate that the smaller the difference of per capita income between two countries, the bigger the volume of bilateral trade. Therefore, the more similar the demand structures of countries, the more they will trade with one another. The estimated coefficient indicates that a 10 percent reduction in GDP per capita difference between two countries would lead to 0.39 percent increase in bilateral trade. Numerous studies have supported this finding (Choi, 2002; Rauh, 2010).

Further, the results show that the dummy for landlocked countries (LL) is significant and has a negative sign. This indicates that being landlocked reduces bilateral trade. The estimated coefficients for this dummy variable are statistically significant at 1 percent. The estimated result shows that bilateral trade will be 19 percent [exp (–0.218)-1 = –0.195] lower if a country is landlocked rather than not. The common border (CB) dummy has a significant negative impact on trade. The coefficients are statistically significant at 1 percent. The estimated result shows that the bilateral trade is 2 percent [exp (–0.021) –1 = –0.020] lower than expected among countries having common border.

Apparently, the result seems contradictory to existing literature. For example, Akhter and Ghani (2010) reported that bilateral trade would increase 3.22 time if member countries share a common border. However, by looking at the trading pattern of countries having common border in South Asia, the results can be justified. For example, Pakistan has a common border with India and Afghanistan. However, trade with these countries, especially India, is restricted due to non-tariff barriers due to political conflicts, institutional hurdles, and procedural requirements. Further, much of the border trade between Pakistan and Afghanistan, Pakistan, and India is underground and unrecorded. These factors led to a negative impact of common border on bilateral trade. Gul and Yasin (2011) and Iqbal and Nawaz (2017) also find similar results.

To quantify the impact of regional integration: SAFTA, the gravity model is augmented and re-estimated using both the PPML estimator and OLS with fixed effects. The results are presented in Table 5. The impact of all basic variables including GDP, distance, LL, CB and CL on bilateral trade remain same as shown in Table 4. The empirical analysis now shows that the regional integration has a negative and significant association with bilateral trade among sample countries. This implies that SAFTA, a regional trade agreement among South Asian countries, may not produce the desired

Table 5

Institutions and Regional Integration Augmented Gravity Model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	FE	FE	FE	FE	PPML	PPML	PPML
$LN(Y_i)$	0.895	1.044	1.043	1.026	0.056	0.056	0.055
	(0.02)***	(0.03)***	(0.03)***	(0.02)***	(0.00)***	(0.00)***	(0.00)***
$LN(Y_j)$	0.981	1.108	1.108	1.092	0.059	0.059	0.058
	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.00)***	(0.00)***	(0.00)***
$D(LN(PCY))$	-0.179	-0.341	-0.355	-0.328	-0.017	-0.017	-0.006
	(0.02)***	(0.03)***	(0.03)***	(0.03)***	(0.00)***	(0.00)***	(0.00)***
$LN(D)$	-1.427	-1.439	-1.455	-1.494	-0.084	-0.085	-0.084
	(0.06)***	(0.08)***	(0.08)***	(0.07)***	(0.00)***	(0.00)***	(0.00)***
LL	-1.517	-1.024	-1.009	-1.038	-0.057	-0.054	-0.074
	(0.12)***	(0.15)***	(0.15)***	(0.14)***	(0.01)***	(0.01)***	(0.01)***
CL	-0.666	-0.543	-0.557	-0.561	-0.038	-0.038	-0.037
	(0.17)***	(0.21)***	(0.21)***	(0.16)***	(0.01)***	(0.01)***	(0.01)***
CB	-0.533	-0.246	-0.251	-0.311	-0.022	-0.022	-0.022
	(0.07)***	(0.08)***	(0.08)***	(0.11)***	(0.00)***	(0.00)***	(0.00)***
RI_SAFTA	-1.006			-0.448	-0.023	-0.192	0.075
	(0.11)***			(0.11)***	(0.01)***	(0.10)*	(0.07)
INS_{SR}		1.690		1.587	0.080	0.072	
		(0.18)***		(0.15)***	(0.01)***	(0.01)***	
INS_{SP}							0.066
							(0.01)***
INS_{WR}			1.749				
			(0.17)***				
$RI * INS_{SR}$						0.048	
						(0.03)*	
$RI * INS_{SR}$							0.029
							(0.02)*
Constant	-16.192	-29.549	-29.627	-27.876	0.445	0.397	0.527
	(0.82)***	(1.14)***	(1.11)***	(1.04)***	(0.08)***	(0.08)***	(0.06)***
Observations	1,983	1,983	1,983	1,983	1,983	1,983	1,983
R-squared	0.743	0.789	0.790	0.791	0.765	0.765	0.763
Year FE	YES	YES	YES	YES	YES	YES	YES

Source: Author's own calculation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

results i.e. boosting bilateral trade. Some recent studies have also concluded that SAFTA failed to create a significant increase in intra-regional trade in the South Asian region (Dembatapitiya & Weerahewa, 2015; Iqbal & Nawaz, 2017). This shows that South Asia may not be able to reap the potential benefits of economic integration through trade at their full potential. These results are supported by recent studies (Iqbal and Nawaz, 2017).

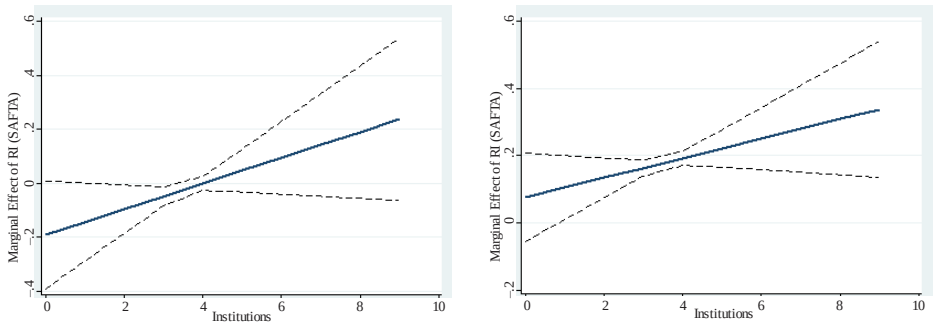
Why has this region failed to achieve the benefits of its trade agreement? Is SAFTA irrelevant? To probe these questions, this study extends the model to control for the quality of the institutional framework. To quantify the role of institutional setup in the country, an institutional quality index (INS) is constructed as explained in section 5. Two types of indices are constructed; one with simple average of all indicators (INS_s) and other with weighted average (INS_w). Furthermore, (INS_s) is incorporated in the model in two ways: (i) institutional quality index for the reporter country (INS_{jt}) and (ii) institutional quality index for the partner country (INS_{jt}).

The institutions augmented gravity model estimation results are reported in columns (2)-(7) of Table 5. The estimation results show that INS have a significant positive direct impact on bilateral trade. The estimated coefficients range from 0.08 to 0.66. This indicates that a 10 percent increase in institutional quality would lead to .8 percent to 0.6 percent increase in bilateral trade in case of PPML estimator. However, estimated coefficients are very high in case of fixed effect (from 1.7 to 1.5). This implies that supportive institutions are necessary to promote bilateral trade. Furthermore, impact of reporter country institutions (INS_{SR}) is relatively higher (0.072) as compared to partner country institutions (INS_{SP}) (0.066).

To assess the complementarity between regional integration and institutions, interactive terms of regional integration and institutions ($RI * INS$) are added in the model. Two different interactions are included; namely $(RI_{ijt}) * \ln(INS_{it})$ and $(RI_{ijt}) * \ln(INS_{jt})$ that capture the interaction of regional integration with reporter country institutions and partner country institutions, respectively. The results are reported in model 6 and 7 in Table 5. The result shows that the interaction term have a positive and significant impact on bilateral trade. This implies that institutional arrangements play an important role in ensuring the effectiveness of regional trade agreements. We know from the estimation result that the coefficient on $(RI_{ijt}) * \ln(INS_{it})$ is positive implying that the reductive effect declines as the quality of institutions increases.

However, Brambor, et al. (2006) shows that it is incorrect to decide on the inclusion of the interactive term simply by looking at the significance of the coefficient of the interactive variable. The marginal effect of SAFTA on bilateral trade should be observed by constructing confidence intervals for the estimates of coefficient of SAFTA and interactive term of SAFTA and institutions over the possible values of the institutions. The solid sloping line in Figure 2 indicates how the marginal effect of SAFTA changes with the increase in institutional quality. The confidence intervals around the line allow us to determine the condition under which institutions have a statistically significant effect on the bilateral trade – they have a statistically significant effect whenever the upper and lower bounds of the confidence interval are both above (or below) the zero line (Brambor et al., 2006).

Fig. 2. Determining the Range of Significance of the Marginal Effect of RI*INS



Note: Author's own formulation based on model 6 & 7 reported in Table 5.
Dashed lines show the 95 percent confidence band.

In Figure 2 the marginal effect of SAFTA on bilateral trade against different value of institutions is shown. It can be observed that significant contribution of SAFTA is only possible when institutional quality is sufficiently high. This implies that the complementary association should be considered with caution as the association yields positive trade only when the quality of institutions become very high. The estimated coefficient of interaction term is small as compared to coefficient of SAFTA.

Well defined institutions provide a pathway to implement required reforms and channelise resources needed for bilateral trade. A well-defined institutional framework helps to implement in practice the agreements reached in principle in an RTA. Iqbal and Nawaz (2017) also provide grounds to argue that "*SAFTA is not effective in promoting trade due to low institutional quality and stringent non-institutional arrangements, including high tariff along with low physical infrastructure. Both SAFTA and MFN can only contribute to bilateral trade significantly, if complemented by institutional framework*".

Apart from the overall institutional quality index, individual indicators of the various dimensions of institutional quality can also be used to gauge the contribution of the institutional framework to bilateral trade volume. The results based on PPML estimator are reported in Tables 6 & 7. The estimation results show that all dimensions of institutional quality have a positive and significant impact on bilateral trade. Control over corruption (CC) and government effectiveness (GE) make a relatively higher contribution to trade volume, whereas rule of law (RL), regulatory quality (RQ) and political stability and absence of violence/terrorism (PA) make a relatively low contribution.

Table 6

Institutions and Regional Integration Augmented Gravity Model: Components of Institutions (PPML Estimator)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	*INS_CC*	*INS_GE*	*INS_PA*	*INS_RL*	*INS_RQ*	*INS_VA*
$LN(Y_i)$	0.056	0.055	0.057	0.056	0.057	0.055
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$LN(Y_j)$	0.059	0.060	0.060	0.059	0.059	0.059
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$D(LN(PCY))$	-0.021	-0.024	-0.016	-0.017	-0.017	-0.012
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$LN(D)$	-0.086	-0.089	-0.090	-0.082	-0.087	-0.086
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
LL	-0.073	-0.047	-0.071	-0.055	-0.055	-0.076
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
CL	-0.044	-0.049	-0.039	-0.040	-0.042	-0.037
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
CB	-0.021	-0.021	-0.031	-0.021	-0.025	-0.028
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
RI_SAFTA	-0.168	-0.344	-0.053	-0.154	-0.297	-0.429
	(0.11)	(0.11)***	(0.03)*	(0.09)*	(0.11)***	(0.13)***
INS_{SR}	0.286	0.299	0.085	0.190	0.203	0.009
	(0.03)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)
$RI * INS_{SR}$	0.043	0.093	0.010	0.038	0.075	0.108
	(0.03)	(0.03)***	(0.01)	(0.02)*	(0.03)**	(0.03)***
Constant	0.630	0.642	0.693	0.626	0.621	0.771
	(0.06)***	(0.06)***	(0.06)***	(0.06)***	(0.06)***	(0.07)***
Observations	1,983	1,983	1,873	1,983	1,983	1,983
R-squared	0.770	0.777	0.764	0.766	0.773	0.758
Year FE	YES	YES	YES	YES	YES	YES

Source: Author's own calculation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7

Institutions and Regional Integration Augmented Gravity Model: Components of Institutions (PPML Estimator)

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	INS_CC	INS_GE	INS_PA	INS_RL	INS_RQ	INS_VA
$LN(Y_i)$	0.056	0.057	0.056	0.055	0.056	0.054
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$LN(Y_j)$	0.059	0.057	0.060	0.058	0.060	0.059
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$D(LN(PCY))$	-0.004	0.002	-0.007	-0.005	-0.005	-0.013
	(0.00)**	(0.00)	(0.00)***	(0.00)***	(0.00)***	(0.00)***
$LN(D)$	-0.086	-0.087	-0.090	-0.083	-0.085	-0.080
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
LL	-0.070	-0.060	-0.073	-0.072	-0.072	-0.086
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
CL	-0.041	-0.048	-0.036	-0.039	-0.041	-0.033
	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
CB	-0.025	-0.022	-0.032	-0.021	-0.024	-0.022
	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.00)***
RI_SAFTA	-0.104	-0.128	-0.006	0.036	-0.071	0.040
	(0.06)*	(0.08)*	(0.02)	(0.05)	(0.04)*	(0.08)
INS_{SP}	0.214	0.251	0.089	0.184	0.180	0.094
	(0.03)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***	(0.02)***
$RI * INS_{SP}$	0.037	0.032	-0.009	-0.018	0.032	-0.021
	(0.02)*	(0.02)*	(0.01)	(0.01)	(0.02)*	(0.02)
Constant	0.661	0.685	0.719	0.678	0.662	0.717
	(0.06)***	(0.06)***	(0.06)***	(0.06)***	(0.06)***	(0.06)***
Observations	1,983	1,983	1,870	1,983	1,983	1,983
R-squared	0.763	0.772	0.762	0.765	0.768	0.759
Year FE	YES	YES	YES	YES	YES	YES

Source: Author's own calculation. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Interesting findings emerge from the interactive term. We find that government effectiveness, regulatory quality, and accountability dimensions have relatively higher complementary contribution in making regional integration effective. All these dimensions, linked with proper implementation of policy, reform agenda especially agreed during trade agreements. The purpose of regional integration is to facilitate trade by reducing tariff and non-tariff barriers. The reduction in these barriers is only possible when domestic institutions ensure the implementation of policies.

7. CONCLUDING REMARKS

The present study has investigated the role of the institutional framework in explaining the effectiveness of trade agreements to promote bilateral trade in South Asia using an institutions-augmented gravity model. The empirical analysis is performed using OLS with fixed effects and the Poisson Pseudo Maximum Likelihood (PPML) estimation technique for panel of 11 countries over the period 1996-2015.

There are two important findings of the empirical analysis: First, the estimation has confirmed for this panel of South Asian economies, the gravity model's prediction that economic development and trade costs are two key determinants of bilateral trade. There is a natural growth of bilateral trade linked with economic development of the

country. Conversely, in the case of these South Asian economies, the normally positive "common border" effect has not been confirmed, possibly owing to political conflicts, especially those between Pakistan and India, Pakistan and Afghanistan, and India and Nepal. These conflicts undermine the natural trade potential.

Second, the empirical analysis has shown that regional integration is not in itself effective in promoting bilateral trade. The estimated impact of SAFTA—a regional trade agreement of South Asian economies has a negative impact on bilateral trade. To look at the underlying reasons behind the estimated negative impact of SAFTA, this study has investigated the role of institutions. The findings have revealed that institutions have a direct as well as indirect impact on bilateral trade. Institutions, indirectly, complement the regional integration.

The RTA can create regional trade if supported by institutional framework. More specifically, government effectiveness, regulatory quality, and accountability are the key institutions to establish the efficacy of regional trade agreements. Without supportive institutions, the RTA may not produce desired results as evident in the case of SAFTA progress over the last 10 years. Moreover, the complementary association should be considered with caution. The association yields positive trade only when the quality of institutions becomes very high.

Various policy implications emerged from empirical analysis: First, economic development, being the key determinant of bilateral trade, begs continuous investment by the public as well as private sectors to promote bilateral trade. The government should focus on the development of key infrastructures both physical and soft, to reduce trade costs that negatively affect bilateral trade. In recent decades, development of physical infrastructure is the hallmark of geo-spatial transformation to promote bilateral trade. Economic corridors like the China-Pakistan Economic Corridor (CPEC) is the best example to reduce trade cost. The core of CPEC is to reduce trade cost and hence enhance bilateral trade.

Second, institutional reform is essential to reap the potential benefits of regional trade agreements. Based on empirical analysis, it can be argued that regional trade agreements can only be effective when these are supported by a well-defined institutional framework. The success of EU is the best example to support the role of institutions. To conclude, South Asian countries should focus on institutional reforms to reap the benefits of regional trade agreements.

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Economic & Cultural Distance & Regional Integration: Evidence from Gravity Model Using Disaggregated Data for Pakistan

SALAHUDDIN, JAVED IQBAL, and MISBAH NOSHEEN

This study applies generalised gravity models to analyse Pakistan's bilateral trade flows at commodity level using both panel as well as cross-sectional data estimation techniques. The empirical findings indicate that distance and size of the economy are the major determinants of commodity trade flows. For many commodities, real exchange rate, trade preferences, being landlocked, technological differences and market size are vital factors, which boost bilateral trade flows. Remarkably, there is an inverse relationship between bilateral trade flows and a common border. As far as regional trading blocs are concerned, the results show that ASEAN is a potentially significant destination for Pakistan's commodity trade. The findings illustrate that in the case of SAARC trading partners, the potential of trade has not materialised. For the purpose of robustness of our results, we have also used agricultural and non-agriculture related trade costs. Estimates indicate that trade costs between Pakistan and its trading partners are highly significant and negatively related to commodity trade flows, while other empirical findings confirm the robustness of the results.

Keywords: Gravity Model, Commodity, Regional Integration, ASEAN, ECO, OIC, SAA

1. INTRODUCTION

No country in the world can produce all the goods and services it needs as none has the resources to meet all its requirements on its own. Countries differ with respect to skills, technology, land, climate, available capital, labour, mineral products, and forests. Trade with other countries fulfils requirements for goods and services a country is unable to meet itself. In the literature, previous studies empirically evaluate the pattern and determinants of trade flow at the aggregate level by using a gravity model. For instance, McCallum (1995) asserts that a national border has a tremendous effect on trade between the US and Canada. Zarzoso and Lehmann (2003) predict the volume and direction of trade amongst MERCOSUR and European Union. In addition, Boughanmi (2008), and Insel & Tekce (2009) empirically determine the trade pattern of GCC (Gulf Cooperation Council) countries by applying the gravity model.

Salahuddin <salahuddin@eco.qau.edu.pk> is MPhil Scholar, School of Economics, Quaid-i-Azam University, Islamabad. Javed Iqbal <javed@qau.edu.pk> is Assistant Professor, School of Economics, Quaid-i-Azam University, Islamabad. Misbah Nosheen <misbah.nosheen@yahoo.com> is Associate Professor, Department of Economics, Hazara University, Mansehra.

In the case of Pakistan, several studies attempted to estimate the pattern and determinants of trade at the aggregate level (Akhter & Ghani (2010); Malik & Chaudhary 2011; and Zaheer et al. 2013). In aggregate level studies, the impact of trade determining factors is expected to be uniform across individual commodities. However, commodity trade flows are frequently affected by the importing and exporting country's policies, among many other factors.

Thus, this study explores the determinants of commodity trade flows in case of Pakistan against 42 major trading partners by using disaggregated data at 3-digit SITC (Standard International Trade Classification) level. For this purpose, we select the 11 most traded commodities based on their importance in consumption, production, and share in aggregate trade flows of Pakistan. The selected commodities are as follows: rice, fruits, leather manufacture, pharmaceuticals, iron & steel, cotton, sports equipment, toys, electrical equipment, motor vehicles, footwear, and cement.

There is very little empirical evidence explaining the pattern of commodity trade flows. For examples, Harrigan (1994) uses the disaggregated data at 3-digit ISIC (International Standard Industrial Classification) level and empirically estimates the intra-industry trade in agriculture-related products such as crop production, livestock, hunting, and fishing. Lee and Swagel (1997) use the 4-digit ISIC data to investigate the effects of trade barriers and industries on the trading patterns of the food manufacturing industry, which includes dairy and grain products, slaughtering, preserved fruit, and canned items.

Moreover, Jayasinghe and Sarker (2008) and Karemera et al. (2009) empirically estimate the effects of regional trade agreements on the trade of selected agriculture-related commodities by using disaggregated trade data. Karemera et al. (2011) found that the uncertainty in exchange rate significantly reduces commodity trade flows. In addition, Castillo et al. (2016) explore the determinants of the wine trade and analyse the changes that have occurred in global wine exports.

The current study has modified the generalised gravity model into a commodity-specific gravity model while using commodity trade flows. A panel, as well as cross-sectional data, is used to estimate the empirical model. The panel analysis captures overall trade flows from 2000 to 2015, while the cross-sectional analysis captures trade flows separately in three different time intervals i.e., 2001-2005, 2006-2010 and 2011-2015.

The study addresses these fundamental questions:

- The internal and external factors to determine the trade flows of specific commodities.
- Is gravity modelling applicable to determine the trade pattern for a particular commodity for Pakistan's bilateral trade flow?
- Do neighbouring countries and cultural similarities influence Pakistan's bilateral trade flows?
- Do regional trade agreements play any role in enhancing or resisting bilateral trade flows?

In recent decades, bilateral trade has increased significantly. Regional integration is a central feature of economic growth and plays a vital role in determining trade flows. Through bilateral trade, nations come closer and enter regional trading blocs. There are

many successful examples showing that regional integration boosts economies and living standards of people in the concerned regions, which includes well-known trade agreements like ASEAN, NAFTA, and EU. For instance, (Frankel et al. 1995; Gould 1998; Krueger 1999a, 1999b, Jayasinghe & Sarkar 2008; Karemera et al. 2009; and Narayan & Nguyen 2016) showed the impacts of regional integration such as ASEAN, APEC, ECO, OIC, SAARC and WTO on bilateral as well as multilateral trade flows. This study also examines the impacts of regional integration in trade creation or trade diversion on commodity level trade flows.

Modeling and forecasting bilateral trade flows has been an important task in international economics. There are several models used for evaluating bilateral trade patterns among different countries of the world. The Ricardian theory of trade is based on comparative advantage, while the Heckscher-Ohlin model of trade emphasises resource abundance. As per trade theories, countries can specialise in the production of those commodities that it can produce efficiently with minimal cost (Samuelson et al. 1997).

Over the last few decades, the gravity model has been the most commonly used model to explain trade flows. This study evaluates the determinants of commodity trade flows by using a gravity model. The findings of the study reveal that GDP, differences in market size, bilateral real exchange rate, Relative Factor Endowments (RFE), being landlocked, common colony, and ASEAN have positively influenced commodity trade flows, while distance, common border, and SAARC have negative effects on commodity trade flows.

The remaining structure of the study is as follows:

Section 2: Comprehensive literature review.
Section 3: Model derivation and data specification.
Section 4: Empirical results and discussion.
Section 5: Conclusion with policy recommendations.

2. LITERATURE REVIEW

Tinbergen (1962) was the first to consider the gravity model in its simple form, followed by Poyhonen (1963) who extended the work on gravity further while using it empirically. Since then, there are numerous studies on the implications of gravity models, conducted empirically as well as theoretically. Researchers investigate linkages between gravity models and related issues with international trade such as evaluating trade patterns, measuring the cost of border, highlighting the effects of cultural similarities, and estimating the effects of regionalism on trade pattern (Eichengreen & Irwin, 1998; Feenstra, 1998; Hamilton et al. 1992; Baldwin, 1994; and Paas, 2000).

The gravity model has proved an efficient instrument to investigate bilateral trade patterns among the regional trading blocs (Bergstrand, 1985 & 1989; Koo & Karemera, 1991; Oguledo & Macphee, 1994; Zhang & Kristensen, 1995; Frankel, 1997; Rajapakse & Arunatilake, 1997; Karemera et al. 1999; Mathur, 2000; Sharma & Chua, 2000; Hassan, 2000 & 2001; Jakab et al. 2001; Soloaga & Winters, 2001; Christie, 2002; Carrillo & Li, 2004, and Egger & Pfaffermayr, 2003). In recent studies, regional integration or regional free trade agreements have proved to be a key factor explaining bilateral trade flows.

At the commodity level as well as at a disaggregated level, gravity models have been applied by Zahniser et al. (2002); Peterson et al. (2013). For forestry products, the gravity model has been applied by Buongiorno (2015, 2016); and Olofsson et al. (2017).

Likewise, at commodity level trade flows, Koo et al. (1994) investigate the factor affecting meat trade flows by using cross-sectional and time series data framework from 1983 to 1989. For this purpose, they modified the traditional gravity model into a specific commodity gravity model to evaluate the single commodity's trade flows. The findings of the study show that economic unions and a common border significantly enhanced meat trade flows. On the other hand, the distance between trading partners has negatively influenced meat trade flow.

Karemera et al. (1999) evaluate the benefits and determinants of free trade agreements in the Pacific Rim countries. For this purpose, the study modifies the traditional gravity model into a specific gravity model and uses the modified version model for single commodity trade flows. The study uses the cross-sectional and time-series framework. In the empirical analysis, the study includes commodities which are most traded among Pacific Rim countries. The empirical results found that the trade pattern among the Pacific Rim countries is determined by the income of countries, exchange rate, regional trade agreements, unit value of imports, and exports. Furthermore, the finding shows that trade significantly increases between members of ASEAN while trade has come down with non-member countries.

Similarly, Karemera et al. (2009) investigate whether the effects of regional blocs on trade flows create trade or divert it. The study evaluates the impacts of regional trade agreements such as NAFTA, APEC, and EU on selected commodity trade flows. For empirical analysis, the study uses the generalised gravity model of Bergstrand (1985, 1989) and modifies his model into a single commodity gravity model. Additionally, the empirical model for product trade flow uses the LS technique for estimation. The study uses disaggregated level panel data from 1996 to 2002. The empirical evidence shows that income has significant and positive impacts on commodity trade flows while the effects of population are positive for importing countries and negative for exporting countries. Furthermore, the establishment of NAFTA, APEC, and EU encourages trade flows. In addition, it found that there is more trade creation in NAFTA and APEC as compared to EU. The estimated coefficients show that the Asian Pacific Rim region is a significant destination for vegetables and fruits from US states.

Karemera et al. (2011) analyse the effects of exchange rate uncertainty on vegetable commodity trade flows among the OECD countries. The study also examines the effects of regional trade agreements such as the APEC, the NAFTA, and the EU on selected commodity trade flows. The study uses the commodity-specific gravity model for selected vegetable trade from the period 1996 to 2002. The findings of the study show that volatility in exchange rate significantly reduces trade flows in most commodities. In addition, empirical evidence also reveals that both long term and short-term uncertainty in exchange rate has a positive impact on specific commodity trade flows.

Jafari et al. (2011) identify the factor affecting export flows among the G8 countries by applying the gravity model. The empirical model estimated through panel data analysis for the years 1990 to 2007. The study found that the export flows among the G8 countries are positively determined by GDP, population, currency depreciation of

exporter countries, and a common border. However, transportation costs and importer's currency appreciation have negatively affected the volume of trade flows among the G8 countries.

Antonio and Troy (2014) examine the commodities trade flows for Caribbean Community countries (CARICOM) through the application of the traditional gravity model for international trade. The study found that trade to GDP ratio, per capita GDP differential, and language, impact trade flow positively. On the other hand, exchange rate, geographical distance, and historical trade relationships have significant negative effects on trade flows. The results of the study proposed that management of the exchange rate is critical and that CARICOM countries may be served better by trading with countries with higher living standards.

Karemera et al. (2015) explore the impacts of regional trade agreements on global meat trade flows. The study concentrates on NAFTA, EU, MERCOSUR, and ASEAN and establishes the determinants of bilateral and multilateral trade flows for meat trade. The study uses the specific gravity model with panel data from 1986-2009. The results of the study suggest that distance, income, population, production capacity, and exchange rate are major determinants of meat trade flows, while meat trade flow significantly increased with income and population. In addition, findings of the study reveal that the establishment of NAFTA and EU have significantly increased meat trade flows in regional bloc members while there are trade diversion effects between member to non-member trade flows. Furthermore, hoof and mouth diseases reduced meat trade flows, and the effects of exchange rate depends on product type.

In case of Pakistan, many studies have investigated Pakistan's trade flows using the gravity model. Akhter & Ghani (2010) show that the regional trade agreement between SAARC members will divert trade for the member countries. However, if a trading bloc between Pakistan, Sri Lanka and India is formed, it should result in trade creation. Akram (2013) explores the determinants of intra-industry trade between Pakistan and the SAARC region. The results show that Pakistan's trade is dominated by the vertical Intra Industry Trade while it shows that Pakistan's trade is explained more by country specific variables than by industry specific variables.

Zaheer et al. (2013) explore determinants of commodity trade flows for Pakistan while using the gravity model. It shows that in case of crude materials, the trade is of an intra-industry nature, while the country analysis shows that Pakistan's intra-industry trade is higher with Singapore.

Abbas & Waheed (2015) investigate Pakistan trade flows through the gravity model. The findings of the study indicate that the results of the models are in line with the gravity model, however, over time, the distance variable become less important. Hussain (2017) while analysing the determinants of trade flows for Pakistan shows that the findings are consistent with the theoretical prediction of the gravity model. However, in the case of language, and RTA dummy, there are mixed results for trade flows of Pakistan, India and China. Malik & Chaudhary (2011), Kabir & Salim (2010), Iqbal (2016), Khan et al. (2013), and Achakzai (2006) have reported the same.

Similarly, Butt (2008) shows that distance and size of economy are good indicators in explaining trade flows of Pakistan. Likewise, geographical, cultural and historical factors have expected signs in explaining trade bilateral trade flows of Pakistan. Gul &

Yasin (2011), while exploring trade potential for Pakistan, state that Japan, Sri Lanka, Bangladesh, Malaysia, the Philippines, New Zealand, Norway, Sweden, Italy, and Denmark are potentially good trading partners. In the case of regional trading blocs, Pakistan has great trade potential to be explored with ASEAN, EU, the Middle East and the African countries.

Salim and Mehmood (2015) investigate the determinants of Pakistan's cultural goods export with 157 trading partners from 2003 to 2012. For empirical analysis, the study selected the six categories of cultural goods that are classified at 6-digit level HS Codes and applied the gravity model to determine the influence factors of cultural goods exports flow. The study shows that distance, as well as market size between trading countries, are the most important determinants of cultural goods trade flows. The empirical evidence of the study suggests that cultural goods trade is significant and positively influenced by Pakistan's GDP growth rate, while the GDP of partner countries, as well as distance, have a negative impact.

Khan and Mehmood (2016) identify the impact of bilateral and regional trade agreements on Pakistan's trade flows in terms of trade creation and trade diversion with the help of the gravity model. The study analyses whether preferential reduction of tariff in favour of trading partners would enhance, or worsen, welfare of member countries. The results of the study suggest that the effects of trade creation by bilateral free trade agreements (BFTAs), Regional Trade Agreements (RTA), and South Asian Free Trade Agreements (SAFTA), are significantly higher than those of trade diversion are.

Altaf et al. (2016) use the gravity model to investigate the numerous determinants of trade cost for agricultural vs. non-agricultural trade, as well as overall trade of Pakistan with major trading partners across Asia, North America and Europe. For this purpose, the study decomposes the trade data into two macro-sectors, agricultural and non-agricultural, from 2003 to 2012. The study examined the relationship between trade cost and its major determining factors with a panel data-estimation technique. The empirical evidence suggests that maritime transport, geographical distance, and trade facilitation are the main determinants of trade cost. Moreover, trade costs for the agricultural sector tend to bypass the trade costs for the non-agricultural sector. The findings of the study also show trade cost as a significant barrier to bilateral trade flow, which implies that higher trade costs are an obstacle to bilateral trade and hamper the realisation of gains from trade liberalisation.

Irshad et al. (2018a) explore Pakistan's trade potential with China by using the gravity model for the period 1992–2015. The study uses various econometric techniques such as EGLS, REM, 2-stage EGLS, GMM, Tobit and PPML methods for estimation purpose. The findings of the study indicate that Pakistan's bilateral trade with all FTA partner countries is positively affected by GDPs, religion, WTO, trade openness in both countries, and a common border, but negatively affected by geographical distance and inflation. In addition, Irshad et al. (2018b) use a gravity model to estimate China's trade potential with OPEC member countries. The study shows that China's trade flows with OPEC countries were positively affected by GDP and trade openness, while trade cost (distance) and depreciation in bilateral exchange rate had a negative influence on China's trade flows.

3. METHODOLOGY

The gravity model is used to measure bilateral trade flows between different geographical regions. The gravity model is based on Newton's law of gravitation which has an application in Physics. In international economics, Tinbergin (1962) developed the traditional gravity model. Since then, the gravity model is used in various fields to evaluate foreign direct investment, migration flows, and especially to determine the pattern of trade flows.

Over time, there have been many attempts to provide a strong theoretical background to the gravity model. For example, Linemman (1966) and Anderson (1979) tried to provide some conventional theories and formulate a reduced form for the gravity model. Bergstrand (1985, 1989) developed a micro-foundation of the gravity model and expanded it by incorporating the price variable in the equation by using a CES utility function. In addition, Anderson and Wincoop (2003) extended the gravity model by incorporating trade barriers such as transportation and trade costs in empirical analysis while using different assumptions and properties.

The basic presumption of the gravity model is that bilateral trade flows between countries are directly proportional to the economic size of a country, generally measured by the GDP of the country, and inversely related to the geographical distance between them, which is a proxy for transportation cost. Similarly, in existing literature, numerous studies have used different qualitative variables to augment the traditional gravity model (see McCallum 1995; Anderson and Wincoop, 2003; Hutchinson 2005, & Kien, 2009). Karemera et al. (1999, 2009, and 2015) and Anderson & Wincoop (2003) modified the traditional gravity model into a specific one for single commodity trade flows.

This study uses the extended form of the specific gravity model. We augmented the traditional model by including relevant variables such as bilateral real exchange rate, relative factor endowments, market size differences, and other factors, which can affect Pakistan's bilateral trade flows. Furthermore, the study tends to improve the empirical model by adding regional integration and trade preferential dummies.

The present study follows the commodity-specific gravity model of Jayasinghe & Sarkar (2008) and Karemera et al. (2009, 2015) as follows:

$$T_{ijt} = BY_{it}^{\beta_1} Y_{jt}^{\beta_2} d_{ij}^{\beta_3} DGDP_{ijt}^{\beta_4} \times \exp[\beta_5 RFE_{ijt} + \beta_6 RER_{ijt} + \beta_7 D_1 + \beta_8 D_2 + \beta_9 D_3 + \beta_{10} D_4 + \beta_{11} ASEAN + \beta_{12} ECO + \beta_{13} OIC + \beta_{14} SAARC + \in_{ijt} \quad \ldots \quad (1)$$

In addition, the estimated coefficients are interpreted in terms of elasticity so we transform the empirical model in log form. Thus, the simplest form of commodity specific gravity model becomes as follows:

$$lnT_{ijt} = \beta_0 + \beta_1 lnY_{it} + \beta_2 lnY_{jt} + \beta_3 lnd_{ij} + \beta_4 lnDGDP_{ijt} + \beta_5 RFE_{ijt} + \beta_6 RER_{ijt} + \beta_7 D_1 + \beta_8 D_2 + \beta_9 D_3 + \beta_{10} D_4 + \beta_{11} ASEAN + \beta_{12} ECO + \beta_{13} OIC + \beta_{14} SAARC + \in_{ijt} \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

In model (2), i represents Pakistan while *j* is used for Pakistan's trading partners. Where T_{ijt} is the value of total bilateral trade (export plus import) of a particular commodity measured in US $1000, between country *i* and *j* in specific time *t*, followed by Jayasinghe and Sarkar (2008); Y_{it} and Y_{jt} are the real gross product of Pakistan as well

as trading partner j in year t; $DGDP_{ijt}$ is the difference in market size between country i and j in year t; RFE_{ijt} is the relative factor endowment between country i and j in year t; RER_{ijt} is the bilateral real exchange rate between country i and j in year t; d_{ij} is the geographical distance between country i and j; D_1 is the dummy variable for adjacent country, it takes the value 1 if country j share common border with Pakistan and, 0 for otherwise; D_2 is the dummy variable common official language (English) which takes the value 1 if country j uses English as an official language, and 0 for otherwise; D_3 is the dummy variable for common colony; it takes the value 1 if both country i and j were Ex or present colony of the same region, and 0 for otherwise; D_4 is the dummy variable for landlocked countries, Likewise, it takes the value 1 if country j has no access to water transport and 0 for otherwise; $ASEAN$ is a dummy variable for regional integration which takes the value 1 if country j is member of Association of Southeast Asian Nations and, 0 for otherwise; similarly, ECO is a dummy variable which takes the value 1 if country j is a member of Economic Cooperation Organisation and, 0 for otherwise; OIC is a dummy variable it takes the value 1 if country j is a member of Organisation of Islamic Cooperation and, 0 for otherwise; $SAARC$ is a dummy variable which is equal to unity if country j is a member of South Asian Association for Regional Cooperation and, 0 for otherwise.

GDP and distance are focus variables of the gravity model to determine trade flows. According to Frankel (1997), GDP presents the level of development, market size, the output capacity of exporting countries, and purchasing power for importing economies. It is expected that GDP would positively affect trade flows. In addition, Ekanayake et al. (2010) and Karemera et al. (2016) show that countries with a high GDP have more trade volume as compared to low income or less developed countries.

A traditional gravity model uses total GDP of a country to evaluate the overall trade flows by using aggregate level data (Linneman, 1966; Bergstrand, 1985, 1989), & Karemera et al. 1999). This study uses disaggregated data of specific commodities. In the case of commodity-level analysis, the use of total GDP can overestimate the productive capacity of the commodity. Therefore, to avoid this problem, following Karemera et al. (2009), we have used a percentage share of agriculture and industrial sector GDP of Pakistan for commodity trade flows. Moreover, the study uses the total GDP of partner countries that represent the purchasing power of foreign countries (Karemera et al. 2016).

We use geographical distance (from the capital to capital) between trading countries as a proxy for transportation and information related costs. A rise in distance between trading countries is expected to increase transportation costs, which in turn is expected to negatively affect the bilateral trade flows. The exchange rate is the most important macroeconomic variable determining the international trade pattern. The real exchange rate acts as a proxy for prices and can be described as the depreciation or appreciation of domestic currency relative to foreign currency. In aggregate level studies, the assumption is that the impact of exchange rate across differentiated commodities remains the same. However, there are chances of rising uncertainty because the effects of aggregation may crowd out the impact on single commodity trade flow. Hence, this study will help overcome this issue as our analysis uses on disaggregated trade data. Many studies suggest that a variation in exchange rate tends to enhance trade flows (Bacchetta and van Wincoop, 2000; and DeGrauwe & Skudelny, 2000). On the other hand, Danial

(1990) argues that the uncertainty in the exchange rate may affect trade flows inversely. However, the expected sign of the real exchange rate depends on the country's currency fluctuations.

We also include the relative factor endowments (RFE) variable as a measure of technological differences between Pakistan and its trading partners. The RFE can be expressed as the differences in log value of capital/labour ratio between country *i* and *j*. However, because of unavailability of capital/labour ratio at the commodity level, following Egger (2002) and Baltagi et al. (2003), we use the difference between per capita incomes instead of capital/labour ratio. In addition, this study also augments our empirical model by including the variable in the model that captures the effects of differences in markets size (DGDP) on commodity level trade flows. According to Helpman and Krugman (1985) and Zaheer et al. (2003), DGDP can be defined as the differences in capabilities to produce differentiated products between country *i* and *j*.

We assume that countries neighbouring landlocked economies incur a high transportation cost as compared to island nations. According to Frankel (1997), air and land transport is more expensive compared to water transport. Being landlocked means a country is bordered by land and has no access to water transport. The expected coefficient of the landlocked dummy is supposed to be negative.

Many other qualitative variables such as the cultural and historical similarities play a vital role in determining the trade pattern. Difficulty in communication is considered a major barrier in trade relations. Hutchinson (2005) and Kien (2009) posit that the larger the proportion of population speaking a common official language, the higher the trade volume among member countries. McCallum (1995), Anderton & Skudendelny (2001), as well as Anderson & Wincoop (2003), show that the existence of a common border tends to increase bilateral trade volume. In addition, Ekanayake et al. (2010) identify the common colony as an important determinant of trade flows. Hence, we include a common official language, common colony and common border as dummy variables in our empirical model.

Finally, this study aims to investigate the impact of regional trade agreements i.e., ASEAN, ECO, OIC, and SAARC on Pakistan's trade flows. The selected trade blocs and their members are shown in the appendix. In the modern world, the role of regional integration has become a central feature of economic development. Karemera et al. (2009, 2015), Akhter & Ghani (2010), and Ekanayake et al. (2010) empirically evaluate the impact of regional integration on bilateral as well as multilateral trade flows. As per their findings, countries that have a formal membership of the regional bloc, trade more. This study uses the balance panel as well as cross-sectional data of all variables.

Data of all observations are taken annually from 2000 to 2015. The study includes a sample of 42 cross-section countries that are presented in the appendix. The dependent variables used for analysis are the total bilateral trade of specific commodities. The broad description of commodities with corresponding codes is shown in the appendix. The data for exports and imports at 3-digit SITC level is taken from UN-Commodity Trade (WITS). Data on GDP, market size, GDP differences, and relative factor endowment are extracted from WDI. The data on the bilateral real exchange rate and distance in kilometre is collected from IMF and CEPII respectively.

4. EMPIRICAL RESULTS AND DISCUSSION

The present study uses both panel and cross-sectional data for empirical analysis. The panel data analysis is used to capture the overall trade flows from 2000 to 2015, while cross-sectional analysis captures the trade flows separately in three different time intervals, i.e. 2001-2005, 2006-2010, and 2011-2015. The regression analysis at different time intervals helps to identify the structure of trade flows over different political and economic regimes. We have estimated 11 separate regressions for each of the selected commodities and one additional regression estimated for the aggregate sum of all these commodities. For estimation, we have used Generalised Least Square (GLS) model for cross-sectional analysis, and Random Effect Model (REM) for panel analysis.

Cross-sectional data is generally supposed to suffer from a heterogeneity problem. To account for the heterogeneity problem, we rely on the GLS approach, used in literature as a suitable technique to address unknown heterogeneity problems (Akhter & Ghani 2010). For panel data, fixed effect and random effect models are used in general, however, due to the presence of different time-invariant variables, the fixed effect model is not a suitable approach, therefore, we used REM for panel data. Furthermore, for cross-sectional data analysis, we use Pakistan to foreign country GDP ratio. The estimated results under both panel as well as cross-sectional analysis are shown in the appendix.

(a) Effects of Income and Distance

From both types of estimations, i.e. panel as well as cross-sectional analysis, it is apparent that the standard variables of the gravity model are statistically significant and have expected signs in most of the selected commodities as per the philosophy of gravity models. The estimated coefficients of Pakistan's, and the foreign countries, GDP are statistically significant and have expected positive signs in most cases, which depict a direct relationship between GDP growth in trading countries and commodity trade flows. This implies that when economies grow, they produce more goods, and export more by creating large exportable surpluses. This suggests that commodity trade flows in most cases are determined by GDP. However, in the case of pharmaceutical, cement, and footwear products, it carries significant and negative signs indicating that GDP affects the aforementioned products negatively.

According to Bahmani-Oskooee (1986), Bahmani-Oskooee, Iqbal & Nosheen (2015), and Bahmani-Oskooee, Iqbal and Khan (2017), as the size of the economy grows, it may affect both exports and imports positively as well as negatively. An increase in the size of the economy causes domestic output to grow, and will have a positive impact on exports. Likewise, if the increase in the economic size of a country results in increasing the productive capacity of a country, it will help the country to develop import substitutes, and as a result, imports will decrease. In addition, the increase in domestic income also helps increase imports by increasing the purchasing power of a country.

The negative impact of GDP on cement trade is due to Pakistan being an efficient producer of cement related products, and cement being a major export commodity for the country. During the last few years, the domestic consumption of cement related products has increased due to construction of new government projects, such as power and infrastructure, housing schemes in public and private sector, and now CPEC (China

Pakistan Economic Corridor), the leading project currently in process. Due to increasing demand for these products in domestic markets, our export of this commodity has decreased. Similarly, with increasing GDP, more multinational pharmaceutical companies have registered in Pakistan, resulting in import substitutes; therefore trade of pharmaceutical products has decreased as most of the domestic demand has been met from domestic production.

GDP growth has had a negative impact on the footwear industry. Although Pakistan has the potential to increase exports of quality footwear, its world market share is 0.001 percent equaling $110 million, as compared to India at $10 billion and Vietnam at $6.23 billion. The total domestic market of footwear products is Rs. 250 billion out of which Rs.100 billion is met from Chinese imports while the remaining is covered from within the country (WITS, WTO; The Pakistan Business Council, 2017). According to the Pakistan Bureau of Statistics, over the last few years, export of footwear products have decreased. For example, during July-April (2016-17), footwear export experienced a decrease of 32.54 percent. Thus, the decrease in exports can be attributed to increased domestic consumption, resulting in reduced trade of footwear products (See *Pakistan Economic Survey, 2016-17*).

Estimates of GDP ratio carry statistically positive and significant signs, which suggest that an increase in a trading country's GDP growth rate leads to an increase in commodity trade flows. However, it shows that the GDP ratio (domestic income over foreign income) tends to affect rice trade flows negatively in the first and second-time intervals. This is interpreted as a 1 percent increase in GDP ratio, leading to decreases in the rice trade flow by 0.70 percent and 0.56 percent respectively. However, the result shows that bilateral commodity trade is more sensitive to changes in the foreign country's GDP than domestic income.

Empirical findings reveal that cotton and leather manufacturing trade flows increased significantly with the GDP ratio during the third interval as compared to the first and second interval. Trade in sports equipment, and iron & steel increased more with GDP ratio during the second interval. The findings suggest that the income of trading countries is the most important determinant of commodity trade flows. These results are consistent with previous studies such as Frankel (1997), Prabir (2006), and Jayasinghe & Sarker (2008). For Pakistan, our results are in line with the findings of Akhter & Ghani (2010), Akram (2013), Zaheer et al. (2013), Abbas & Waheed (2015), Khan & Mahmood (2016), and Hussain (2017).

Rice and fruits are Pakistan's major exportable commodities. As per the *Pakistan Economic Survey (2015-16)*, during the last few years, the production of these commodities has decreased by approximately –2.7 percent and –5.3 percent respectively. One of the reasons behind the decreasing trend in production of rice is climate change creating unfavourable weather conditions in the rice growing areas in Pakistan. Moreover, low crop prices and higher production costs of agricultural commodities encourage farmers to substitute maize and fodder for rice as a cash crop.

Geographical distance has a considerable effect on commodity trade flows. The theory of spatial equilibrium recommends that there is an inverse relationship between distance and bilateral trade flows. From both analyses, the estimates of distance have expected negative and statistically significant impacts on commodity trade flow like rice,

fruit, electrical equipment, iron & steel, cement product, footwear, and total trade models. It implies that geographical distance is a hindrance to Pakistan's bilateral trade flows. However, the magnitude and degree of significance varies across the time interval as well as the commodity. In most cases, the elasticity of estimates of distance is greater than unity. It suggests that a 1 percent increase in distance leads to more than 1 percent diminution in commodity trade flows.

When a country is far from Pakistan then transportation-related costs increase for bilateral trade so it tends to decrease commodity trade flows. Hence, the estimated coefficients of distance confirmed the hypothesis that transportation and other transport related costs reduce bilateral trade flows. These findings are in line with the findings of Bikker (1987), Boisso & Ferrantino (1994), Harris & Matyas (1998), Hassan (2001), Rehman (2003), and Jayasinghe & Sarkar (2008). For Pakistan, our results are in line with the findings of Butt (2008). Gul & Yasin (2011), Karemera et al. (2009, 2015), Malik & Chaudhary (2011), Akram (2013), Abbas & Waheed (2015), Salim & Mehmood (2015), and Hussain (2017).

(b) Effects of Difference in Market Size (DGDP), Bilateral real Exchange Rate (RER) and Relative Factor Endowment (RFE)

The study has used Difference of GDP (DGDP) and Relative Factor Endowment (RFE) as proxies for economic size or, alternatively, for the difference in the capability to produce differentiated products and the relative difference in factor endowments (a proxy for technological difference) between Pakistan and its trading partners respectively. Helpman and Krugman (1985) show that the trade volume of intra-industry trade depends on the economic size and RFE of trading partners.

Economies with less difference in per capita income are supposed to be similar in demand pattern, while countries with a larger difference in per capita incomes are supposed to have more disparity in demand structure. Similarity in demand pattern implies that countries would have a higher level of intra-industry trade, whereas more disparity in demand pattern would be reflected in a lower level of intra-industry trade (IIT), as postulated by the Heckscher-Ohlin-Samuelson (HOS) theorem. Likewise, when the disparity in the RFE increases between trading partners, IIT is supposed to decrease. On the other hand, if the disparity in the RFE decreases between trading partners, it would result in an increase in IIT.

The size of a trading partner exerts a positive effect, while RFE differences exert a negative effect. The empirical evidence on economic size indicates that bilateral trade of selected commodities increased more in the case of the third interval than the first and second.

Furthermore, RFE has a statistically significant influence on many commodity trade flows. However, the estimated value of coefficients and the expected relationship between RFE and commodity trade flows varies across the product as well as intervals. During the first interval, the RFE has a significant and expected positive influence on rice, fruits, leather manufacturing, and footwear trade flows. In the second and third intervals, the RFE has a significant influence on cotton and leather manufacturing trade flows. The traditional trade theory postulates that bilateral trade increases due to the difference in technology between trading countries. The findings show that Pakistan has a

tendency to trade more with countries that are dissimilar in terms of technology and factor endowments. Therefore, the estimates of RFE, which are positively related to trade flows, are consistent with theory.

However, cotton trade flows are significant but unexpectedly negatively affected by RFE. The results are consistent with findings of Egger (2002), Ekanayake (2010), Kabir & Salim (2010), and Akram (2013). Pakistan is a major cotton producing country. The share of cotton production in Pakistan's GDP is 1 percent and cotton is a central exportable commodity. As per the *Pakistan Economic Survey*, during the last few years, the production of cotton has declined. Some of the reasons for the declining trend in cotton products are unfavourable weather conditions, frequent and prolonged rains, and pest attacks. Furthermore, due to the high prices of fertilisers & pesticides, and low price of cotton crop, farmers are disinclined to cultivate cotton.

Exchange rate plays a dynamic role in determining trade flows. This study uses the bilateral real exchange rate as a proxy for the price level. The effects of exchange rate on commodity trade vary across commodities. The estimates of exchange rate are statistically significant in the case of trade flows of rice, cotton, electrical equipment, leather manufacturing, cement products, motor vehicles, and sports equipment. However, the estimated coefficients of the exchange rate, which have positive signs, indicate that depreciation of domestic currency relative to foreign currency leads to an increase in commodity trade flows. The empirical findings suggest that commodity trade increases less than proportionately with 1 percent depreciation of domestic currency. These findings are consistent with the results of Gul & Yasin (2011).

According to theory, the response of exports and imports to an increase in depreciation depends upon elasticity. If a product or commodity is less (more) elastic, then trade flows may respond less (more) than proportionately. According to the Marshall-Lerner conditions, for devaluation/ depreciation to be successful, the elasticity of exports and imports should be greater than one. Therefore, in our results, though depreciation causes trade flows to increase to some extent, it does not fulfil the Marshall-Lerner condition. One possible explanation for this is that elasticity itself is dependent upon characteristics of the commodity, i.e. its substitutability with other commodities, or alternatively, availability of substitutes or being a necessity or luxury. Hence, if products are not necessities then their elasticity with respect to the exchange rate could be greater than one. However, if commodities are necessities, then their elasticity with respect to the exchange rate may be less than one.

In our commodities group, electrical equipment, motor vehicles, cement, and pharmaceuticals have special characteristics; for example, electrical equipment and motor vehicles have a major share in machinery imports and vehicle parts. These are a type of necessity for further value addition in the domestic country, so we expect less proportionate change with respect to the exchange rate. In case of cement products, we have a minor share of imports as well as exports that too mainly to countries like Afghanistan and India, as most of the cement products are consumed domestically. Hence, we expect a less proportionate response with respect to the exchange rate. As far as pharmaceutical products are concerned, most of the multinational companies are located domestically. While we still have a major share of imports, since pharmaceuticals products are necessities, we expect a less than 1 percent response with respect to the exchange rate.

(c) Effects of Landlocked, Common Border, Common Language, and Common Colony

We hypothesised that a country not having access to water transport bears a high transportation cost for the sake of trade. The estimated coefficients of the landlocked dummy are statistically significant and have an unexpected positive relationship with most of the selected commodities trade flows. However, the level of significance and magnitude are different across commodities as well as intervals. The estimates show that if a country is landlocked, commodity trade flow of Pakistan increases by more than 1 percent as compared to other economies, which are not landlocked.

In our sample of Pakistan's trading partners, only Afghanistan is a landlocked country. The reason behind the positive effects of being landlocked is that we have a common border with Afghanistan as well.

The impact of the common border on commodity trade flows is quite surprising. The results of the border dummy are statistically significant but have unexpected negative impacts on rice, fruits, electrical equipment, cement products, and motor vehicles trade flows. The estimated coefficients of the border dummy from the first interval are significant and have a negative relationship with motor vehicles and sports equipment. The second and third intervals have significant negative influences on leather manufacturing, electrical equipment, motor vehicles, and sports equipment trade flows. The border dummy reveals that with the countries with whom Pakistan shares a common border, commodity trade decreases more disproportionately as compared to geographically separated countries. Our results on the common border dummy are similar to the findings of Gul & Yasin (2011), Abbas & Waheed (2015), and Iqbal (2016) for Pakistan.

Diplomatic relations and historical events are the main barriers to bilateral trade with all neighbouring countries, except China. Therefore, Pakistan does not have much trade with India, Afghanistan, and Iran. The relationship between Pakistan and India has been unstable and problematic since the time of Independence in 1947. The conflict between the two nations tends to cripple trade relations. Despite having a common border, same culture, and language, there is only a 3.2 percent share of the total trade with India, which is quite low. The bilateral trade between Pakistan and Afghanistan is only 2.8 percent. Some reasons for the decline in bilateral trade between them are security conditions and corruption. The major share of the bilateral trade between them is informal, which is not measured under the legal framework. Iran, Pakistan's other neighbour, is burdened with international economic sanctions which hamper trade, keeping it down to 2.9 percent. Finally, from the aspect of the common border, bilateral trade diminishes due to a dominance of political factors.

It is difficult to express the effects of cultural similarities on trade flows quantitatively. Therefore, the study uses common language and colony dummies as proxies for historical and cultural similarities. The findings from the panel analysis indicate that electrical equipment and iron & steel trade flows are significantly and negatively affected by a common language which implies that if Pakistan and the trading partner have a common language then commodity trade decreases by more than 1 percent as compared to countries which do not have the same language.

From a cross-sectional technique, the results are different due to a change in technique, as well as time. During the estimation of the first interval, the estimates of a language dummy have statistically significant impacts on rice, electrical equipment, cement products, and sports equipment, while from the second and third intervals, the estimates show that they have a significant influence on rice, iron & steel, cement products, and footwear trade flows. However, the effects of a common language have mixed signs, i.e. positive and negative. Thus, electrical equipment, iron & steel, footwear, and sports equipment trade flows are negatively affected while rice and cement products are positively affected by common language. The results suggest that commodity trade decreases (increases) with common language countries. Khan et al. (2013) also found the same results for cultural similarities.

The estimated coefficients of the common colony, from both techniques, are statistically significant, and have an expected positive sign in case of most of the selected commodity trade flows. For instance, trade flows of rice, cotton, leather manufacturing, electrical equipment, iron & steel, cement products, motor vehicles, footwear, sports equipment, and total trade have significantly increased. It implies that for those countries where Pakistan had a colonial link, the commodity trade flows increased significantly, thanks to those ties. These results are consistent with the findings of Ekanayake et al. (2010), while for Pakistan, our results are in line with the findings of Salim and Mehmood (2015).

(d) Effects of Regional Trade Agreements

The study analysed the effects of regional blocs such as ASEAN, ECO, OIC, and SAARC on selected commodity trade flows. The extent of trade creation and trade diversion is also analysed. The estimated results, from both panel as well as cross-sectional analysis, suggest that there has been significant trade creation in fruit, motor vehicles, electrical equipment, iron & steel, pharmaceutical products, and total trade among ASEAN members during the study period. In the case of sports equipment, the dummy variable of ASEAN has a significant and negative sign during the first and second intervals. The negative sign of the estimated coefficient suggests that ASEAN members would divert trade in sports equipment. The findings suggest that there has been a significant increase in trade flows of fruit and pharmaceutical products among ASEAN members during the first interval, more than in the second and third interval, while trade in electrical equipment, experienced a greater increase in the second interval. Similarly, total trade, and trade in motor vehicles, increased with ASEAN members during the third interval, more than in the first and second. These findings are in line with the results of Gul & Yasin (2011).

The estimated coefficient of a dummy variable ECO is statistically significant and has the expected positive sign in case of motor vehicles during the entire study period. The result suggests that a possible inclusion in ECO may lead to significant trade creation in motor vehicles, while the trade of motor vehicles comparatively increased more in the second interval, than in the first and third intervals. The findings on the ECO dummy are in line with the findings of Achakzai (2006).

The estimated coefficients of the OIC bloc are statistically significant, and have an expected and positive relationship with rice and fruit trade flows. The magnitude and sign

of estimated coefficients of OIC suggests that there are strong trade creation effects in cases of rice and fruit trade flows during the first interval as compared to the second and third intervals. The empirical findings from all intervals show that OIC led to trade diversion in the case of pharmaceutical products and sports equipment as shown by negative and significant signs.

Similarly, the estimated coefficients of SAARC are statistically significant and have unexpected negative signs in most of the selected commodity trade flows during the entire study period. For rice, iron & steel, cement products, footwear, sports equipment, and electrical equipment trade flows, the coefficient of SAARC is negative, statistically significant and decreasing over time. The results show that the SAARC members are becoming less open to trade in case of rice, iron & steel, cement products, footwear, sports equipment, and electrical equipment trade flows with Pakistan. However, during 2000-2015 and 2011-2015, the findings suggest that SAARC led to trade creation for cotton and leather manufacturing trade flows. Interestingly, during the entire study period, the magnitudes of selected commodities are greater, which asserts that commodity trade decreases (increases) more than proportionately with SAARC members. These findings on the SAARC dummy are consistent with the study of Gul & Yasin (2011).

The empirical evidence suggests that the SAARC region has a negative impact on Pakistan's commodity trade flows because most of the members of SAARC are agro-based countries. They export mostly their agricultural sector related commodities to the Middle East and the EU, while in return, these countries import the industrial sector related commodities from developed countries. Therefore, Pakistan's commodity trade flows are negatively affected by the SAARC region.

Robustness of Results

In the empirical results above, we have used distance as a proxy variable for trade costs. However, in recent years, Altaf, Mahmood, and Noureen (2017) have developed a trade cost variable for both agriculture and non-agricultural products although data are available from 2003-2012 only. We use that data to check for the robustness of our results. Following Altaf et al. (2017), we tend to use agricultural-sector as well as non-agricultural sector trade cost in a gravity model for commodity trade flows. The results of the empirical model using trade cost are reported in Table A7 in the Appendix.

In developed countries, trade cost is recognised as an important determining factor of national trade performance and competitiveness. With much effort, developed countries have made effective policies for the reduction of trade cost. On the other side, developing countries like Pakistan have made minimal effort at the policy level to address this issue. Pakistan still exports a large amount of agricultural related commodities, while trade cost for the agricultural sector is substantially higher than that of the non-agricultural sector. Trade cost between trading countries is the main hindrance for bilateral trade flows.

Estimates indicate that trade cost between Pakistan and its trading partners is highly significant and negatively related to commodity trade flows. It reveals that the increase in trade cost reduces Pakistan's bilateral trade flows against its trading partners. This shows the government's lack of policy towards trade facilitation.

The estimated coefficient of Pakistan's GDP, as well as trading countries, have expected signs and are significant at 5 percent or higher. With respect to estimated coefficients of GDP, the findings reveal that a rise in income of an exporting or importing country leads to increased bilateral trade flows of rice, cotton, and motor vehicles. However, the magnitude of the coefficients is greater with the partner country's income suggesting that the quantities of a commodity traded are more sensitive to change in the trading partner's level of economic development.

Our results show that RFE and exchange rate are significant factors in enhancing commodity trade flows. The empirical findings reveal that bilateral trade of selected commodities is strongly influenced by RFE and RER, while differences in market size negatively affect the bilateral trade flows of rice, cotton, and total trade. In addition, bilateral trade flows of rice, cotton, and total trade sharply decrease with those trading partners that have the same colonial ties. This may possibly be attributed to the fact that with increasing globalisation, many countries have come closer to each other in terms of trading relations partly because of trade agreements and partly because of reduction in trade barriers. Cultural and education related contacts that have emerged so far between countries indicate that the colony effect has subsided over time.

Under the current circumstances, common border with trading countries is a strong factor to encourage bilateral trade flows of rice, cotton, iron and steel, cement products, motor vehicles, and total trade. However, electrical equipment and sports equipment trade flow is adversely affected by those countries that share a common border.

For regional trading blocs, the coefficients of ASEAN and SAARC dummy are statistically positive and significant for rice, cotton, fruit, and total trade. Estimates show that formations of ASEAN and SAARC may enhance commodity trade flows and may significantly contribute to trade creation for the commodities. Empirical results show that ASEAN led to significant trade diversion in case of electrical equipment, leather manufacturing, and motor vehicle trade flows as shown by negative and highly significant signs.

Similarly, the estimated coefficients of most of the selected commodity on OIC are negative and statistically significant. The negative estimates show that OIC members are becoming less open to trade with Pakistan for footwear, sports equipment, electrical equipment, pharmaceutical products, and motor vehicle trade flows. However, the findings suggest that OIC led to trade creation in case of cement products trade flows. It is interesting to note that the regional integration under SAARC leads to more trade creation among SAARC members than the integration under ASEAN and OIC for most of the selected commodity.

5. CONCLUSION AND POLICY IMPLICATIONS

The study has used the specific gravity model to arrive at the determinants of commodity trade flows in case of Pakistan against her major trading partners. For empirical analysis, the study used both panel as well as cross-sectional analysis from 2000 to 2015. The panel analysis captures the overall trade flows from 2000 to 2015 while cross-sectional analysis measures the trade flows separately in three different time intervals i.e., 2001-2005, 2006-2010 and 2011-2015. However, both analyses give almost similar results in terms of signs of coefficients. Nevertheless, in the case of the magnitude of coefficients, some variation can be found in the results.

Based on empirical results, we found that income from trading countries has significant and positive impacts on most of the selected commodity trade flows. The estimates of geographical distance reflect the theory of spatial equilibrium and indicate that the distance between trading countries is an important factor in determining trade flows of selected commodities. The impacts of relative factor endowment (RFE), differences in market size, bilateral real exchange rate (RER), common colony, and being landlocked stimulated more commodity trade. The interesting finding of the study is the negative impact of the common border on trade flows in case of most commodities. Thanks to unstable diplomatic relations between Pakistan and its neighbouring countries, trade flows have reduced with these countries.

The study examined the impacts of major regional blocs on commodity trade flows. We found that there are significant positive trade creation effects in the cases of fruit, motor vehicles, total trade, iron & steel, pharmaceutical products, and electrical equipment among ASEAN members, while the ECO bloc has a positive impact only on the motor vehicles trade flow.

Similarly, results show that the OIC bloc had significant trade creation in rice, fruits, and sports equipment. In general, the study found the trade creation effects of ASEAN are greater than OIC and ECO. Unfortunately, in the case of trade with SAARC members, hardly any improvement in trade flows can be observed in almost all commodities. For the purpose of robustness of our results, we have also used agricultural and non-agriculture related trade cost. The estimates indicate that trade cost between Pakistan and its trading partners is highly significant and negatively related to commodity trade flows*;* whereas other empirical results show that the results are robust.

Firstly, empirical results have important policy implications. Exchange rate fluctuations tend to create uncertainty on trade flows of agricultural related products such as rice and fruits. Pakistan faces competition from India, China, and other countries in the international market. The more uncertain exchange rate fluctuations are, the more reluctant the exporters and importers in maintaining trade levels with Pakistan in these products. They tend to divert their trade to other competitors in the markets. Hence, stability in the exchange rate is necessary to stabilise commodity trade flows, in particular agricultural products.

Secondly, we see reduced trade with neighbouring countries, India and Afghanistan, that share a common border with Pakistan. This is possibly the result of political disputes affecting friendly relations adversely. Similarly, although Pakistan has cordial relations with Iran, trade is still affected negatively due to international economic restrictions. Therefore, sustained and increased trade levels are dependent on normal and cordial political relations with our neighbours.

Thirdly, results indicate that commodity trade has not shown a satisfactory performance as with SAARC members as well as with neighbouring countries. Pakistan's bilateral trade can be enhanced with its neighbouring countries, without hurting national interest, through bilateral dialogue and free trade agreements. Being a member of SAARC, its impact on commodity trade flow is not as fruitful as compared to trade with ASEAN. The study found that ASEAN is a significant destination for Pakistan's trade flow. Hence, Pakistan should focus on another trading bloc like ASEAN.

Fourthly, results show that trade-related cost is a significant obstacle in the way of Pakistan's bilateral trade flows, and can be minimised through proper policy actions. Higher trade cost leads to lower competitiveness, thus limiting the potential benefits of trade. If proper policies are put in place, sufficient reduction in trade cost can be achieved. To reduce trade cost, Pakistan should actively participate in WTO's agreements on trade facilitation and reduce the red-tape at border crossings to cut down on trade costs.

We see that trade costs for agricultural commodities are substantially higher, compared to industrial products, thus shipment of perishable agricultural commodities must be expedited to help minimise trade cost. Similarly, trade cost could be reduced through improvement in cargo handling, port connectivity, and transportation. In addition, the negative effects of distance can be decreased through development of both soft and hard infrastructures by using modern technological methods such as internet, electronic media, and publicity campaigns.

It is evident that cultural similarities can benefit Pakistan's commodity level trade flows, so Pakistan should utilise our diaspora in the target countries for bilateral trade, where we have cultural similarities with Pakistan. Through this initiative, Pakistan could enhance competitiveness by reducing transaction costs.

APPENDIX

Table A1

Countries Included for Specific Commodities Trade Flows with Pakistan

S. No.	Country Name	S. No.	Country Name	S. No.	Country Name	S. No.	Country Name
01	Afghanistan	12	Denmark	23	Morocco	34	Sri Lanka
02	UAE	13	Finland	24	Netherlands	35	Sweden
03	Bangladesh	14	Hong Kong	25	Philippine	36	Thailand
04	Belgium	15	India	26	Portugal	37	Turkey
05	Canada	16	Indonesia	27	Qatar	38	Ukraine
06	China	17	Italy	28	Romania	39	United Kingdom
07	Egypt	18	Japan	29	Russia	40	United States
08	France	19	Kuwait	30	Saudi Arabia	41	Yamen
09	Germany	20	Malaysia	31	Singapore	42	Iran
10	Greece	21	Oman	32	South Africa		
11	Brazil	22	Kenya	33	Spain		

Table A2

List of Countries which belong to Common Border, Common Language, Common Colony, and Landlocked

Common Colony	Common Language	Common Border	Landlocked
UAE	Canada	Afghanistan	Afghanistan
Bangladesh	India	Iran	–
Hong Kong	Kenya	India	–
India	Philippine	China	–
Kuwait	United Kingdom	–	–
Malaysia	United States	–	–
Kenya	–	–	–
Qatar	–	–	–
Singapore	–	–	–
Sri Lanka	–	–	–
Yamen	–	–	–

Table A3

Regional Free Trade Blocs and Member Countries

01. ASEAN Members		
Indonesia	Malaysia	Philippine
Thailand	Singapore	–
02. ECO Members		
Afghanistan	Iran	Turkey
Pakistan	–	–
03. OIC Members		
Afghanistan	Bangladesh	Egypt
Indonesia	Iran	Kuwait
Malaysia	Morocco	Oman
Pakistan	Qatar	Saudi Arabia
Turkey	United Arab Emirates	Yamen
04. SAARC Members		
Afghanistan	Bangladesh	India
Sri Lanka	Pakistan	–

Table A4

Description of Variables and Sources of Data

Variables Name	Exact Definition	Source	Unit	Expected Sign
Specific Commodity Trade T_{ijt}	Total bilateral trade (imports plus exports) of the particular commodity from Pakistan to "j" trading partner in a specific year "t".	WITS At SITC-3 digit Revision-1	Thousands of U.S. dollar	–
GDP Y_{it}	GDP of Pakistan in a specific year "t".	World development indicators	at market prices, constant at 2010 US $	Positive
GDP Y_{jt}	GDP of "j" trading partner in a specific year "t".	World development indicators	at market prices, constant at 2010 US $	Positive
Relative factor endowment RFE_{ijt}	Technological differences between Pakistan and "j" trading partner in a specific year "t".	World development indicators	at market prices, constant at 2010 US $	–
Differences in market size $DGDP_{ijt}$	Differences in capabilities to produce differentiated product between Pakistan and "j" trading partner in a specific year "t".	World development indicators	at market prices, constant at 2010 US $	–
Real exchange rate RER_{ijt}	The bilateral real exchange rate between Pakistan and "j" trading partner in a specific year, defined as $\therefore RER = \frac{NER_i}{NER_j} * \frac{CPI_j}{CPI_i}$	IMF International Financial Statistics	LCU/ Current U.S. dollar constant at 2010	Ambiguous
Distance d_{ij}	It is the geographical distance from the capital to capital between Pakistan and "j" trading partner.	CEPII	Kilometer	Negative
Contingency D_1	It is a border dummy, =1 if "j" trading partner share common border with Pakistan.	The CIA world factbook	–	Positive
Common official language D_2	It is common official language (English) dummy, =1 if "j" trading partner share common official language with Pakistan.	The CIA world factbook	–	Positive
Common Colony D_3	It is common colony dummy, =1 if Pakistan and "j" trading partner were a colony of the same region.	The CIA world factbook	–	Positive
Landlocked D_4	Dummy for landlocked, =1 if "j" trading partner has no access to water transport.	The CIA world factbook	–	Negative
ASEAN	Dummy for a regional trade agreement, =1 for members of ASEAN and, =0 otherwise.	The CIA world factbook	–	Positive
ECO	Dummy for a regional trade agreement, =1 for members of ECO and, =0 otherwise.	The CIA world factbook	–	Positive
OIC	Dummy for a regional trade agreement, =1 for members of OIC and, =0 otherwise.	The CIA world factbook	–	Positive
SAARC	Dummy for a regional trade agreement, =1 for members of SAARC and, =0 otherwise.	The CIA world factbook	–	Positive

Table A4.1

Description of Commodities

Commodities	SITC code Revision 1
01. Rice	042
02. Cotton	263
03. Domestic electrical equipment.	725
04. Medicinal & pharmaceutical products.	541
05. Motors vehicles	732
06. Footwear	851
07. Fruits, fresh, dried fruits, oil nuts.	051
08. Lime, cement & building material.	661
09. Iron & steel bars, rods, angles.	663
10. Perambulator, toys, game & sports equipment.	894
11. Manufacturing of leather or artifacts.	612

Table A5

Estimated Results of Gravity Model under Panel Analysis 2000-2015

	Rice	Fruit	Cotton	Electrical Equipment	Leather Manuf.	Pharm. Products	Iron & Steel	Cement & Products	Road Motor Vehicles	Spots Item	Footwear	Total Trade
GDP_{Pak}	0.123***	0.0687**	-0.0575	0.00151	0.155***	-0.0579***	0.135*	-0.0991***	0.0172	0.0571***	-0.0381*	1.693***
	(3.13)	(1.96)	(-1.40)	(0.06)	(6.86)	(-3.15)	(3.60)	(-2.73)	(0.73)	(3.68)	(-1.66)	(-10.89)
$GDP_{trading\ partner}$	1.389***	1.784***	0.768***	1.439***	0.174	1.109***	2.845*	1.953***	1.493***	0.945***	1.122***	0.537***
	(6.08)	(8.14)	(3.18)	(5.60)	(0.83)	(5.71)	(7.32)	(5.82)	(6.17)	(6.04)	(4.69)	(-4.03)
Distance	-2.370***	-3.564***	1.347	-2.050*	0.302	-0.438	-2.550	-2.775***	-0.882	0.0129	-1.543*	-0.920**
	(-2.87)	(-3.32)	(1.49)	(-1.83)	(0.51)	(-0.55)	(-1.77)	(-2.95)	(-1.02)	(0.02)	(-1.70)	(-2.13)
Differences in market size	0.0423	0.195	-0.225	0.300**	0.207*	0.264**	-0.538**	0.0618	0.208	-0.0800	0.303**	0.205**
	(0.30)	(1.46)	(-1.51)	(2.11)	(1.66)	(2.44)	(-2.45)	(0.31)	(1.51)	(-0.89)	(2.25)	(-3.29)
Relative factor endowment	-0.305	-0.206	-0.112	-0.635***	1.022***	0.000247	-0.191	-0.649**	-0.210	0.605***	0.203	0.0649
	(-1.24)	(-0.74)	(-0.42)	(-2.11)	(5.35)	(0.00)	(-0.45)	(-2.13)	(-0.82)	(3.78)	(0.77)	(-0.5)
Real exchange rate	0.0106***	-0.0106***	0.00241	0.000366	0.00162	-0.00240	-0.0000651	0.00620	-0.00274	0.00434**	0.000858	0.00327**
	(3.18)	(-3.38)	(0.68)	(0.11)	(0.54)	(-0.94)	(-0.01)	(1.28)	(-0.84)	(2.03)	(0.27)	(-2.19)
Landlocked	8.626***	6.392*	3.603	10.14***	0.131	6.108**	10.04**	12.09***	5.952**	2.868*	9.598***	2.856**
	(3.25)	(1.86)	(1.24)	(2.82)	(0.07)	(2.40)	(2.16)	(3.94)	(2.14)	(1.69)	(3.29)	(-2.04)
Common border	-5.662***	-3.533*	1.963	-3.437*	0.728	-0.350	-1.027	-3.045*	-2.790*	-1.312	-2.216	-0.721
	(-3.62)	(-1.79)	(1.15)	(-1.66)	(0.63)	(-0.24)	(-0.38)	(-1.66)	(-1.71)	(-1.31)	(-1.30)	(-0.88)
Common language	0.884	0.767	-0.0385	-1.906*	-0.0804	0.204	-2.726*	0.857	-0.580	-0.422	-1.393	0.163
	(1.06)	(0.70)	(-0.04)	(-1.67)	(-0.14)	(0.25)	(-1.86)	(0.92)	(-0.66)	(-0.80)	(-1.52)	(-0.38)
Common colony	3.048***	1.369	0.248	3.325***	0.0947	1.190	2.392*	3.757***	1.966**	0.264	2.249**	0.859**
	(3.71)	(1.28)	(0.28)	(2.98)	(0.16)	(1.51)	(1.66)	(3.99)	(2.27)	(0.50)	(2.48)	(-1.97)
ASEAN	-0.981	3.194***	0.911	0.724	-0.0733	1.273	1.188	-1.415	3.415***	-0.228	-0.805	0.81*
	(-1.13)	(2.80)	(0.95)	(0.61)	(-0.12)	(1.53)	(0.78)	(-1.44)	(3.75)	(-0.41)	(-0.84)	(-1.8)
ECO	1.272	-0.181	-0.197	-0.340	-0.961	-1.482	1.762	0.0640	1.566	0.107	-2.618	-0.146
	(0.84)	(-0.09)	(-0.12)	(-0.16)	(-0.91)	(-1.02)	(0.67)	(0.04)	(0.99)	(0.11)	(-1.58)	(-0.19)
OIC	1.664**	1.274	1.018	0.595	-0.0860	-0.335	-0.663	1.085	-0.00620	-0.294	0.356	0.517
	(2.09)	(1.22)	(1.17)	(0.55)	(-0.15)	(-0.44)	(-0.48)	(1.22)	(-0.01)	(-0.58)	(0.41)	(-1.26)
SAARC	-3.571**	-0.920	2.739	-3.498*	1.223	0.929	-2.941	-3.588**	-0.289	0.798	-2.896*	-0.336
	(-2.42)	(-0.48)	(1.70)	(-1.76)	(1.16)	(0.66)	(-1.14)	(-2.14)	(-0.19)	(0.85)	(-1.79)	(-0.44)
_cons	-13.27*	-19.24**	-18.01*	-23.48***	-14.27**	-24.43***	-39.68***	-23.53**	-31.78***	-18.66***	-18.77**	-45.80***
(Constant)	(-1.71)	(-1.96)	(-2.13)	(-2.24)	(-2.39)	(-3.27)	(-2.87)	(-2.47)	(-3.81)	(-3.64)	(-2.17)	(-9.84)
Observations	672	672	672	672	672	672	672	672	672	672	672	672

Note: Value of z statistics are in parentheses and p*<0.01(Significant at 10%), p**<0.05(Significant at 5%), p***<0.10(Significant at 1%).

Table A6.0

Cross-Sectional Analysis with GLS (2001-2005)

	Rice	Cotton	Fruits	Electrical Equipment	Leather Manuf.	Pharm. Products	Iron & Steel	Cement & Products	Footwear	Road motor Vehicles	Sport Items	Total Trade
GDP ratio	0.708**	-0.71**	-0.191	-0.267	-0.0575	-0.0252	-1.099**	-0.257	0.758**	-0.399	-0.84***	0.0085
	(2.35)	(-2.41)	(-0.53)	(-0.65)	(-0.25)	(-0.10)	(-1.95)	(-0.82)	(2.14)	(-1.24)	(-5.56)	(0.06)
Distance	-0.127	0.295	-2.40***	-1.638*	-0.228	-0.904	-1.476	-1.442*	-0.888	-0.889	-0.312	-0.860**
	(-0.17)	(0.40)	(-2.65)	(-1.65)	(-0.40)	(-1.36)	(-1.04)	(-1.83)	(-0.99)	(-1.09)	(-0.82)	(-2.24)
Differences in market size	0.344*	0.311*	0.500**	0.868***	0.505***	0.695***	0.932***	0.531***	0.671***	0.687***	0.374***	0.563***
	(1.95)	(1.82)	(2.38)	(3.63)	(3.78)	(4.49)	(2.83)	(2.90)	(3.23)	(3.64)	(4.22)	(6.32)
Relative factor endowment	0.690**	-0.58**	0.578*	0.246	0.614***	0.231	0.131	0.0139	0.976***	-0.217	-0.0323	0.0172
	(2.39)	(-2.09)	(1.68)	(0.63)	(2.81)	(0.91)	(0.24)	(0.05)	(2.87)	(-0.70)	(-0.22)	(0.12)
Real exchange rate	-0.006	0.011*	-0.005	0.0142*	0.00705	0.00310	-0.0005	0.00925	0.00195	0.0113*	0.00680**	0.00425
	(-0.91)	(1.85)	(-0.63)	(1.71)	(1.52)	(0.58)	(-0.05)	(1.45)	(0.27)	(1.72)	(2.21)	(1.37)
Landlocked	-7.091	11.55**	2.495	7.029	4.035	0.913	18.36*	10.53*	-6.708	7.189	13.42***	1.095
	(-1.30)	(2.18)	(0.38)	(0.95)	(0.98)	(0.19)	(1.80)	(1.86)	(-1.05)	(1.23)	(4.89)	(0.40)
Common border	0.383	-1.105	-0.931	-1.959	-0.795	-0.354	0.340	-0.615	0.629	-3.374**	-3.03***	-0.810
	(0.25)	(-0.73)	(-0.50)	(-0.92)	(-0.67)	(-0.26)	(0.12)	(-0.38)	(0.34)	(-2.02)	(-3.85)	(-1.03)
Common language	1.730**	-0.344	1.380	-2.101**	-0.295	0.194	-1.842	1.628**	-0.633	-0.683	-0.620*	-0.0405
	(2.34)	(-0.48)	(1.57)	(-2.10)	(-0.53)	(0.30)	(-1.34)	(2.12)	(-0.73)	(-0.86)	(-1.67)	(-0.11)
Common colony	0.605	0.788	0.0380	2.518**	1.282**	0.357	2.321	1.842**	0.535	1.472*	1.359***	0.698*
	(0.72)	(0.96)	(0.04)	(2.20)	(2.01)	(0.48)	(1.48)	(2.11)	(0.54)	(1.63)	(3.21)	(1.64)
ASEAN	0.331	0.361	4.641***	2.412**	-0.552	2.250***	1.512	-0.286	1.124	3.349***	-1.57***	1.037**
	(0.39)	(0.43)	(4.55)	(2.07)	(-0.85)	(2.99)	(0.95)	(-0.32)	(1.11)	(3.65)	(-3.63)	(2.39)
ECO	-0.0776	0.735	-0.356	0.802	-0.914	-1.228	1.315	0.163	-2.405	2.542*	-0.139	0.148
	(-0.06)	(0.58)	(-0.23)	(0.45)	(-0.92)	(-1.07)	(0.54)	(0.12)	(-1.56)	(1.81)	(-0.21)	(0.22)
OIC	2.149**	0.640	1.343*	0.656	-0.299	-1.233**	-0.810	0.689	0.143	-0.731	-0.404	0.345
	(3.11)	(0.95)	(1.63)	(0.70)	(-0.57)	(-2.03)	(-0.63)	(0.96)	(0.18)	(-0.99)	(-1.16)	(0.99)
SAARC	-0.724	-0.109	1.333	-1.939	-1.706	1.181	-2.311	-3.426**	-1.347	-0.628	-1.963***	-1.042
	(-0.51)	(-0.08)	(0.79)	(-1.01)	(-1.60)	(0.95)	(-0.88)	(-2.34)	(-0.81)	(-0.42)	(-2.77)	(-1.46)
_cons	-3.911	-1.725	9.722	-5.988	-7.816	-4.071	-8.197	1.023	-7.817	-3.561	1.453	2.202
	(-0.56)	(-0.26)	(1.18)	(-0.64)	(-1.49)	(-0.67)	(-0.63)	(0.14)	(-0.96)	(-0.48)	(0.42)	(0.63)
Observation	42	42	42	42	42	42	42	42	42	42	42	42

Note: Value of z statistics are in parentheses and p***<0.01(Significant at 1%), p**<0.05(Significant at 5%), p*<0.10(Significant at 10%).

Table A6.1

Cross-Sectional Analysis with GLS (2006-2010)

	Rice	Cotton	Fruits	Electrical Equipment	Leather Manuf.	Pharm. Products	Iron & Steel	Cement & Products	Footwear	Road Motor Vehicles	Sport Items	Total Trade
GDP ratio	0.569*	-1.16***	-0.236	0.0646	-0.463**	0.0195	-1.423**	0.649*	0.431*	-0.513*	-1.13***	0.0141
	(1.81)	(-2.97)	(-0.54)	(0.15)	(-2.12)	(0.06)	(-2.24)	(1.83)	(1.32)	(-1.66)	(-7.63)	(0.09)
Distance	-1.068	0.433	-2.70**	-1.798*	-0.449	0.105	-3.727**	-2.578***	-1.557	-1.197	-0.278	-1.22***
	(-1.35)	(0.44)	(-2.47)	(-1.68)	(-0.82)	(0.13)	(-2.34)	(-2.90)	(-1.90)	(-1.48)	(-0.75)	(-3.06)
Differences in market size	0.193	0.581**	0.382	0.688***	0.433***	0.611***	1.573***	0.676***	0.896***	0.797***	0.217**	0.618***
	(1.01)	(2.44)	(1.45)	(2.65)	(3.26)	(3.23)	(4.07)	(3.14)	(4.51)	(4.07)	(2.40)	(6.40)
Relative factor endowment	0.429	-0.644*	0.352	0.547	0.702***	0.268	-0.360	0.129	0.410	-0.227	-0.0965	-0.145
	(1.38)	(-1.67)	(0.82)	(1.30)	(3.25)	(0.87)	(-0.57)	(0.37)	(1.27)	(-0.71)	(-0.66)	(-0.93)
Real exchange rate	-0.00253	0.0115	0.0101	0.0292***	0.0107*	0.000310	0.0139	0.0166*	0.00596	0.0185**	0.0111***	0.00294
	(-0.30)	(1.10)	(0.87)	(2.57)	(1.84)	(0.04)	(0.82)	(1.77)	(0.68)	(2.16)	(2.82)	(0.70)
Landlocked	-6.779	19.83***	3.233	4.405	6.540*	2.286	23.49**	-4.808	-0.660	8.294	19.05***	0.482
	(-1.20)	(2.83)	(0.41)	(0.58)	(1.67)	(0.41)	(2.06)	(-0.76)	(-0.11)	(1.44)	(7.16)	(0.17)
Common Border	-0.587	-0.966	-1.920	-3.742	-2.100*	1.576	-3.957	0.696	-1.383	-4.165**	-2.81***	-0.673
	(-0.33)	(-0.44)	(-0.78)	(-1.56)	(-1.71)	(0.90)	(-1.11)	(0.35)	(-0.75)	(-2.30)	(-3.36)	(-0.75)
Common language	2.036***	0.111	1.386	-1.410	-0.444	0.772	-3.074**	1.501*	-1.82***	-0.435	-0.0843	0.171
	(2.70)	(0.12)	(1.33)	(-1.38)	(-0.85)	(1.04)	(-2.02)	(1.77)	(-2.33)	(-0.56)	(-0.24)	(0.45)
Common colony	0.502	1.985*	-0.461	1.599	0.434	0.123	2.834	1.334	0.519	1.430	0.966**	0.507
	(0.58)	(1.83)	(-0.38)	(1.35)	(0.72)	(0.14)	(1.61)	(1.36)	(0.57)	(1.60)	(2.35)	(1.15)
ASEAN	0.0240	0.344	3.543***	2.648**	-0.312	1.557*	2.697	-0.00605	0.125	3.801***	-1.42***	0.964**
	(0.03)	(0.31)	(2.89)	(2.20)	(-0.51)	(1.77)	(1.50)	(-0.01)	(0.14)	(4.18)	(-3.40)	(2.15)
ECO	1.093	0.407	0.555	0.196	0.135	-1.714	2.542	-1.643	-2.459*	3.165**	0.174	0.0500
	(0.77)	(0.23)	(0.28)	(0.10)	(0.14)	(-1.22)	(0.88)	(-1.03)	(-1.66)	(2.17)	(0.26)	(0.07)
OIC	1.203*	0.962	0.773	0.701	-0.608	-0.104	-1.760	1.148	-0.317	-0.641	-0.952***	0.148
	(1.66)	(1.07)	(0.77)	(0.71)	(-1.21)	(-0.15)	(-1.20)	(1.41)	(-0.42)	(-0.87)	(-2.79)	(0.40)
SAARC	-1.719	1.054	0.550	-0.501	0.534	1.246	-3.963	-2.723*	-2.572*	-0.622	-0.953	-1.085
	(-1.17)	(0.58)	(0.27)	(-0.25)	(0.52)	(0.86)	(-1.34)	(-1.65)	(-1.69)	(-0.42)	(-1.38)	(-1.47)
_cons	10.17	-10.34	16.89*	-0.505	-4.430	-10.37	-3.737	6.745	-5.309	-3.348	5.627	4.974
	(1.37)	(-1.12)	(1.65)	(-0.05)	(-0.86)	(-1.41)	(-0.25)	(0.81)	(-0.69)	(-0.44)	(1.61)	(1.33)
Observation	42	42	42	42	42	42	42	42	42	42	42	42

Note: Value of z statistics are in parentheses and p***<0.01(Significant at 1%), p**<0.05(Significant at 5%), p*<0.10(Significant at 10%).

Table A6.2

Cross-Sectional Analysis with GLS (2011-2015)

	Rice	Cotton	Fruits	Electrical Equipment	Leather Manuf.	Pharm. Products	Iron & Steel	Cement & Products	Footwear	Road Motor Vehicles	Sport Items	Total Trade
GDP ratio	0.467	-1.29***	-0.419	0.220	-0.498**	-0.0363	-1.17***	0.210	-0.0566	-0.381	-1.069***	0.108
	(1.48)	(-3.69)	(-1.00)	(0.53)	(-2.49)	(-0.11)	(-3.09)	(0.48)	(-0.17)	(-1.16)	(-6.05)	(0.62)
Distance	-1.72**	0.552	-3.2***	-2.572***	-0.536	0.663	-4.43***	-1.404	-1.425*	-1.506*	-0.279	-1.38***
	(-2.25)	(0.65)	(-3.19)	(-2.57)	(-1.11)	(0.81)	(-4.82)	(-1.32)	(-1.73)	(-1.89)	(-0.65)	(-3.23)
Differences in market size	0.587***	0.633***	0.463*	0.713***	0.453***	0.602***	1.669***	0.651**	0.796***	1.006***	0.248**	0.740***
	(3.06)	(2.99)	(1.82)	(2.85)	(3.74)	(2.95)	(7.27)	(2.44)	(3.86)	(5.04)	(2.32)	(6.93)
Relative factor endowment	0.153	-0.776**	0.209	0.601	0.831***	0.245	0.0920	-0.410	0.323	-0.210	0.0685	-0.117
	(0.50)	(-2.31)	(0.52)	(1.51)	(4.32)	(0.76)	(0.25)	(-0.97)	(0.99)	(-0.66)	(0.40)	(-0.69)
Real exchange rate	0.0125*	0.00691	0.0110	0.0326***	0.0116**	0.00153	0.0111	0.0112	0.0130	0.0254***	0.0144***	0.00388
	(1.65)	(0.82)	(1.09)	(3.29)	(2.40)	(0.19)	(1.22)	(1.06)	(1.59)	(3.20)	(3.40)	(0.92)
Landlocked	-3.560	24.28***	7.168	1.326	5.007	4.434	20.27***	0.131	6.347	9.067	16.34***	0.375
	(-0.64)	(3.94)	(0.96)	(0.18)	(1.42)	(0.74)	(3.03)	(0.02)	(1.06)	(1.56)	(5.23)	(0.12)
Common Border	-2.791	-1.093	-3.871	-5.664**	-2.129	1.261	-3.203	-0.414	-2.514	-6.602***	-3.321***	-1.275
	(-1.50)	(-0.53)	(-1.57)	(-2.34)	(-1.81)	(0.64)	(-1.44)	(-0.16)	(-1.26)	(-3.41)	(-3.20)	(-1.23)
Common language	0.821	-0.489	1.766	-0.922	-0.169	0.398	-2.45***	0.807	-1.597**	-0.332	0.0911	-0.174
	(1.08)	(-0.58)	(1.75)	(-0.93)	(-0.35)	(0.49)	(-2.70)	(0.77)	(-1.96)	(-0.42)	(0.21)	(-0.41)
Common colony	0.988	2.202**	-0.168	1.448	-0.0263	0.231	2.178**	1.817	0.908	1.433	0.998**	0.507
	(1.15)	(2.32)	(-0.15)	(1.29)	(-0.05)	(0.25)	(2.11)	(1.52)	(0.98)	(1.60)	(2.07)	(1.06)
ASEAN	0.162	0.309	2.856**	1.797	0.0716	1.520*	2.126**	-0.775	-0.368	4.212***	-0.637	1.224**
	(0.19)	(0.33)	(2.51)	(1.61)	(0.13)	(1.67)	(2.08)	(-0.65)	(-0.40)	(4.73)	(-1.33)	(2.57)
ECO	1.118	-1.074	0.887	1.822	-0.0536	-1.045	1.481	1.838	-1.779	2.706*	1.036	-0.305
	(0.77)	(-0.67)	(0.46)	(0.96)	(-0.06)	(-0.68)	(0.85)	(0.91)	(-1.14)	(1.79)	(1.28)	(-0.38)
OIC	0.840	0.315	0.807	0.594	-0.412	-0.565	-1.125	-0.290	-0.233	-0.652	-1.204***	-0.376
	(1.18)	(0.40)	(0.85)	(0.64)	(-0.91)	(-0.74)	(-1.31)	(-0.29)	(-0.30)	(-0.88)	(-3.01)	(-0.95)
SAARC	-2.599*	1.294	0.243	-0.00994	1.971**	2.003	-5.65***	0.229	-1.888	-0.0450	0.207	-0.687
	(-1.84)	(0.83)	(0.13)	(-0.01)	(2.21)	(1.33)	(-3.34)	(0.12)	(-1.24)	(-0.03)	(0.26)	(-0.87)
_cons	6.420	-11.74	20.39**	4.929	-4.852	-14.39*	-2.460	-0.685	-3.221	-6.880	4.141	3.128
	(0.86)	(-1.42)	(2.05)	(0.50)	(-1.02)	(-1.80)	(-0.27)	(-0.07)	(-0.40)	(-0.88)	(0.99)	(0.75)
Observation	42	42	42	42	42	42	42	42	42	42	42	42

Note: Value of z statistics are in parentheses and p***<0.01(Significant at 1%), p**<0.05(Significant at 5%), p*<0.10(Significant at 10%).

Table A7

Estimated Results of Gravity Model using Trade Cost Variable under Panel Analysis 2003-2012

	Rice	Fruit	Cotton	Electrical Equipment	Leather Manuf.	Pharm. Products	Iron & Steel	Cement & Products	Road Motor Vehicles	Spots Item	Footwear	Total Trade
GDP_{Pak}	0.273**	0.022	-0.0266	-0.0615	0.0139	-0.0983**	-0.0194	0.00045	0.135*	0.0648	-0.029	0.0694
	(-2.6)	(-0.21)	(-0.19)	(-1.65)	(-0.26)	(-3.27)	(-0.34)	(-0.01)	(-2.26)	(-1.5)	(-1.01)	-0.16
$GDP_{trading\ partner}$	4.653**	2.335	5.412*	-0.739	1.373	-2.795**	3.148	2.654	0.629	1.043	0.576	2.821***
	(-2.61)	(-1.29)	(-2.32)	(-0.57)	(-0.73)	(-2.69)	(-1.58)	(-1.12)	(-0.3)	(-0.7)	(-0.58)	(-4.71)
Trade cost	-	-	-							-		
	0.0653***	0.0508***	0.0794***	-0.0339**	0.0436**	0.00438	0.00625	-0.0189	0.00818	0.0976***	-0.0028	-0.0514***
	(-6.08)	(-4.65)	(-5.64)	(-3.06)	(-2.71)	(-0.49)	(-0.36)	(-0.92)	(-0.46)	(-7.59)	(-0.33)	(-9.23)
Differences in market size	-5.680**	-1.945	-5.899**	-0.896	-2.425	1.86	-2.951	-1.399	-3.463	-0.496	-1.81	-1.907**
	(-3.28)	(-1.11)	(-2.60)	(-0.69)	(-1.29)	(-1.77)	(-1.47)	(-0.58)	(-1.65)	(-0.33)	(-1.81)	(-3.23)
Relative factor endowment	4.523***	1.121	3.261***	-1.802***	0.138	0.659	1.532	2.012*	1.145	-0.866	1.080**	1.186***
	(-6.56)	(-1.6)	(-3.6)	(-3.48)	(-0.18)	(-1.58)	(-1.91)	(-2.1)	(-1.37)	(-1.44)	(-2.71)	(-5.03)
Real exchange rate	0.00559	0.0138**	-0.0061	0.0178***	0.0123**	0.00723**	-0.0041	0.00172	0.0158***	0.00309	0.0133***	-0.002
	(-1.34)	(-3.25)	(-1.11)	(-6.48)	(-3.09)	(-3.26)	(-0.96)	(-0.34)	(-3.56)	(-0.97)	(-6.29)	(-1.51)
Common border	8.882***	2.061	10.16***	-4.629***	-1.445	1.387	6.781***	8.208***	3.097*	-5.053***	0.543	2.544***
	(-5.83)	(-1.33)	(-5.08)	(-5.02)	(-1.08)	(-1.86)	(-4.75)	(-4.82)	(-2.08)	(-4.72)	(-0.77)	(-6.1)
Common language	0.318	0.24	1.858***	-0.166	1.108**	0.11	-1.233**	1.153*	0.651	-3.055***	-0.251	-0.973***
	(-0.74)	(-0.55)	(-3.3)	(-0.61)	(-2.81)	(-0.5)	(-2.94)	(-2.3)	(-1.49)	(-9.69)	(-1.20)	(-7.92)
Common colony	-9.954***	-2.189	-10.02***	-0.253	0.406	1.072	-0.268	-0.544	-3.778	1.114	-0.891	-2.086***
	(-6.07)	(-1.31)	(-4.65)	(-0.21)	-0.23	-1.08	(-0.14)	(-0.24)	(-1.91)	(-0.78)	(-0.94)	(-3.74)
ASEAN	6.022***	2.141	4.885**	-4.551***	-5.705***	0.927	0.936	-1.163	-4.573*	2.248	-0.994	1.893***
	(-4.2)	(-1.47)	(-2.59)	(-3.93)	(-3.40)	(-0.99)	(-0.52)	(-0.54)	(-2.45)	-1.67	(-1.12)	(-3.59)
OIC	1.978	-1.303	2.518	-4.205***	-2.075	-3.328***	-1.395	5.782***	-3.489*	-8.097***	-4.081***	-0.214
	(-1.78)	(-1.15)	(-1.72)	(-4.86)	(-1.65)	(-4.77)	(-1.04)	-3.62	(-2.50)	(-8.06)	(-6.13)	(-0.54)
SAARC	12.86***	7.852**	10.15**	-7.807***	-5.155	-1.139	-0.762	3.495	-3.41	-0.579	-0.236	5.463***
	(-4.96)	(-2.97)	(-2.98)	(-3.90)	(-1.77)	(-0.71)	(-0.25)	-0.95	(-1.06)	(-0.25)	(-0.15)	(-6.01)
_cons	28.24**	24.57*	2.026	67.35***	28.76**	36.06***	-4.26	36.18**	86.52***	13.75	42.12***	-11.688
(Constant)	(-2.44)	-1.62	-0.17	-7.19	-2.11	-4.77	(-0.29)	(-2.09)	-5.73	-1.26	-5.84	(-1.17)
Observations	100	100	100	100	100	100	100	100	100	100	100	100

Note: Value of z statistics are in parentheses and p*<0.01(Significant at 10%), p**<0.05(Significant at 5%), p***<0.10(Significant at 1%).

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Gender Gaps in Child Nutritional Status in Punjab, Pakistan

THERESA THOMPSON CHAUDHRY, MAHA KHAN, and AZKA SAROSH MIR[***]

Child nutritional status has improved over the period 2008 to 2014 in Punjab, Pakistan's largest province with a population of over 100 million, as rates of severe stunting have declined by 8.6 percentage points and average height-for-age (HFA) has increased by 0.19 standard deviations. However, the nutritional status of children in Punjab is still quite poor in comparison to many Sub-Saharan African countries. Recent research from India suggests eldest son preference and son-biased fertility stopping patterns negatively impacts the nutritional status of other children in the household, especially daughters. In order to test for latent gender discrimination in Punjab, Pakistan, a culturally similar neighbour, we apply a finite mixture model to a sample of couples with at least one child of each gender, though we do not find any. We do find, however, that when there is a larger share of children without an elder brother, that is, there is no son or a son is born after several daughters, that the incidence of stunting is higher and average HFA z-score of a couple's children is lower, using an OLS analysis. This suggests that some families might be increasing their fertility beyond the number of children they can support in pursuit of sons. In this way, couples' preferences regarding the gender composition of their children can have subsequent effects on the long-term nutritional status of their children.

JEL Classification: I2, I14, I15
Keywords: Pakistan, Height-for-Age, Gender, Finite Mixture Model

1. INTRODUCTION

South Asia is home to some of the worst rates of child malnutrition in the world, with India, Pakistan, and Bangladesh accounting for more than half of the world's malnourished children (Mehrotra, 2006).[1] Given its levels of income per capita, health and education, South Asia has underperformed in measures of child malnutrition in comparison to Sub-Saharan Africa (Osmani & Sen, 2003). This includes one of the key indicators of long-term health and nutritional status for children, the measure of their height-for-age, in particular when this measure is below international norms.[2] Stunting is

Theresa Thompson Chaudhry <theresa@lahoreschool.edu.pk> is Professor, Department of Economics, Lahore School of Economics, Lahore. Maha Khan <mk1202@york.ac.uk> is Ph.D. Candidate, Department of Economics and Related Studies, University of York, UK. Azka Sarosh Mir <azka_mir_2005@hotmail.com> is Research and Teaching Fellow, Center for Research in Economics and Business, Lahore School of Economics, Lahore.

[1]In Pakistan, 1200 children under the age of 5 years die every day and 35 percent of these deaths occur due to malnutrition (UNICEF, 2012).

[2]According to the World Health Organisation (2013), child growth is a global measure of children's nutritional status, and the three most widely used indicators of poor growth include the states of being "stunted", "wasted", and "underweight". The consequences of stunting are serious and long-term, making these children more vulnerable to repeated bouts of infections and diseases.

a case of chronic malnutrition where a child is too short for their age (Rawe, Jayasinghe, Mason, Davis, Pizzini, Garde, & Crosby, 2012). Researchers give more importance to stunting, or lower than height-for-age, (in comparison to rates of underweight and wasting) since stunting is a cumulative indicator of nutritional status of children starting from the prenatal phase. The consequences of stunting are serious and long-term, making these children more vulnerable to repeated bouts of infections and diseases.

According to the most recent Pakistan Demographic and Health Statistics (PDHS) 2017-18, anthropomorphic measurements taken for around 3500 children under the age of five indicated that 37.6 percent were stunted, 23.1 percent were underweight, and 7.1 percent were wasted (NIPS & ICF, 2019). This marks an improvement over the PDHS 2012-13, where 44.8 percent of children in Pakistan were stunted, 30 percent were underweight, and 10.8 percent were wasted (NIPS & ICF, 2013). The summary statistics also reveal that child nutritional status was better for wealthier families, urban families, children with more educated mothers, and those with longer birth spacing; these patterns were observed in both 2012-13 and 2018-19. Punjab's child nutrition indicators were the best amongst the provinces, with Sindh, Baluchistan, and FATA's levels of child nutrition amongst the lowest nationally, especially in the rural areas where stunting could exceed 50 percent (NIPS & ICF, 2019). Tariq, Sajjad, Zakar, Zakar, and Fischer (2018), using PDHS 2012-13 data, found that high birth order was associated with a child under age two being stunted and underweight. According to the same study, children under age two were also vulnerable to malnutrition if the child's mother was young, married consanguineously, had less education, or was herself underweight. Similar results for the risks of the three measures of malnutrition for an expanded sample of children under age five were found using the PDHS 2012-2013 by Khan, Zaheer, and Safdar (2019). They further found that female children were less likely to be stunted, underweight, or wasted. Asim and Nawaz's (2018) review of the literature on child nutrition in Pakistan suggests that high fertility and its contributing factors (early marriage and lack of birth spacing) as well as feeding practices are major drivers of the country's current levels of malnutrition.

Recently, Jayachandran and Pande (2017) have suggested that India's poor performance, relative to Africa, can at least partly be explained by an eldest son preference and son-biased fertility stopping behaviours. Parents sometimes have more than their ideal number of children in order to have their desired number of sons; this tends to happen when the first-born child (or children) are girls. Further, they find that Indian girls are shorter for their age than children in Sub-Saharan Africa by 0.143 z-score points, where the z-score represents the number of standard deviations from the median of an international reference population developed by the World Health Organisation (WHO). Previous studies had already noted that Indian girls had poorer outcomes as compared to girls in other developing countries (Barcellos, Carvalho, & Lleras-Muney, 2014; Mishra, Roy, & Retherford, 2004).[3] Discrimination against girls has also been detected in Bangladesh, particularly in early studies (Bairagi, 1986; Chen, Haq, & d'Souza, 1981; Dancer, Rammohan, & Smith, 2008; Rousham, 1996).

[3]Barcellos et al. (2014) found, using data spanning 20 years and 58 countries, that while girls in developing countries tend to have higher height- and weight-for-age z-scores than boys on average, the female advantage is significantly smaller in India, which is suggestive of discrimination against girls. Mishra et al. (2004) found that Indian boys were more likely than girls to be stunted in the early-1990s, but less likely to be stunted by the late-1990s.

An interesting comparison with the Indian case is the province of Punjab, Pakistan, which is culturally and linguistically very similar to its neighbouring Indian province of Punjab. In comparison to both India and Bangladesh, incomes are higher in Punjab, which is almost exclusively Muslim, like Bangladesh but unlike India. While there has been much research looking at the child level outcomes in Punjab, we extend this work by asking whether girls are also disadvantaged in Punjab. While Afzal (2013) found a 0.086 height-for-age z-score advantage for girls in Punjab, it is a much smaller advantage in magnitude than that found in Sub-Saharan Africa, where Jayachandran and Pande (2013) measured the female height-for-age advantage to be almost a quarter of a standard deviation in z-score.[4] Some smaller-scale studies have found worse outcomes for girls rather than boys, in the poorest and marginalised populations in Pakistan, like squatter settlements and rural areas (Baig-Ansari, Rahbar, Bhutta, & Baddrudin, 2006; Nuruddin & Hadden, 2015). Gender gaps in Pakistan are not limited to nutrition; Khan (2008) identified them in children's education as well.

In this study, we will apply an alternative test to data from Punjab, in particular the mixture model of Morduch and Stern (1997), to see whether regression averages are hiding a subset of households who discriminate against girls. Morduch and Stern's (1997) analysis is based on the premise that microeconometric studies using child level data (including height-for-age z-scores) may be unable to detect the pro-son bias evident at the macro-level (such as skewed gender ratios) because they pool households exhibiting heterogeneous attitudes toward children based on gender.

For example, if only a fraction of households discriminate against their daughters or households differ in the extent of their pro-son bias, regression-averaged discrimination may fail to come out as statistically significant. Further, OLS estimates may be inconsistent if common factors determine the outcome variable (child health) and group membership (households with strong pro-son bias). Therefore, Morduch and Stern (1997) applied a mixture model approach to a sample of households in Bangladesh that had at least one son and one daughter to divide the sample into two groups based on a latent variable: one with a pro-son bias, and one without.

Standard regression analysis on the full sample (a pooled OLS analysis) in Bangladesh's case yielded no statistically significant difference in height-for-age z-scores based on gender, regressions. However, the analysis on the two groups separately (as differentiated by the finite mixture model approach) indicated that girls had a 7 percent disadvantage in height-for-age in one group, and a 6 percent advantage in the other.

Morduch and Stern (1997) is the only prior work that has applied the finite mixture model to understand household-level gender discrimination, and it used a very small data set consisting of just over 300 observations collected in the late 1980s. Ours is the first study conducted for Pakistan applying the FMM procedure and makes use of a much larger and more recent data set of over 19,000 households. An innovation of our study is that it tests whether son-biased fertility stopping rules is the source of gender gaps and whether there is evidence of residual discrimination once that factor is controlled for in the analysis.

[4]A height advantage for girls of 0.23 standard deviations was observed in Jayachandran and Pande's (2013) sample of 25 Sub-Saharan African countries.

The results of our study will inform policy-makers in the following way. If we find that there is discrimination against the female children of the family, public health officials together with medical staff and lady health workers can be guided to pay special attention to the anthropomorphic growth of the female children under their care, while public health campaigns can target female children. On the other hand, if son-biased fertility stopping behaviours are driving nutritional deficits within families, all children in the household are at risk and public health measures can be directed towards increasing birth spacing and family planning.

The remainder of the paper will proceed as follows:

- Section 2 describes the finite mixture model (FMM) that will be used in the analysis to identify latent gender discrimination.
- Section 3 discusses the data set, which is a pooled cross-section of the MICS Punjab for 2008, 2010, and 2014.
- Section 4 presents the results in three parts: (i) correlates of family-average stunting and height-for-age z-scores, (ii) how child-level HFA is related to child gender and son-biased fertility stopping, and (iii) the results of the finite mixture model.
- Section 5 concludes the study.

2. METHODS

Mixture (or latent class) models are a way of identifying and controlling for unobserved heterogeneity within a population that allow for the unbiased and consistent estimation of sub-population parameters. Finite mixture models (FMM) do this for a limited number of discrete latent classes, modelling statistical distributions as a mixture (or weighted sum) of other distributions. In our case, we will be considering the latent classes as households in Punjab with a pro-son bias and those without, as in Morduch and Stern (1997). More recently, mixture models have been applied to the study of the effectiveness of prenatal care (Conway & Deb, 2005), job loss and health behaviours (Deb, Gallo, Ayyagari, Fletcher, & Sindelar, 2011), and medical care utilisation (Deb & Trivedi, 2002). The FMM estimation procedure is described in Cameron and Trivedi (2005) and summarised below.

Following Cameron and Trivedi (2005), if we assume that the pooled sample is actually a probabilistic mixture of two sub-populations, with probability density functions (pdf) $f_1(t \mid \mu_1(\mathbf{x}))$ and $f_2(t \mid \mu_2(\mathbf{x}))$, then the two-component finite mixture is defined as:

$$\pi f_1(\cdot) + (1 - \pi) f_2(\cdot) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where observations are drawn from f_1 and f_2, with probabilities π and $1 - \pi$, respectively. The probability of belonging to the first class, π, might be already known or otherwise may be estimated. The finite mixture model can be extended to include three or more latent classes, such that $\Sigma\pi_j = 1$.

Cameron and Trivedi (2005) define $d_i = (d_{i1},...,d_{im})$ as an indicator variable, where $d_{ij} = 1$($d_{ij} = 1$) indicates that t_i was drawn from the j^{th} latent group or class for $i = 1, \ldots, N$. Were the d observed, the log-likelihood of the model would be written:

$$\ln L(\mu, \pi/t, d) \overset{SEP}{=} \sum_{i=1}^{N} \sum_{j=1}^{m} d_{ij} \ln f_j(t_i; \mu_j) + \sum_{i=1}^{N} \sum_{j=1}^{m} d_{ij} ln\pi_j \quad \ldots \quad (2)$$

Instead, the EM algorithm in which the variables d = ($d_1, \ldots, d_n$) are treated as missing data will be estimated. Given values of π_j, the posterior probability that observation t_i belongs to the population *j*, *j* = 1,2,...*m*, denoted z_{ij}, is:

$$Z_{ij} \equiv \Pr[y_i \in population\ j] = \frac{\pi_j f_j(y_i/X_i, \beta_j)}{\sum_{j=1}^{m} \pi_j f_j(y_i/X_i, \beta_j)} \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

According to Cameron and Trivedi (2005), if we average the values of z_{ij} over *i*, we obtain the probability that a randomly chosen observation belongs to subpopulation *j*; hence E[z_{ij}] = π_j.

We start with an estimate, $\widehat{z_{ij}}$, of E[d_{ij}]. Conditional on estimate $\widehat{z_{ij}}$, Cameron and Trivedi (2005) write:

$$EL(\beta_i, \ldots, \beta_m, \pi/t, \hat{z}, x_1, \ldots, x_m) = \sum_{i=1}^{N} \sum_{j=1}^{m} \hat{z_{ij}} \ln f_i(t_i, \mu(x_j, \beta_j) + \sum_{i=1}^{N} \sum_{j=1}^{m} \hat{z_{ij}} ln\pi_j \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

and this provides us with what is referred to as the E-step of the EM algorithm. The next step of the algorithm, the M-step, maximises EL (above) by solving this pair of first-order conditions:

$$\hat{\pi_j} - N^{-1} \sum_{i=1}^{m} \hat{z_{ij}} = 0, \quad j = 1, \ldots, m, \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

$$\sum_{i=1}^{N} \sum_{j=1}^{m} \hat{z_{ij}} \frac{\partial ln f_j(t_j/\beta_j)}{\partial \beta_j} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

Through this, we are able to calculate new values of $\widehat{z_{ij}}$, which are used to iterate through the aforementioned E- and M-steps until the process converges (Cameron & Trivedi, 2005).

3. DATA

We create a rich dataset by combining three rounds of the district-based Multiple Indicators Cluster Survey Punjab, from 2008, 2011, and 2014 for our analysis. It includes 36 districts and 150 tehsils or towns in urban and rural Punjab. For instance, in 2011, 95,238 households were interviewed, including 66,666 children under the age of five (Bureau of Statistics Punjab, 2011).[5] The variable of interest, the proxy for a child's long-term nutritional status, is measured by standardised z-scores for height-for-age (HFA) for children age 0 to 59 months. The z-scores,[6] recommended by World Health Organisation (WHO) and the National Centre for Health Statistics (NCHS), represent a comparison of

[5]In 2008, 91,075 households were surveyed for the MICS including 70,226 children under the age of five. And in 2014, 38,405 households were interviewed for the MICS including 27,495 children under the age of five (Bureau of Statistics Punjab, 2008; 2016). The sample size of the MICS Punjab is the main reason for focusing on just one province: The nationally representative Pakistan Demographic and Health Survey 2012-13 contained anthropomorphic measurements for fewer than 3,500 children (NIPS & ICF, 2013). The newest PDHS 2017-18 has around the same usable sample size (NIPS & ICF, 2019).

[6]Children's height and weight are standardised according to the following formula: $Z = (x - \mu)/\sigma$, where *x* is the raw score and μ and σ are the mean and standard deviation, respectively.

the sampled children with an international reference population of the same age and gender (de Onis & Blössner, 2003). Specifically, the z-score measures the number of standard deviations (SD) from an international reference population's median values of height, adjusted for gender and age.

The MICS 2011 data for Punjab indicates that about 15 percent of the children were severely stunted, that is, below –3 SD of the reference group and 20 percent of the children under five years of age were moderately stunted (Table 1). The mean z-score for height-for-age in the sample was –1.46 in 2011, which means that on average, a child in Punjab was 1.46 standard deviations below the median for a reference group child of the same age and gender. Over the time period considered in this study, the share of children severely stunted has fallen from 22.2 percent in 2008 to 13.6 percent of the under-five population in 2014, while the share of moderately stunted children has remained steady at around 20 percent of children. Together, these statistics imply steady improvement in child nutritional status in Punjab over time since the total share of stunted children has fallen. It would also appear to be the case that some children who would previously have been severely stunted (had the distribution remained unchanged) are now only moderately stunted, and some moderately stunted children have moved out of the stunted category altogether.

Table 1

Height-for-Age z-score in the MICS Punjab, 2008-2014

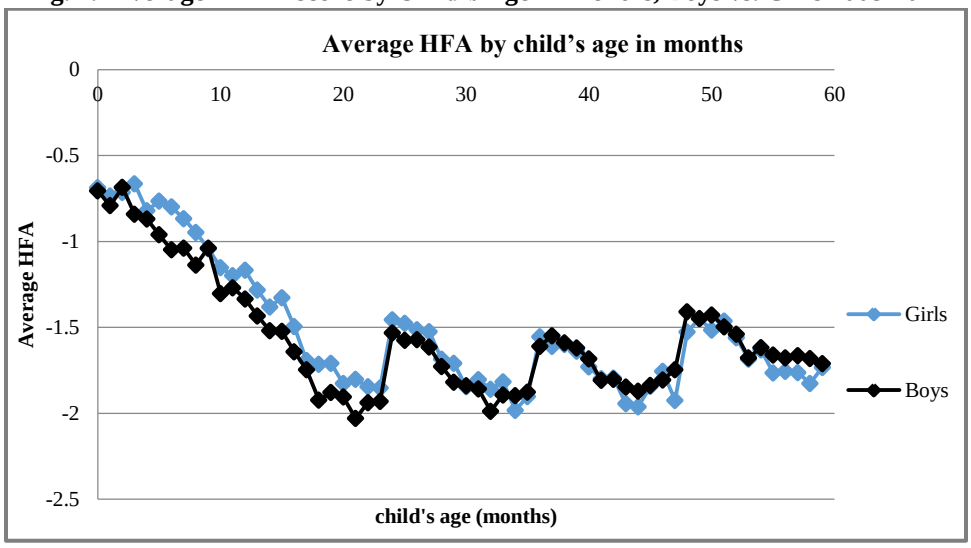
	Number of Observations	Mean HFA z-score	Standard Deviation	Moderate Stunting (z-score= -2 to -2.99)	Severe Stunting (z-score<2.99)
2008	57,349	–1.63	1.81	19.4%	22.2%
2011	62,398	–1.46	1.53	20.1%	14.7%
2014	26,336	–1.44	1.46	20.6%	13.6%

Source: Authors' calculations based on MICS 2008, 2011, and 2014; excluded outliers >5.99 and <–5.99.

If we plot the HFA z-scores for girls and boys at different ages (from birth to age 5 years) using the pooled data of the MICS Punjab 2008, 2011, and 2014, we see that children of both genders start out at birth with z-scores of about –0.7 standard deviations, but then the z-scores dip precipitously until about 20 months of age (Figure 1). The age-profiles HFA of girls and boys track each other closely, though it is mostly higher for girls before the age of 35 months, and marginally higher for boys thereafter.

Using the combined data of the MICS Punjab 2008, 2011, and 2014, we obtain a sample of 86,242 couples with at least one child under the age of five. To obtain this sample, we have dropped outliers that we define as z-scores >5.99 or <–5.99 and children whose parents have been married more than 15 years, since the data only identifies mothers of children age 14 and younger. Of these, 53,945 couples (51,420 couples) have at least one son (daughter) under five years of age and data on the relevant household characteristics (Table 2). The family average HFA is about 1.5 standard deviations below the international reference population's median, and it is slightly higher, by 0.05 standard deviations, for the average daughter than the average son. A bit more than one-third of the average family's children under-five are stunted. Couples have on average 1.5 children of each gender, while about two-thirds of the couple's children are born before the eldest son. Almost half of the mothers have not completed primary education and just over one-third of the sample is living in urban areas.

Fig. 1. Average HFA z-score by Child's Age in Months, Boys vs. Girls 2008-2014



Source: Authors' calculations based on data from MICS 2008, 2011, and 2014. Outliers (z-scores greater than 6 and less than -6 were excluded.

Table 2

Summary Statistics for All Couples with at least One Child < 5 Years Old

Variables	Obs	Mean	Std. Dev.	Min	Max
Average HFA of children born to a mother	86,242	–1.48	1.50	–5.99	5.97
Average HFA of male children born to a mother	53,945	–1.51	1.56	–5.99	5.96
Average HFA of female children born to a mother	51,420	–1.46	1.57	–5.99	5.98
Share of a mother's under-5 children stunted	86,242	.36	.44	0	1
Share of a mother's under-5 sons stunted	53,945	.37	.46	0	1
Share of a mother's under-5 daughters stunted	51,420	.36	.46	0	1
Male share of under-5 children	86,242	0.51	0.34	0	1
Share of children born before eldest son	86,242	0.65	0.32	0.09	1
Number of boys	86,242	1.50	1.16	0	8
Number of girls	86,242	1.50	1.23	0	8
Urban (dummy)	86,242	0.37	0.48	0	1
Landholding (dummy)	86,242	0.32	0.47	0	1
Wealth score	86,242	0.01	0.99	–2.75	2.71
Number of children under 5 years in HH	86,242	1.75	0.99	1	13
Mother educated to primary school (dummy)	86,242	0.18	0.38	0	1
Mother educated to middle school (dummy)	86,242	0.09	0.29	0	1
Mother educated to secondary or higher (dummy)	86,242	0.24	0.43	0	1
HH head educated to secondary or higher (dummy)	86,242	0.30	0.46	0	1
Mother's average age at birth	86,242	27.17	6.77	10	50
Data year=2011 (dummy)	86,242	0.45	0.50	0	1
Data year=2014 (dummy)	86,242	0.19	0.39	0	1
Child age (months)	86,242	29.07	14.31	0	63

Source: Authors' calculations based on MICS Punjab 2008, 2011, and 2014.
The breakdown of observations by year is: 30,547 in 2008; 39,219 in 2011; 16,476 in 2014.

To implement the finite mixture model to identify latent discrimination, we restrict the sample to couples with at least one child of *each* gender under the age of five. This leaves us with a sub-sample of 19,123 couples. Summary statistics for this sub-sample are shown in Table 3. Similar to the full sample, the average daughter's HFA exceeds that of her brother by 0.047 standard deviations. The summary statistics for the sub-sample in Table 3 do not vary much from the full sample described in Table 2.

Details on the other control variables are as follows. The wealth score, provided by the MICS data set, is a composite measure based on a principal component analysis of household assets. The mother's average age at birth is the mean of the mother's age at the birth of each child included in the sample.

Table 3

Summary Statistics for Mixture Model Regression

Variables	Mean	Std. Dev.	Min	Max
Male average less female average of HFA of children 0-5 years of age in HH	–0.047	1.880	–10.560	8.710
Male share of under-5 children	0.490	0.146	0.111	0.889
Share of children born before eldest son	0.572	0.296	0.091	1.000
Urban (dummy)	0.348	0.476	0.000	1.000
Landholding (dummy)	0.317	0.465	0.000	1.000
Wealth score	–0.063	0.981	–2.747	2.695
Number of children under 5 years in HH	2.519	0.909	2.000	13.000
Mother educated to secondary or higher (dummy)	0.220	0.414	0.000	1.000
HH head educated to secondary or higher (dummy)	0.286	0.452	0.000	1.000
Mother's average age at birth	26.703	5.928	10.000	48.500
Data year=2011 (dummy)	0.473	0.499	0.000	1.000
Data year=2014 (dummy)	0.197	0.398	0.000	1.000
Number of Observations = 19,123				

Source: Authors' calculations based on MICS 2008, 2011, 2014 of couples with at least one child of each gender age <5 years.

4. RESULTS

The results are presented in three parts. First, we look at family average stunting and height-for-age z-scores for around 82,000 families included in the pooled MICS data using an OLS analysis. In the second part, we consider the impact on child-level HFA of gender and of not having an elder brother using the pooled MICS data for over 145,000 children under age five, again using OLS. Lastly, we estimate the finite mixture model to search for latent gender discrimination using the data of approximately 19,000 households that had at least one son and one daughter under age-five.

(i) Stunting, Family-Average HFA and Gender Composition of Children

In the first part of the analysis, we examine the role of having a large share of children without an elder brother on the household's share of stunted children and household average HFA in the full sample applying an OLS analysis that includes district fixed-effects. Here, we take as the dependent variable the share of children under-five who are stunted and the family average height-for-age of all children under-five for all couples with at least one child in that age group. This leads to a sample of 86,242 families, using pooled data from MICS Punjab 2008, 2011, and 2014. We also consider the average stunting of male and female children separately. The summary statistics for this sample were described in Table 2. We predict that the share of stunted children will be higher when son-biased fertility preferences are present and the family bears a larger number of children than anticipated in order to have a son, because family resources are stretched further, and each child consequently receives a smaller allocation (Jayachandran & Pande, 2017).

We find that the share of stunted children is higher and the average HFA z-score is lower when the share of children without an elder brother is higher (Table 4, col 1 and 4).[7] These results are suggestive of the hypothesis mentioned earlier, that families might increase their fertility beyond their ability to support their children in pursuit of a son. Interestingly, these son-biased fertility preferences are more likely to hurt sons than daughters, when we look at stunting separately by gender (Table 4, col 2-3). Further, when we run the regressions by wealth quintile, we find that this effect is strongest for the second lowest and the third (middle) wealth quintiles, but insignificant for the poorest and the richest quintiles (Appendix Table 1).

The regressions also lend support to the idea that it is beneficial in general to be in the minority gender-wise. The share of stunted daughters is higher when the male share of under-five children is larger, whereas the reverse is the case for the share of stunted sons (Table 4, col 2-3). Garg and Morduch (1998) had found for Ghana that both boys and girls should benefit nutritionally from a larger number of sisters, because sisters present less competition for household resources; our results for the average stunting of boys coincide with that result, but for girls we get just the opposite. The result for son's under-five being worse off when there is a larger share of boys in the same age group may also reflect the fact that boys have lower HFA scores in general in developing countries (Barcellos et al. 2014). A larger number of total children in the family raises the level of stunting (and lowers the average HFA) of those children under age-five, reflecting quantity/quality tradeoffs.

With 2008 as the base year, the time trend improvements from 2008 to 2011 and 2014 can be seen in the coefficients on the data year dummies (Data year=2011 and Data year=2014). The coefficients on the control variables follow expected patterns: Maternal education and to a lesser extent household head's education confer substantial and statistically significant benefits to child nutrition. Compared to mothers who have not completed primary education (the excluded category), child stunting is lower and average HFA is higher for mothers who have completed each subsequent level of education—primary, middle, and secondary or higher. Landownership and assets overall also

[7]Note that the variable "share of children without an elder brother" takes its highest value (=1) when there is no son or when the first son is the last-born child.

Table 4

Correlates of Share of Children Stunted and Average HFA z-score of a Couple's Children under Age Five, 2008-2014

Variables	(1) Share of under-5 Children Stunted (All)	(2) Share of under-5 Children Stunted (Males)	(3) Share of under-5 Children Stunted (Females)	(4) Avg HFA (all)
Male Share of under-5 Children	0.027***	0.065***	-0.033***	-0.093***
	(0.005)	(0.010)	(0.012)	(0.017)
Share of Children without Elder Brother	0.022***	0.028***	0.002	-0.087***
	(0.007)	(0.009)	(0.011)	(0.023)
Number of Children	0.006***	0.009***	0.008***	-0.010**
	(0.001)	(0.002)	(0.002)	(0.004)
Urban (dummy)	0.024***	0.024***	0.026***	-0.083***
	(0.004)	(0.006)	(0.006)	(0.015)
Landholding (dummy)	-0.037***	-0.037***	-0.036***	0.123***
	(0.003)	(0.005)	(0.005)	(0.012)
Wealth Score	-0.077***	-0.074***	-0.081***	0.288***
	(0.003)	(0.003)	(0.003)	(0.009)
Number of Children under 5 Years in HH	-0.004**	-0.002	-0.005**	0.018***
	(0.002)	(0.002)	(0.002)	(0.006)
Mother Educated to Primary School (dummy)	-0.030***	-0.031***	-0.026***	0.090***
	(0.004)	(0.006)	(0.006)	(0.014)
Mother Educated to Middle School (dummy)	-0.046***	-0.045***	-0.044***	0.145***
	(0.005)	(0.007)	(0.007)	(0.018)
Mother Educated to Secondary or Higher (dummy)	-0.081***	-0.086***	-0.076***	0.304***
	(0.005)	(0.006)	(0.007)	(0.017)
HH Head Educated to Secondary or Higher (dummy)	-0.031***	-0.032***	-0.030***	0.124***
	(0.004)	(0.005)	(0.005)	(0.012)
Mother's Average Age at Birth	-0.001***	-0.001***	-0.001***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)
Data year=2011 (dummy)	-0.075***	-0.069***	-0.077***	0.214***
	(0.004)	(0.005)	(0.005)	(0.014)
Data year=2014 (dummy)	-0.089***	-0.087***	-0.088***	0.231***
	(0.005)	(0.006)	(0.006)	(0.016)
Average Child Age (months)	0.010***	0.011***	0.010***	-0.049***
	(0.000)	(0.001)	(0.001)	(0.002)
Squared Avg. Child Age	-0.000***	-0.000***	-0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.264***	0.218***	0.291***	-0.913***
	(0.015)	(0.025)	(0.020)	(0.051)
Number of Observations	86,242	53,945	51,420	86,242
R-Squared	0.086	0.070	0.082	0.108

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Clustered standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.
District fixed-effects included here but not reported.

translate into better nutritional status. All else being equal, children in urban households have higher stunting by about 0.025 points and lower average HFA z-scores, by 0.08 standard deviations. It is unclear what is leading the children of urban areas to experience worse nutritional status but we might speculate that, holding all else equal, there is greater food security and/or lower rates of infectious disease in rural areas.

The coefficients on child age and squared-age show that HFA z-scores (stunting) follow a U shape (inverted-U) pattern, deteriorating in the early months followed by a modest recovery. This is similar to z-score patterns observed worldwide and in South Asia in particular (Victora, de Onis, Hallal, Blössner, & Shrimpton, 2010). Contributing factors include the poor feeding practices that have been documented in Pakistan, such as low rates of breastfeeding in the first hour after birth, and low rates of exclusive breastfeeding, as well as deficiencies in the diversity of complementary foods (Torlesse & Raju, 2018).

Before we conclude this section, we would like to discuss the role of parental height and its absence from the analysis here. Genetic endowment, especially through parental height, has a strong relationship with a child's adult height, and while we would have liked to control for parental height in our regressions, the data is not collected by the MICS. On the other hand, WHO guidelines suggest that children under the age of five, when adequately nourished, will have a common distribution of height-for-age. Our main variable of interest here has been the incidence of stunting, determined by children falling at least two standard deviations below the median height for their gender and age, a measure that is substantially more representative of child nutritional status (and consequently less related to parental height) according to the WHO (de Onis & Blossner, 2003).

On the other hand, where we look at the average HFA of the family's under-five children, we admit that the parental height may be considered an omitted variable. However, bias is only a concern to the extent that the omitted variable is correlated with the explanatory variables. It is plausible that mother's height is positively correlated with her educational attainment and therefore the coefficient on maternal education may be biased upwards. However, we cannot think of a reason *a priori* why a mother's height should be related to our main variables of interest, that is the gender mix of the children, and therefore we remain confident of the results regarding son-biased fertility (i.e., when there is a larger share of children without an elder brother).

As a robustness check, we ran the regressions separately for 2008, 2011, and 2014. While there are some minor changes in the magnitude and statistical significance of a few coefficients (in particular for the 2014 sample, which is much smaller than the other years), the results do not change qualitatively from those presented in Table 4 (see Appendix Tables 2-4).

(ii) Child-level HFA with (or Without) an Elder Brother

In the second part of the analysis, we consider the impact on child-level HFA of gender and of not having an elder brother. For this analysis, we use the individual HFA data on more than 145,000 children (summary statistics at the household level were presented in Table 2). We start with an OLS analysis, first with only the gender variables, and then including a large number of household and child-level controls (Table 5, col 1-2).

Finally, in order to control for other relevant unobservable factors that are constant within neighbourhoods and households, we control for cluster fixed effects (CFE) and household fixed effects (HFE) in Table 5 (col 3-4). Eldest sons have an advantage of 0.09 to 0.21 z-score points. For girls without an elder brother, this advantage is reduced by 0.04-0.05 z-score points, although this effect disappears in the HFE specification. Female children on average are taller by 0.06-0.07 standard deviations for the first three specifications, which rises slightly in the HFE regression. Overall, however, girls without an elder brother have better nutritional outcomes than eldest brothers since the positive coefficient on *Female* overpowers the negative coefficient on the interaction term *Female*No Elder Brother* in all but the HFE specification, as revealed by the F-statistic on the significance of the test *Female+ Female*No elder brother* = 0.

Table 5

Correlates of Child-level HFA z-score of Children under Age 5, 2008-2014

Variables	(1) OLS no Controls	(2) OLS with Controls	(3) CFE	(4) HFE
Female	0.069***	0.062***	0.065***	0.087***
	(0.012)	(0.011)	(0.011)	(0.016)
No Elder Brother	0.210***	0.086***	0.093***	0.203***
	(0.012)	(0.011)	(0.012)	(0.017)
Female* No Elder Brother	–0.044***	–0.040**	–0.045***	0.027
	(0.017)	(0.016)	(0.017)	(0.024)
Observations	146,083	145,817	145,817	146,030
R-squared	0.004	0.121	0.089	0.112
Number of Households				92,074
Number of Clusters			15,588	
F-test: *Female+ Female*No Elder Brother* = 0	F=3.38 Prob > F=0.0659	F=4.52 Prob > F=0.0335	F=2.66 Prob > F=0.1030	F=37.58 Prob > F= 0.0000

Source: Authors' calculations based on MICS 2008, 2011, 2014. Robust standard errors clustered at the mother, cluster, and household levels respectively. Controls include mother's education, household head education, household landholding, wealth, urban dummy, child age-in-months fixed effects, district fixed effects, year-of-birth fixed effects, and month-of-birth fixed effects.

(iii) The Finite Mixture Model

Lastly, we apply the finite mixture model technique on the sub-sample of couples in Punjab that have at least one child of each gender under the age of five (summarised in Table 3), using a set of controls resembling those used in Morduch and Stern (1997)[8] to see if there is a latent group of households with a pro-son bias. The dependent variable we use to measure latent gender discrimination is defined at the couple-level as the difference in the average HFA for sons and the average HFA for daughters: (average

[8]Morduch and Stern (1997) controlled for: age of woman head of household, income per capita, Hindu religion, rural location, household size, mother's education, distances to medical facilities and regional centres, and gender of first born.

HFA of sons - average HFA of daughters). Since development is associated with greater gender equality in a variety of settings, we predict that discrimination will be lower for families that are wealthier, urban, and more educated, but higher for families with son-biased fertility preferences, the latter being consistent with Jayachandran and Pande (2017).

As a first step, before applying the mixture model, we run an OLS regression on the full (pooled) sample of around 19,000 couples to see the how the population average gender gap in HFA varies with household characteristics.[9] According to the OLS regression results, girls have an average *advantage* of 0.132 standard deviations in height-for-age z-score over their brothers when we control only for household characteristics, which rises to 0.208 standard deviations when we control for gender composition (Table 6, col 1-2).

Table 6

Finite Mixture Model Results

Dependent variable: Male average less female average of height-for-age in family (Children Aged 0-5 years)

	(1)	(2)	(3)	(4)
			Group 1	Group 2
Variables	Pooled Sample (OLS)	Pooled Sample (OLS)	(FMM)	(FMM)
Residual Difference in HFA (Boys - Girls)	**-0.132***	**-0.204***	**-0.144**	**-0.329**
	(0.080)	(0.118)	(0.159)	(0.380)
Share of Male Children		-0.219**	-0.141	-0.379
		(0.108)	(0.151)	(0.345)
Share of Children without Elder Brother		0.217***	0.090	0.484***
		(0.055)	(0.075)	(0.184)
Urban (dummy)	0.028	0.034	-0.014	0.138
	(0.036)	(0.036)	(0.048)	(0.115)
Landholding (dummy)	-0.029	-0.033	0.009	-0.121
	(0.031)	(0.031)	(0.043)	(0.102)
Wealth Score	-0.014	-0.023	0.008	-0.087
	(0.019)	(0.020)	(0.028)	(0.066)
Number of Children under 5 Years in HH	0.004	0.009	0.023	-0.023
	(0.015)	(0.015)	(0.020)	(0.046)
Mother Educated to Secondary or Higher (dummy)	-0.035	-0.045	-0.067	0.002
	(0.039)	(0.039)	(0.050)	(0.123)
HH Head Educated to Secondary or Higher (dummy)	-0.025	-0.024	0.019	-0.114
	(0.034)	(0.034)	(0.044)	(0.112)
Mother's Average Age at Birth	0.003	0.005**	0.003	0.009
	(0.002)	(0.002)	(0.004)	(0.008)
Observations		19,123	19,123	19,123
Classification Based on Likely Latent Class Membership			16641	2482

Source: Authors' calculations based on MICS 2008, 2011, 2014.

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

[9]Given that the dependent variable in the mixture model is the *difference* in height-for-age between male and female siblings, the effect of parental height drops out as long as parental height affects both genders to roughly the same extent.

The female advantage in our sample is reinforced when there is a larger share of sons in the household but is reduced in families where the share of children without an elder brother is higher; in other words, the female advantage in HFA falls when the first son is born at a later birth order (Table 6, col 2). Therefore, when the eldest son is born at a later birth order, either the son(s) are doing better nutritionally, daughter(s) are doing worse, or both. This might happen if some families increase their fertility beyond the number of children they can support, to have a son, harming the nutritional status of the elder daughters, known as a son-biased fertility pattern. However, a more benign possibility is that if the boy is the youngest he will naturally have a higher HFA because, as noted in Figure 1, younger children (especially less than 15 months) tend to have higher HFA z-scores than older children do.

Next, in order to test whether a latent sub-population of couples with a pro-son bias exists, we apply the finite mixture model to divide the sample into two groups. When we do this, however, we do not find a higher height-for-age for boys in either group. In fact, we identify one group where girls have a statistically insignificant advantage in their height-for-age of 0.14 z-score points (Table 6, col 3), and a second group where girls have a larger but still statistically insignificant advantage of 0.329 z-score points over their brothers (Table 6, col 4). Group 1, identified by the mixture model, encompasses 87 percent of the observations. As a robustness check, we carried out the FMM estimation separately for households with two children and for households with three or more children. In both cases, the constant term, which is the measure for latent discrimination, is statistically insignificant (Appendix Table 7). As another robustness check, we included district fixed effects; again, the results did not change qualitatively from those reported in Table 5 (Appendix Table 8).

Therefore, we do not find evidence of the same kind of latent discrimination against girls as was found in Bangladesh by Morduch and Stern (1997) using the mixture model approach, where they found sons to have 7 percent higher HFA z-scores on average than daughters in one group of households.[10] Morduch and Stern (1997) also found that mothers' education at the primary level and rural households benefited boys over girls, but we do not find the same in our results. Another result of Morduch and Stern (1997) was that the height advantage of boys was greater when the first-born child was a girl. This is similar to our result that the height advantage of boys was greater when the share of children without an elder brother was higher (that is, the first-born children were girls).

Concluding this section, we found that the male-female gap was statistically insignificant in our FMM specification. In addition, the diagnostic tests on the FMM cast doubt that our model can identify two distinct classes of families (Appendix Table 6).[11] Putting these together, we are not confident that we can classify a latent group of families discriminating based on gender.

[10]Given that there were some outliers for the dependent variable, as seen in the summary statistics in Table 3, we re-estimate the mixture model excluding those households for which the difference in HFA z-scores between male and female children is less than 6 in absolute value. The results, shown in Appendix Table 5, do not change substantially from Table 6.

[11]Diagnostics of the finite mixture model results are in Appendix Table 6. We see that average probability of a household being assigned to a latent class if they are actually a member of that group is nearly 74 percent, which appears promising. However, as the entropy measure is only around 0.2 (on a scale of 0 to 1), the mixture model has less explanatory power than we would expect if there were in fact two distinct classes of households; typically, the entropy measure should take a value at least 0.5.

5. CONCLUSIONS

Child nutritional status has improved in Punjab, Pakistan over the period 2008 to 2014, as severe stunting rates have declined by 8.6 percentage points and average HFA has increased by 0.19 standard deviations. However, the nutritional status of its children is still quite poor in comparison to a number of Sub-Saharan African countries. Studies in India and Bangladesh have found evidence pointing to potential latent gender discrimination (Barcellos et al. 2014; Jayachandran & Pande, 2017; Morduch& Stern, 1997).

Barcellos et al. (2014) had found that youngest-born girls had an advantage of 0.181 standard deviations over youngest-born boys using DHS data from 58 developing countries spanning 1986 – 2009, although this advantage was 0.034 deviations smaller for Indian girls. Replicating their analysis using our sample, in unreported results, we find that youngest girls have an advantage of 0.127 standard deviations over youngest boys, in other words an advantage even smaller than Barcellos et al. (2014) observed for Indian girls.

We find that girls in Punjab have a smaller HFA advantage over boys as seen in other studies in developing countries. Yet we do not find evidence of latent discrimination against girls using the finite mixture model, unlike what Morduch and Stern (1997) found in Bangladesh. We do find, however, that when a larger share of children is born before the eldest son, that is, a son is born after many daughters that the share of children stunted is higher and the average HFA of the children is lower. This suggests that families extend their fertility quite possibly beyond the number of children they can support in pursuit of sons. Current evidence does not suggest that this has led to sex-selective abortions (Zaidi & Morgan, 2016). We conclude that couples' preferences regarding the gender composition of their offspring (in particular, pursuit of a son) can lead to excess fertility, which can have subsequent effects on the long-term nutritional status of their children, especially (and ironically) sons. These effects are concentrated in the second (from bottom) and third (middle) quintiles of wealth.

Fertility preferences driven by son-bias are attitudes that are unlikely to change in the short term, but have scope to change as the status of women in the household improves through higher rates of educational attainment, participation of women in the labour force, and greater empowerment of women. Increasing education of mothers also has a direct impact on children's nutritional status.[12]

Arif, Farooq, Nazir, & Satti (2014, p. 115) note that child malnutrition is a difficult problem to tackle, as it is "deeply rooted in child illness, environmental factors and a weak health system", further finding that it will not be fixed simply through economic growth or poverty alleviation. Even so, there are many useful interventions available to improve nutrition in the near term, in particular early and exclusive breastfeeding and a diverse complementary diet as children age (Torlesse and Raju, 2018). Raju and D'Souza (2017) note that Pakistan's expenditures on nutrition programmes are low, and this is an area where targeted improvements can be made, especially in lagging areas.

[12]In a related analysis of the correlates of child-level HFA carried out in a separate study, we find that child nutritional status is positively related to mother's and household head's education, household wealth and land ownership, and negatively related to birth order, child age-in-months, and living in urban areas (Chaudhry, Khan, & Mir, 2018).

Raju and D'Souza's literature review also summarises some evidence that cash transfer programs like BISP can improve the nutritional status of girls. The lady health worker (LHW) program has proven to be effective in some areas of child nutrition such as growth monitoring, and can be further improved in other aspects, including encouraging early and exclusive breastfeeding and proper complementary feeding. Isolated pilot programs to improve child nutrition by LHWs have shown much promise for future scaling up (Raju & D'Souza, 2017). Finally, given that son-biased fertility (that is, having too many children in order to bear a son) appears to be a significant factor in child stunting, family planning and birth spacing should also be strongly encouraged.

Appendix Table 1

Correlates of Share of Children Stunted a Couple's Children under Age Five, 2008-2014, by Wealth Quintile

Variables	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	Highest Quintile
Male Share of under-5 Children	0.021	0.036***	0.035***	0.028***	0.020**
	(0.013)	(0.012)	(0.011)	(0.010)	(0.010)
Share of Children without Elder Brother	0.016	0.037**	0.038**	0.004	0.008
	(0.017)	(0.016)	(0.015)	(0.014)	(0.014)
Number of Children	0.004	0.010***	0.013***	0.008***	-0.000
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Urban (dummy)	-0.007	0.018*	0.036***	0.035***	0.017*
	(0.016)	(0.011)	(0.008)	(0.007)	(0.009)
Landholding (dummy)	-0.033***	-0.035***	-0.027***	-0.043***	-0.038***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)
Wealth Score	-0.059***	-0.086***	-0.104***	-0.102***	-0.053***
	(0.013)	(0.019)	(0.019)	(0.017)	(0.009)
Number of Children under 5 Years in HH	-0.017***	-0.005	-0.003	0.001	0.000
	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
Mother Educated to Primary School (dummy)	-0.032**	-0.045***	-0.030***	-0.029***	-0.009
	(0.014)	(0.009)	(0.008)	(0.009)	(0.014)
Mother Educated to Middle School (dummy)	-0.032	-0.040***	-0.057***	-0.036***	-0.039***
	(0.030)	(0.015)	(0.011)	(0.010)	(0.013)
Mother Educated to Secondary or Higher (dummy)	-0.053	-0.086***	-0.082***	-0.078***	-0.079***
	(0.043)	(0.017)	(0.010)	(0.008)	(0.011)
HH Head Educated to Secondary or Higher (dummy)	-0.051***	-0.024**	-0.032***	-0.032***	-0.026***
	(0.014)	(0.009)	(0.007)	(0.006)	(0.007)
Mother's Average Age at Birth	-0.001	-0.002***	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Data year=2011 (dummy)	-0.048***	-0.056***	-0.077***	-0.072***	-0.098***
	(0.009)	(0.009)	(0.008)	(0.007)	(0.007)
Data year=2014 (dummy)	-0.035***	-0.063***	-0.102***	-0.097***	-0.135***
	(0.011)	(0.010)	(0.009)	(0.009)	(0.009)
Average Child Age (months)	0.014***	0.013***	0.011***	0.009***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Squared Avg. Child Age	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.253***	0.223***	0.249***	0.325***	0.393***
	(0.034)	(0.032)	(0.028)	(0.028)	(0.031)
Number of Observations	15,838	16,579	17,923	19,101	16,801
R-Squared	0.030	0.033	0.044	0.041	0.041

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.

Clustered standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 2

Correlates of Share of Children Stunted and Average HFA z-score of a Couple's Children under Age Five, 2008

Variables	(1) Share of under-5 Children Stunted (All)	(2) Share of under-5 Children Stunted (Males)	(3) Share of under-5 Children Stunted (Females)	(4) Avg HFA (All)
Male Share of under-5 Children	0.019**	0.059***	-0.043**	-0.127***
	(0.009)	(0.018)	(0.021)	(0.033)
Share of Children without Elder Brother	0.017	0.032*	-0.019	-0.105**
	(0.011)	(0.016)	(0.019)	(0.043)
Number of Children	0.007***	0.009**	0.009***	-0.017*
	(0.002)	(0.004)	(0.003)	(0.009)
Urban (dummy)	0.048***	0.041***	0.052***	-0.167***
	(0.008)	(0.010)	(0.010)	(0.030)
Landholding (dummy)	-0.017***	-0.018**	-0.015*	0.060***
	(0.006)	(0.008)	(0.008)	(0.023)
Wealth Score	-0.077***	-0.072***	-0.081***	0.307***
	(0.004)	(0.005)	(0.006)	(0.016)
Number of Children under 5 Years in HH	-0.010***	-0.006	-0.013***	0.044***
	(0.003)	(0.004)	(0.004)	(0.011)
Mother Educated to Primary School (dummy)	-0.038***	-0.045***	-0.028***	0.133***
	(0.008)	(0.010)	(0.010)	(0.029)
Mother Educated to Middle School (dummy)	-0.041***	-0.037***	-0.039***	0.143***
	(0.010)	(0.014)	(0.013)	(0.037)
Mother Educated to Secondary or Higher (dummy)	-0.061***	-0.077***	-0.040***	0.261***
	(0.009)	(0.011)	(0.012)	(0.033)
HH Head Educated to Secondary or Higher (dummy)	-0.015**	-0.013	-0.020**	0.077***
	(0.006)	(0.008)	(0.008)	(0.024)
Mother's Average Age at Birth	-0.002***	-0.002***	-0.003***	0.007***
	(0.000)	(0.001)	(0.001)	(0.002)
Average Child Age (months)	0.009***	0.009***	0.008***	-0.046***
	(0.001)	(0.001)	(0.001)	(0.003)
Squared Avg. Child Age	-0.000***	-0.000***	-0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.324***	0.255***	0.368***	-1.000***
	(0.022)	(0.039)	(0.030)	(0.086)
Number of Observations	30,547	18,879	17,962	30,547
R-Squared	0.052	0.045	0.048	0.070

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 3

Correlates of Share of Children Stunted and Average HFA z-score of a Couple's Children under Age Five, 2011

Variables	(1) Share of under-5 Children Stunted (All)	(2) Share of under-5 Children Stunted (Males)	(3) Share of under-5 Children Stunted (Females)	(4) Avg HFA (All)
Male Share of under-5 Children	0.035***	0.071***	-0.025	-0.104***
	(0.007)	(0.015)	(0.018)	(0.023)
Share of Children without Elder Brother	0.026***	0.027*	0.011	-0.083***
	(0.010)	(0.014)	(0.016)	(0.031)
Number of Children	0.008***	0.011***	0.008***	-0.018***
	(0.002)	(0.003)	(0.003)	(0.006)
Urban (dummy)	0.017***	0.024***	0.020***	-0.069***
	(0.006)	(0.008)	(0.008)	(0.019)
Landholding (dummy)	-0.043***	-0.039***	-0.046***	0.149***
	(0.005)	(0.007)	(0.007)	(0.017)
Wealth Score	-0.076***	-0.075***	-0.079***	0.287***
	(0.003)	(0.004)	(0.005)	(0.011)
Number of Children under 5 Years in HH	-0.001	-0.001	-0.001	0.007
	(0.002)	(0.003)	(0.003)	(0.008)
Mother Educated to Primary School (dummy)	-0.038***	-0.036***	-0.034***	0.094***
	(0.006)	(0.008)	(0.008)	(0.019)
Mother Educated to Middle School (dummy)	-0.050***	-0.050***	-0.047***	0.144***
	(0.008)	(0.011)	(0.011)	(0.025)
Mother Educated to Secondary or Higher (dummy)	-0.093***	-0.094***	-0.096***	0.325***
	(0.007)	(0.009)	(0.009)	(0.022)
HH Head Educated to Secondary or Higher (dummy)	-0.040***	-0.040***	-0.039***	0.149***
	(0.005)	(0.007)	(0.007)	(0.016)
Mother's Average Age at Birth	-0.001***	-0.002***	-0.001***	0.005***
	(0.000)	(0.000)	(0.000)	(0.001)
Average Child Age (months)	0.011***	0.012***	0.010***	-0.050***
	(0.001)	(0.001)	(0.001)	(0.002)
Squared Avg. Child Age	-0.000***	-0.000***	-0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.203***	0.168***	0.221***	-0.759***
	(0.018)	(0.033)	(0.025)	(0.060)
Number of Observations	39,219	24,741	23,532	39,219
R-Squared	0.083	0.067	0.080	0.118

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4

Correlates of Share of Children Stunted and Average HFA z-score of a Couple's Children under Age Five, 2014

Variables	(1) Share of under-5 Children Stunted (All)	(2) Share of under-5 Children Stunted (Males)	(3) Share of under-5 Children Stunted (Females)	(4) Avg HFA (All)
Male Share of under-5 Children	0.029***	0.073***	-0.022	-0.028
	(0.011)	(0.022)	(0.027)	(0.034)
Share of Children without Elder Brother	0.016	0.019	0.017	-0.056
	(0.015)	(0.021)	(0.024)	(0.046)
Number of Children	0.008***	0.009**	0.012***	-0.004
	(0.003)	(0.004)	(0.004)	(0.008)
Urban (dummy)	0.012	0.007	0.006	-0.040
	(0.009)	(0.012)	(0.011)	(0.027)
Landholding (dummy)	-0.052***	-0.060***	-0.044***	0.150***
	(0.007)	(0.010)	(0.010)	(0.024)
Wealth Score	-0.093***	-0.084***	-0.097***	0.319***
	(0.005)	(0.007)	(0.007)	(0.016)
Number of Children under 5 Years in HH	0.002	0.004	-0.003	-0.009
	(0.003)	(0.005)	(0.005)	(0.011)
Mother Educated to Primary School (dummy)	-0.029***	-0.017	-0.029**	0.089***
	(0.010)	(0.013)	(0.013)	(0.027)
Mother Educated to Middle School (dummy)	-0.062***	-0.059***	-0.064***	0.191***
	(0.012)	(0.016)	(0.016)	(0.036)
Mother Educated to Secondary or Higher (dummy)	-0.092***	-0.088***	-0.098***	0.345***
	(0.011)	(0.014)	(0.014)	(0.033)
HH Head Educated to Secondary or Higher (dummy)	-0.044***	-0.053***	-0.037***	0.156***
	(0.007)	(0.010)	(0.010)	(0.023)
Mother's Average Age at Birth	-0.001***	-0.002***	-0.001	0.004***
	(0.000)	(0.001)	(0.001)	(0.001)
Average Child Age (months)	0.012***	0.011***	0.012***	-0.048***
	(0.001)	(0.001)	(0.001)	(0.003)
Squared Avg. Child Age	-0.000***	-0.000***	-0.000***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.173***	0.154***	0.149***	-0.810***
	(0.027)	(0.049)	(0.035)	(0.085)
Number of Observations	16,476	10,325	9,926	16,476
R-Squared	0.118	0.090	0.119	0.155

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 5

Mixture Model Results on Restricted Sample (|Dependent variable| <6

Dependent variable: Male average less female average of height-for-age in HH (Children Aged 0-5 years)

Variables	(1) Pooled Sample	(2) Group 1	(3) Group 2	(4) Pooled Sample	(5) Group 1	(6) Group 2
Residual Difference in HFA (Boys - Girls)	-0.198*	0.087	-0.322	-0.204*	-0.006	-0.291
	(0.115)	(0.299)	(0.200)	(0.114)	(0.285)	(0.188)
Share of Male Children	-0.196*	0.018	-0.286	-0.198*	-0.020	-0.271
	(0.105)	(0.323)	(0.193)	(0.105)	(0.314)	(0.186)
Share of Children Born before Eldest Son	0.193***	-0.036	0.294***	0.191***	-0.040	0.290***
	(0.053)	(0.131)	(0.088)	(0.053)	(0.132)	(0.087)
Urban (dummy)	0.032	-0.016	0.057	0.026	-0.038	0.056
	(0.034)	(0.096)	(0.060)	(0.034)	(0.085)	(0.057)
Landholding (dummy)	-0.016	0.010	-0.027	-0.017	0.020	-0.032
	(0.030)	(0.080)	(0.051)	(0.030)	(0.077)	(0.050)
Wealth Score	-0.025	0.040	-0.054	-0.022	0.042	-0.051
	(0.019)	(0.054)	(0.034)	(0.019)	(0.055)	(0.034)
Number of Children under 5 Years in HH	0.012	0.015	0.010	0.012	0.017	0.009
	(0.014)	(0.030)	(0.023)	(0.014)	(0.031)	(0.023)
Mother Educated to Secondary or Higher (dummy)	-0.048	-0.071	-0.037	-0.048	-0.064	-0.041
	(0.037)	(0.084)	(0.061)	(0.037)	(0.082)	(0.059)
HH Head Educated to Secondary or Higher (dummy)	0.001	0.022	-0.008	0.000	0.028	-0.012
	(0.032)	(0.077)	(0.054)	(0.032)	(0.076)	(0.053)
Mother's Average Age at Birth	0.005**	-0.000	0.007	0.005*	-0.001	0.007*
	(0.002)	(0.007)	(0.004)	(0.002)	(0.007)	(0.004)
Data year=2011 (dummy)	-0.046	-0.146	-0.008			
	(0.031)	(0.227)	(0.104)			
Data year=2014 (dummy)	0.031	-0.145	0.106			
	(0.036)	(0.221)	(0.105)			
Observations	18,987	18,987	18,987	18,987	18,987	18,987

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.

Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 6

Average Posterior Probabilities

Mean	LC1	LC2
p1	**0.738**	0.262
p2	0.264	**0.736**
Entropy	**0.201**	

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.

Appendix Table 7

FMM Estimation, Splitting Sample by Number of Children

	Two Child Families			Families with 3+ Children		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Pooled Sample	Group 1	Group 2	Pooled Sample	Group 1	Group 2
Residual Difference in HFA (Boys - Girls)	-0.260*	0.067	-0.951*	-0.045	-0.147	0.242
	(0.153)	(0.215)	(0.531)	(0.183)	(0.259)	(0.693)
Share of Male Children	-0.180	-0.366	0.221	-0.255*	0.042	-0.997*
	(0.154)	(0.227)	(0.533)	(0.151)	(0.197)	(0.514)
Share of Children Born before Eldest Son	0.269***	0.050	0.738***	0.137	0.139	0.115
	(0.072)	(0.095)	(0.252)	(0.088)	(0.125)	(0.324)
Urban (dummy)	0.049	0.059	0.038	0.020	-0.083	0.262
	(0.046)	(0.062)	(0.150)	(0.056)	(0.078)	(0.199)
Landholding (dummy)	-0.030	0.005	-0.110	-0.032	-0.011	-0.085
	(0.040)	(0.055)	(0.134)	(0.048)	(0.066)	(0.166)
Wealth Score	-0.033	-0.016	-0.073	-0.004	0.021	-0.057
	(0.026)	(0.036)	(0.085)	(0.030)	(0.044)	(0.110)
Number of Children under 5 Years in HH	-			-0.013	0.047	-0.152
				(0.024)	(0.033)	(0.100)
Mother Educated to Secondary or Higher (dummy)	-0.073	-0.131**	0.052	-0.008	0.054	-0.154
	(0.051)	(0.064)	(0.167)	(0.060)	(0.078)	(0.217)
HH head Educated to Secondary or Higher (dummy)	0.003	0.075	-0.139	-0.065	-0.049	-0.111
	(0.044)	(0.056)	(0.147)	(0.053)	(0.072)	(0.189)
Mother's Average Age at Birth	0.005*	0.006	0.004	0.005	-0.003	0.025*
	(0.003)	(0.005)	(0.011)	(0.004)	(0.006)	(0.014)
Data year=2011 (dummy)	-0.029	-0.176**	0.240	-0.033	-0.069	0.035
	(0.042)	(0.079)	(0.181)	(0.052)	(0.095)	(0.220)
Data year=2014 (dummy)	0.054	-0.146*	0.449**	0.030	0.038	-0.013
	(0.050)	(0.083)	(0.194)	(0.060)	(0.098)	(0.236)
Observations	12,107	12,107	12,107	7,016	7,016	7,016
R-squared	0.003			0.002		

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 8

FMM Regression including District Fixed Effects

Variables	(1) Pooled Sample	(2) Group 1	(3) Group 2
Residual Difference in HFA (Boys - Girls)	-0.055	-0.081	-0.581
	(0.137)	(0.218)	(0.515)
Share of Male Children	-0.218**	-0.122	-0.384
	(0.108)	(0.155)	(0.350)
Share of Children Born before Eldest Son	0.215***	0.079	0.494***
	(0.055)	(0.075)	(0.181)
Urban (dummy)	0.025	-0.031	0.141
	(0.037)	(0.051)	(0.119)
Landholding (dummy)	-0.035	-0.010	-0.092
	(0.031)	(0.043)	(0.101)
Wealth Score	-0.006	0.038	-0.097
	(0.022)	(0.031)	(0.070)
Number of Children under 5 Years in HH	0.009	0.024	-0.022
	(0.015)	(0.020)	(0.048)
Mother Educated to Secondary or Higher (dummy)	-0.049	-0.061	-0.017
	(0.039)	(0.050)	(0.124)
HH Head Educated to Secondary or Higher (dummy)	-0.028	0.011	-0.105
	(0.034)	(0.045)	(0.111)
Mother's Average Age at Birth	0.005**	0.003	0.010
	(0.002)	(0.004)	(0.008)
Data year=2011 (dummy)	-0.030	-0.122*	0.137
	(0.034)	(0.065)	(0.140)
Data year=2014 (dummy)	0.036	-0.065	0.227
	(0.040)	(0.070)	(0.149)
2.districtcode	-0.211**	0.019	0.545
	(0.092)	(0.159)	(0.396)
3.districtcode	-0.148	0.085	-0.253
	(0.090)	(0.155)	(0.386)
4.districtcode	-0.024	0.184	-0.240
	(0.128)	(0.167)	(0.399)
5.districtcode	-0.203*	0.166	0.165
	(0.105)	(0.243)	(0.553)
6.districtcode	-0.133	0.006	-0.053
	(0.108)	(0.162)	(0.402)
7.districtcode	-0.038	0.036	0.085
	(0.122)	(0.202)	(0.463)
8.districtcode	-0.121	0.155	0.151
	(0.084)	(0.207)	(0.472)
9.districtcode	-0.093	-0.059	0.333
	(0.097)	(0.149)	(0.372)
10.districtcode	-0.079	0.160	-0.033
	(0.109)	(0.161)	(0.406)
11.districtcode	-0.253***	-0.080	0.501
	(0.095)	(0.172)	(0.431)
12.districtcode	-0.185*	-0.102	0.011
	(0.101)	(0.157)	(0.403)
13.districtcode	-0.127	-0.017	0.050
	(0.122)	(0.156)	(0.398)
14.districtcode	-0.075	-0.081	0.366
	(0.122)	(0.180)	(0.480)
15.districtcode	-0.264**	0.231	-0.145
	(0.112)	(0.184)	(0.440)

Continued—

Appendix Table 8—(*Continued*)

16.districtcode	-0.288***	0.105	-0.455
	(0.107)	(0.177)	(0.430)
17.districtcode	-0.175*	-0.385**	0.455
	(0.099)	(0.181)	(0.448)
18.districtcode	-0.206**	0.092	-0.144
	(0.099)	(0.168)	(0.409)
19.districtcode	-0.220**	-0.126	0.203
	(0.111)	(0.172)	(0.419)
20.districtcode	-0.071	0.260	-0.628
	(0.107)	(0.187)	(0.435)
21.districtcode	-0.088	0.017	0.321
	(0.112)	(0.169)	(0.454)
22.districtcode	-0.076	-0.185	0.608
	(0.102)	(0.259)	(0.557)
23.districtcode	-0.140	-0.061	0.433
	(0.118)	(0.227)	(0.482)
24.districtcode	-0.233**	0.109	-0.048
	(0.115)	(0.213)	(0.496)
25.districtcode	-0.077	0.005	-0.143
	(0.126)	(0.183)	(0.454)
26.districtcode	-0.236**	-0.084	0.478
	(0.118)	(0.246)	(0.540)
27.districtcode	-0.240**	-0.070	-0.010
	(0.102)	(0.174)	(0.456)
28.districtcode	-0.190*	0.002	-0.169
	(0.101)	(0.170)	(0.414)
29.districtcode	-0.224*	0.034	-0.069
	(0.133)	(0.157)	(0.414)
30.districtcode	-0.081	0.254	-0.528
	(0.118)	(0.245)	(0.596)
31.districtcode	0.022	-0.002	0.357
	(0.109)	(0.172)	(0.456)
32.districtcode	-0.021	0.113	0.431
	(0.093)	(0.160)	(0.432)
33.districtcode	-0.084	0.058	0.425
	(0.111)	(0.149)	(0.380)
34.districtcode	-0.084	0.158	0.003
	(0.117)	(0.196)	(0.444)
35.districtcode	-0.280**	0.305*	-0.366
	(0.131)	(0.165)	(0.429)
36.districtcode	-0.188	-0.127	-0.000
	(0.133)	(0.174)	(0.462)
Observations	19,123	19,123	19,123
R-squared	0.004		
Adjusted R-squared	0.000285	0.00180	0.00180

Source: Authors' calculations based on data from MICS 2008, 2011 and 2014.
Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

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Commentary

Bangladesh and Pakistan: The Great Divergence

MAHMOOD HASAN KHAN

There was a time when Bangladesh lagged behind Pakistan in the quality of life measured by any of its major indicators, except for adult literacy and schooling of children. But it is a different story today. Bangladesh is ahead of Pakistan in almost every respect. I intend to present the facts (data) to support this proposition first and then explore the reasons for the great divergence. I am far more certain about the evidence than I am of my explanation since some of it is guesswork, though hopefully not too off the mark.

We have reasonably reliable data for making comparisons on the levels of and changes in the quality-of-life indicators during the last 30 to 40 years. I use the data cited by the World Bank, UNDP and other international organisations. Well, Bangladesh is a far better country than Pakistan to live in and enjoy more freedoms. (Paradoxically the perception is that Pakistan is less corrupt and an easier place to do business, and its people are happier.) When we look at the Human Development Index (HDI), the position of Bangladesh (135) is higher than of Pakistan (152) in the ranking, though Bangladesh was behind Pakistan 30 years ago. The value of HDI for Bangladesh rose from 0.388 in 1990 to 0.614 in 2018 whereas for Pakistan it went up from 0.404 to 0.560. The HDI values adjusted for inequality differ even more: 0.465 for Bangladesh and 0.336 for Pakistan. An equally important fact is that the gender gap in Bangladesh is much smaller than in Pakistan and women in Bangladesh have made far more progress.

These changes are well supported by some of the other indicators. The average income per capita (measured in current US dollars) is one-third higher in Bangladesh now whereas it was lower by one-third in 1980. If measured in the constant PPP dollars, the income level in Bangladesh rose by six times from $851 in 1990 and by only 2.5 times from $1924 in Pakistan. The difference is striking. The growth of income in Bangladesh has also been much less detrimental to the environment: CO_2 emissions per capita were one-half of those in Pakistan. In both countries income inequality is reasonably low, though it has increased somewhat; there has been little change in the income share of the bottom 20 percent of the households. My guess is that wealth is more concentrated in Pakistan than in Bangladesh because of the differences in land concentration.

Mahmood Hasan Khan is Emeritus Professor of Economics, Simon Fraser University, Canada.

Looking at poverty, there are at least three measures of it: the national poverty lines that are incomparable; the international poverty line based on per capita expenditure of PPP$1.90 per day; and the multi-dimensional poverty index developed recently. Pakistan's performance in poverty reduction, measured by the international poverty line, has been far more impressive than of Bangladesh. However, using the multi-dimensional measure of poverty, Bangladesh has a far better position: only one-quarter of its population is poor compared with about 40 percent in Pakistan. The incidence of undernourishment is also significantly lower in Bangladesh and it has gone down more impressively than in Pakistan. While a slightly higher proportion of population in Pakistanis has access to good drinking water, Bangladesh has made far more progress in making this access possible in the last 30 years. A similar trend can be noted for people's access to improved sanitation.

The differences in the growth of GDP and population in the two countries can well explain the achievements in the level of per capita income. In the last fifty years, the annual growth rate of GDP in Bangladesh went up in every decade from 1.0 percent in the 1970s to 6.2 percent in this decade; in Pakistan the rate went up from 4.7 percent in the 1970s to 6.3 percent in the 1980s, but has fallen to 3.8 percent in this decade. (In the last thirty years, economic growth in Bangladesh occurred with lower inflation than in Pakistan.) The proximate reason for the growth differential can be seen in the level of savings and investment in the two countries. The level of savings relative to GDP in Bangladesh increased from merely 8 percent in 1980 consistently to 36 percent in 2019. In Pakistan, the level of savings fell over time from 25 to 21 percent. For investment, in Bangladesh the level rose from 14 percent in 1980 to 32 percent in 2019, but in Pakistan it fell from 18 percent to 16 percent in the same period. Bengalis have been saving and investing more of their income compared to Pakistanis who have also borrowed more from abroad if we look at the foreign debt to GDP ratios for the two countries.

Perhaps a more interesting fact is that the rate of growth of population in Bangladesh declined consistently from 2.69 percent in 1980 to 1.1 percent in 2018. In Pakistan, the rate was higher in 1980 (3.25 percent) and fell more slowly to 2.1 percent in 2018. Consequently population in Pakistan almost tripled to 217 million in 2019 and only doubled in Bangladesh to 163 million. The total fertility rate in Bangladesh went down from 6.4 children per woman in 1980 to 2 children in 2019. Compare it with Pakistan where there were almost the same number of children per woman in 1980, but almost twice as many (3.5 children) in 2019. This difference between the two countries is a reflection of the success of family planning in Bangladesh.

In Bangladesh, both females and males are living longer to 74 and 71 years, respectively, compared with 68 and 66 in years in Pakistan, although that was not the case in 1980 when the average life-span was longer in Pakistan. This difference is reflected in the changes in the infant and under-five mortality rates. We notice two important markers. First, in 1980 the overall mortality rate for infants and under-five children was higher in Bangladesh, but there has been a huge decline: from 134 (per 1,000 live births) to 25 for infants and from 199 to 30 for the under-five children compared with Pakistan where the rates went down from 124 to 57 and from 164 to 69, respectively. Second, similar differences can be seen in the mortality rates for the female and male infants and under-five children since 1990. The levels in Bangladesh are strikingly lower now compared to the mortality rates in Pakistan. It is obvious that the

demographic revolution in Bangladesh has led to fewer births and longer life for the children after birth.

Bangladesh has done even better in human capital formation. It had an edge over Pakistan even in the 1980s. Looking at the values of the Education Index for the two countries, in Bangladesh it rose from 0.251 in 1990 to 0.513 in 2019 and in Pakistan from 0.205 to 0.407 in the same period. Bangladesh has made impressive achievements in adult literacy and school enrolments of both females and males. It was slightly ahead of Pakistan in adult literacy in 1980, but since then the gap has widened: nearly three-quarters of adults in Bangladesh were literate in 2018 compared with about 60 percent in Pakistan. The gap is wider for females: 71 percent versus 48 percent. A similar change can be seen in school enrolments, especially of females. At the primary level, in Bangladesh the proportion in school went up from 84 percent in 1980 to 116 percent in 2018, whereas in Pakistan it rose from 59 to 94 percent. In the secondary schools, Bangladesh has done equally well: the enrolment rate increased from 21 percent in 1980 to 73 percent in 2018; in Pakistan the rate went up from 25 to 43 percent. A more notable fact is that the female enrolment rate in secondary schools was similar (14 percent) in the two countries in 1990, but now it is 78 percent in Bangladesh and 39 percent in Pakistan. Females in Pakistan have obviously lagged behind quite markedly.

The evidence is reasonably clear that Bangladesh has marched ahead of Pakistan in the last 30-40 years after starting from a lower position in 1971. Needless to add, its people suffered grossly from a monstrous cyclone—500,000 people were killed—in 1970 and by the brutal civil war in 1971. On its position before independence from Pakistan, I should refer to the 1970 report of a panel of economists from East Pakistan for the Fourth Five-Year Plan. They argued that much of the backwardness of East Pakistan and the inter-wing disparity were due to the systemic institutional and policy biases. Some of their evidence and arguments were contested by economists from West Pakistan. But much of the evidence was on the side of the East Pakistani economists. Life in East Pakistan was not as good as in West Pakistan for reasons that had to do primarily with the nature of the Pakistani state and the structure of power relations. It is fair to say that it was resentment on one side and insensitivity on the other that led to the break-up of Pakistan. I will say no more since much has been written about this sad chapter of recent history.

How can we explain the great divergence? I will try to make guesses here. I am sure that others, better informed and educated, can provide us with more coherent and convincing account. My first guess is that independence from Pakistan allowed the people of Bangladesh the opportunity to remake the political and administrative structure that had treated East Pakistan as a colony of Pakistan from 1947 to 1971. They could now build institutions and direct resources to meet their national goals. Gaining autonomy for decisions and actions was only the first step to lay the foundation of a new economy and society. But that wouldn't be enough to explain the changes I have highlighted. I should emphasise that in any comparison between the two countries, we should not underestimate the disruptive role of natural calamities. In the last fifty years, floods and cyclones have been far more frequent and severe with devastating effects on the economy and society of Bangladesh. The cyclones of 1970 and 1991 killed about 650,000 people. In Pakistan, floods and earthquakes have been far less frequent and their effects not as severe. People and settlements in Bangladesh are evidently more vulnerable to the vagaries of Nature than they are in Pakistan.

My view is that the interdependent forces of culture, institutions and policies have played a major role in the divergence between Bangladesh and Pakistan. The society in Bangladesh is culturally far more homogeneous than in Pakistan: look at language, ethnicity, religion, customs, food, and much else. Besides, it is also less divided by caste and class and its social structure is less hierarchical in both the home and outside. Related to this is the fact than women in Bangladesh are far less secluded than in Pakistan: they have enjoyed a better status at home and in the community. One has to look at their participation in the economy and society, e.g. more than one-third of them work in the labour force compared with less than one-quarter in Pakistan. A more open and secular milieu supported by the state and civil society institutions may have been important for women's empowerment in Bangladesh. You don't see the same development in Pakistan. Furthermore, the agrarian reforms of 1951 had reduced the inequalities in landownership and rural life in East Pakistan. They had disempowered the land-based oligarchy. No such changes have been allowed to occur in Pakistan. If anything the landed elite have formed strategic alliances with other powerful groups to maintain their influence in society.

Bangladesh went through a tumultuous period of nearly 20 years, starting from the civil war followed by political instability, including the army rule (1975-1981 and 1982-1990). Mercifully, the army's involvement in politics ended in 1990. Since then it has stayed in the barracks, though there have been some aborted mutinies and coup attempts. The elected governments, though by no means clean or democratic, have however given reasonable stability and the rule of law to the country in the last thirty years. Besides Bangladesh has had very little mass violence or acts of terrorism inside the country and no involvement outside its borders. In Pakistan, the army has ruled the country under one pretext or another for long spells since the late 1950s (1958-1970, 1977-1988 and 1999-2008). And in the last 12 years, it has been the kingmaker and powerbroker. Nor is this all. Its active involvement in the affairs of Afghanistan and Kashmir has had serious consequences on life inside the country. Pakistan has almost five times more army personnel than Bangladesh and it also spends a much larger proportion of its GDP on the army. Equally importantly, the army in Pakistan plays a more active role in the economy through ownership of real estate and industries and by contractual services.

In Bangladesh, the civil society institutions, particularly NGOs (like the Grameen Bank and BRAC), have played an important role in supporting the efforts of the government to promote the interests of the poor, females in particular, through various policies and instruments, e.g. access to small loans, health care, schooling, family planning, skills training and so on. Besides, Bangladesh has received much external assistance for these activities and it has utilised it more efficiently than has Pakistan. The partnership of government with NGOs and the donors has been consistently more harmonious than in Pakistan. No matter what the shade of its government, Bangladesh has pursued pragmatic economic policies and promoted diversification of the economy. (The development of the garment industry with foreign capital and female workers has no parallel in Pakistan.) Its human capital has also been a source of increased productivity in the economy. Not so in Pakistan: it has depended more on physical capital.

The state in Pakistan has been more audacious as well with unhappy consequences. The pseudo-socialist experiment of the 1970s bloated the size of the public sector, greatly weakened the role of the private sector and distorted the signals for economic activity. The authoritarian populism of that period did not improve the life of ordinary people. This audacious experiment was followed by a pseud-Islamic experiment that has pushed the country towards religious intolerance, bigotry and division of society. At the same time, Pakistan, induced by the United States, plunged into the on-going civil war in Afghanistan. Consequently, Afghan refugees and the Taliban-turned-terrorists—in whose growth Pakistan had played a major role—took a high toll on civic peace, life and resources. Resources that should have gone to make the economy stronger and improve the quality of life of ordinary people were used to secure internal and external security. Violence and religious extremism have become part of the social fabric. Bangladesh didn't have to carry this extra baggage. The relatively high growth rate of GDP in Pakistan during the periods of the army rule (1977-1988 and 1999-2008) was due mainly to the inflow of foreign aid and the internationally-sponsored macroeconomic stabilisation programmes and some minor reforms.

I should also emphasise the difference between the two countries in their national priorities and strategies. In Bangladesh, a high priority was given to the development of social and human capital. This was not the case in Pakistan: physical infrastructure, national defense and internal security were considered more important. Bangladesh put more national resources and foreign assistance than did Pakistan to develop human capital (education and health care). In addition, the state institutions in Pakistan were more intrusive in the economy than in Bangladesh if you compare the size of the public sector, including the armed forces, and government policies on regulating the domestic markets, foreign trade, and the flow of foreign private capital for investment. Pakistan looks more like a war economy and Bangladesh more like a peace economy.

A final point with which I should end this note. In Pakistan, unlike Bangladesh, land, religion and army have occupied a central place in the public sphere with their corrosive effects on the well-being of ordinary people. This difference between the two countries is an important part of the explanation of the observed divergence.

APPENDIX

Best Countries to Live in: Ranking in 171 countries (2020)

Bangladesh	98
Pakistan	131

Human Freedom Index: Ranking in 162 countries (2018)

Bangladesh	138
Pakistan	140

Press Freedom Index: Ranking: in 180 countries (2020)

Bangladesh	151
Pakistan	144

Economic Freedom Index: Ranking in 180 countries (2020)

Bangladesh	122
Pakistan	135

Human Development Index

	1990 (176 countries)		2018 (189 countries)		Inequality-Adjusted HDI (2018)
	Value	Rank	Value	Rank	Value
Bangladesh	0.388	122	0.614	135	0.465
Pakistan	0.404	117	0.560	152	0.336

Gender Inequality

	Gender Inequality Index (2018)		Gender Development Index (2018)	Gender Gap (2006) 115 countries		Gender Gap (2020) 153 countries	
	Value	Rank	Value	Value	Rank	Value	Rank
Bangladesh	0.536	129	0.895	0.627	91	0.720	50
Pakistan	0.547	136	0.747	0.543	112	0.564	151

Carbon Dioxide Emissions per capita (metric tons)

	1980	2018
Bangladesh	0.101	0.531
Pakistan	0.411	1.050

GDP per capita

	In Current US dollars					In PPP constant 2011 dollars	
	1980	1990	2000	2010	2019	1990	2019
Bangladesh	228	301	415	780	1855	851	4950
Pakistan	303	371	573	986	1285	1924	4884

Income Inequality (Gini Coefficient)

	1995	2015
Bangladesh	28.7	33.5
Pakistan	27.6	32.4

Income Share of the Bottom 20 percent

	1995	2015
Bangladesh	8.8	8.6
Pakistan	8.7	8.9

Population in Poverty (percent)

	$1.90 per day (constant PPP dollars)		Multi-dimensional (2018-2019)	
	1990	2016	Percent	Index
Bangladesh	44	15	25	(0.104)
Pakistan	59	5	38	(0.198)

Population Undernourished (percent)

	1990	2000	2010	2018
Bangladesh	32.8	20.6	17.2	14.7
Pakistan	25.1	23.4	21.7	20.3

Population with Access to Improved Drinking Water (percent)

	1990	2000	2010	2018
Bangladesh	68.1	76.0	83.5	86.9
Pakistan	86.3	88.5	90.5	91.4

Annual Growth Rate of GDP (percent)

	1971-1980	1981-1990	1991-2000	2001-2010	2011-2019
Bangladesh	1.0	4.0	4.7	5.0	6.2
Pakistan	4.7	6.3	4.0	4.3	3.8

Annual Inflation Rate (percent)

	1986-90	1991-95	1996-2000	2001-05	2006-10	2010-15	2016-19
Bangladesh	7.9	5.7	4.9	5.1	7.7	7.7	5.6
Pakistan	6.8	11.2	7.3	5.0	12.5	7.8	5.9

Gross Savings to GDP Ratio (percent)

	1980	1990	2000	2010	2019
Bangladesh	8	23	28	39	36
Pakistan	25	25	20	22	21

Gross Capital Formation to GDP Ratio (percent)

	1980	1990	2000	2010	2019
Bangladesh	14	16	24	26	32
Pakistan	18	19	18	16	16

External Debt to Gross National Income (percent)

	1980	1990	2000	2010	2018
Bangladesh	20.9	38.1	28.3	21.6	18.2
Pakistan	38.8	49.5	45.2	34.2	27.6

Population (million)

	1970	1980	1990	2000	2010	2019
Bangladesh	64.2	79.6	103.2	127.7	147.6	163.1
Pakistan	58.1	78.1	107.7	142.3	179.4	216.6

Annual Growth Rate of Population (percent)

	1980	1990	2000	2010	2018
Bangladesh	2.69	2.43	1.95	1.13	1.10
Pakistan	3.25	2.96	2.65	2.20	2.08

Female Labour Force Participation Rate (percent)

	1990	2000	2010	2019
Bangladesh	25	27	30	36
Pakistan	14	16	22	22

Total Fertility Rate (Number of Children per Woman)

	1980	2019
Bangladesh	6.4	2.0
Pakistan	6.5	3.5

Life Expectancy (Years at birth)

	Female		Male		Overall	
	1980	2019	1980	2019	1980	2019
Bangladesh	53	74	53	71	53	72
Pakistan	58	68	57	66	57	67

Infant Mortality Rate (per 1,000 live births)

	Female		Male		Overall	
	1990	2019	1990	2019	1990	2019
Bangladesh	92	23	107	27	134	25
Pakistan	100	52	113	63	124	57

Under-Five Mortality Rate (per 1,000 live births)

	Female		Male		Overall	
	1990	2019	1990	2019	1990	2019
Bangladesh	140	28	147	32	199	30
Pakistan	136	65	141	74	164	69

Education Index

	1990	2019
Bangladesh	0.251	0.513
Pakistan	0.205	0.407

Adult (15 years and above) Literacy Rate (percent)

	Female		Male		Overall	
	1980	2018	1980	2018	1980	2018
Bangladesh	18	71	40	77	30	74
Pakistan	15	48	35	71	26	59

Gross Primary School Enrolment (percent)

	Female		Male		Overall	
	1990	2018	1990	2018	1990	2018
Bangladesh	77	120	90	112	84	116
Pakistan	40	86	75	102	59	94

Gross Secondary School Enrolment (percent)

	Female		Male		Overall	
	1990	2018	1990	2018	1990	2018
Bangladesh	14	78	28	67	21	73
Pakistan	14	39	31	46	25	43

Armed Forces Personnel (in thousand)

	1990	2000	2010	2018
Bangladesh	103	137	221	221
Pakistan	550	900	346	936

Military Expenditure (percent of GDP)

	1980	1990	2000	2010	2018
Bangladesh	0.86	1.22	1.36	1.32	1.38
Pakistan	5.52	6.52	4.17	3.42	4.03

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Policy

Creativity in Schools: A 21st Century Need

SAMAN NAZIR

Creativity is a skill that the labour market in the coming decade will demand (Csikszentmihalyi, 2006). Students in the 21st century need to be educated in a way that they can tackle the challenges of today's ill-defined lives; to this end, creativity is the epitome resource and an attribute to address individual, social, and global problems. Though discipline and content may differ, creativity is required everywhere (Beghetto, 2010).

Creativity can be Taught

The debate about protecting and nurturing human creativity as early as elementary school starts is becoming critically relevant. Many nations, Western and Asian alike, have made creativity as a curriculum goal. Since the 1990s, education policy-makers in various countries, i.e., United States, China, Singapore, Middle East, Australia, Canada, England, Hong Kong, and Scandinavian nations, have introduced initiatives that target at developing students' creative potential (Craft, 2006; Craft, 2001; Shaheen, 2010).

What is Creativity?

Creativity is the "the ability to produce a novel (original and unexpected) yet appropriate (useful, meets task constraints) work/solution to the problem/response to a situation" (Andiliou & Murphy, 2010; Hondzel & Hansen, 2015; Mayer, 1999).

Creativity can contribute significantly across a spectrum of valuable traits. As Runco (2010, p. x) argued, "creativity is associated with but distinct from intelligence, innovation, imagination, insight, and health…...creativity is distinct and independent capacity.

Creativity plays a role in many things, including problem-solving, adoption, learning, coping, and so on (Runco, 2010, p. x)." Many organisations have identified creativity as the critical agent for developing sustainable knowledge-based economies, including the United Nations and European Union.

Four Asian societies namely, i.e., mainland China, Hong Kong, Taiwan, and Singapore, have introduced creativity in education policy. In 2003, Taiwan published an official document on creativity in education. While the contrary, Hong Kong and Singapore have introduced creativity in national curriculum reforms (Hui & Lau, 2010). Table 1 shows the details of legislation and standard implementation of creative education in these four societies. Three tables from Hui and Lau's study have been merged, although information is used without any alteration.

Saman Nazir <saman@pide.org.pk> is Staff Demographer, Pakistan Institute of Development Economics, Islamabad.

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Table 1

Detail Legislation and Stranded Implementation on Creativity Education in Four Asian Societies

Formal Documents	Mainland China *21st Century Educational Reform* and *Higher Education Law*	Hong Kong *Learning to Learn: The Way Forward in Curriculum Development*	Singapore *Towards Thinking Schools*	Taiwan *White Paper on Creative Education: Establishing a Republic of Creativity for Taiwan*
Year of Issue	1998	2001	1997	2002
Details of legislation on creativity education.				
1. Is there an individual policy on creativity education?	✓✓✓			
2. Is creativity education part of another policy?	✓✓	✓✓✓	✓	✓
3. Does the policy discuss creativity in the curriculum?	✓	✓✓✓	✓	✓✓✓
4. Does the policy discuss creativity in extra-curricular activities?	✓✓	✓✓✓		
5. Does the policy discuss creativity in the arts and cultural experiences?	✓✓	✓✓✓		
6. Does the policy discuss creativity in other learning experiences?	✓✓	✓✓✓		
7. Does the policy discuss creativity in testing?	✓✓	✓✓✓		
8. Is creativity education mandated?	✓	✓✓	✓✓✓	
9. Are programmes mandated with funding?	✓	✓✓✓		
10. Are programmes not mandated but urged?	✓	✓✓	✓✓	✓
Standard implementation of creativity education.				
1. Is general creativity identified?	✓	✓✓✓	✓✓	✓✓✓
2. Are there strategies for implementing creativity in the core curriculum (integrated in preschool education, learning areas in primary and secondary education, general education, and professional training in tertiary education?)	✓	✓✓✓	✓	✓✓✓
3. Are there strategies for implementing creativity at all grade levels?	✓✓✓	✓✓	✓✓✓	
4. Are there strategies for implementing creativity in teacher education?	✓	✓✓	✓	✓✓
5. Are standardised creativity tests used in assessment?	✓			
6. Are curriculum-based assessments used in evaluating creativity?	✓✓	✓	✓✓✓	
7. Are products or examples of work considered in creativity assessment (non-test information)?	✓	✓✓	✓	✓✓✓
8. Are achievements outside school considered in creativity assessment?	✓	✓✓	✓✓	✓✓✓

Source: Hui & Lau (2010, pages 219, 222, 224).

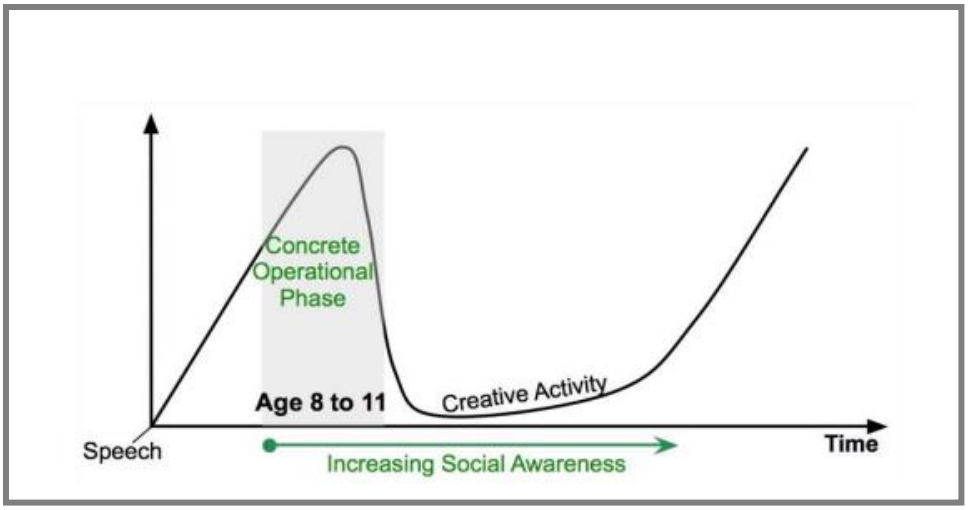
Note: ✓, ✓ ✓, ✓ ✓ ✓ indicate agreement assigned by 1 rater, 2 raters, 3 raters respectively.

The 4th-grade Slump

Researchers who worked on the classroom environments have described the classroom's classical image as an act where individual teachers standing in front of students, conveying information to be copied and recited. In 1950, Guilford discussed creative thinking among school-age children as it is severely discouraged in classrooms. Almost after a decade, Torrance endorsed his concerns by reporting his studies with first and 2nd-grade students. Results suggest that children with improvised thinking have been subjected to such a classroom environment that would eliminate fantasy from too early (Beghetto, 2010).

Torrance documented several longitudinal studies and came with the term "fourth-grade slump," a shape decline in divergent thinking in almost half of the children (Beghetto, 2010). All creative thinking abilities begin declining either at the end of third grade or at the beginning of the fourth grade (child's age 8 to 11 years old) (Torrance, 1967). From the onset of speech, child creativity increases until the age of 9 years, followed by a trough period. This rapid slump period matches when the child enters a 'concrete operational phase' (Yee & Lynn, 2015). The concrete operational phase in Piaget's cognitive development theory is when a child starts using logic in concrete ways. The fourth-grade slump in a conceptual drawing is given below.

Conceptual Diagram of Fourth-Grade Slump based on Torrance's Generalised Developmental Curve of Creative Thinking



Source: Yee & Lynn (2015, p. 6).

Strategies for Teaching Creatively

Research shows that creativity could be increased by education and training among children (Ergen & Akyol, 2012; Mirzaie, Hamidi & Anaraki, 2009; Zahra, Yusooff, & Hasim, 2013). For example, a study examines the effectiveness of creative training among preschool students through brainstorming, web link, storytelling, and role-plays (Zahra, Yusooff, & Hasim, 2013). Results show a significant positive effect of creative

training on divergent thinking skills (i.e., fluency, flexibility, elaboration, and originality) among students.

Teachers' beliefs about a supportive classroom environment to nurture creativity are crucial. Research shows that teachers who believe that creative thinking can be nurtured and developed in a classroom environment described a classroom's core features as open, flexible, unconventional, and student-centred (Andiliou & Murphy, 2010).

Big 'C' and little 'c'

The literature on creativity differentiates creativity between "big C" and "little c." The former metaphor for creativity refers to the inventions that are grand or change human lives in one way or another. The "big C" is a process where something historically or socially novel emerges or happens. The "little c" is everyday creativity or possibility thinking, where output may not be necessarily significant for society but only to the individual (Craft 2001; Lin 2011; Moran 2010). The ideas produced by students may not be regarded as creative joints or useful in the long run, but if the concept is new to them, it is considered little 'c' creativity. In the education of context, the target will be to cultivate and encourage the little c creativity among students.

Big C = refers to creative ideas/products that are original/unexpected historically to the world.

Little c = refers to everyday creative ideas that are new to the individuals.

The possibilities to nurture creativity in classrooms are limitless; however, below are the few examples taken from Newton's book *Creativity for a new curriculum: 5-11* (Newton, 2012). For example, how to nurture creativity in Geography class? Newton suggests that since Geography seeks to understand people's interaction and the environment, children could be assigned environmentalists, town planners, travel book writers, or explorers. Engaging maybe incorporate a combination of roles. In history, nurturing creativity could mean finding things out or solving problems and not about spinning narratives. Students must be given space to break free from the traditional way of doing things like mathematics, where the sound knowledge base is required. That means showing flexibility in one's approach to problem-solving where the creativity lies (Newton, 2012).

Elements to Nurture Creativity among Children

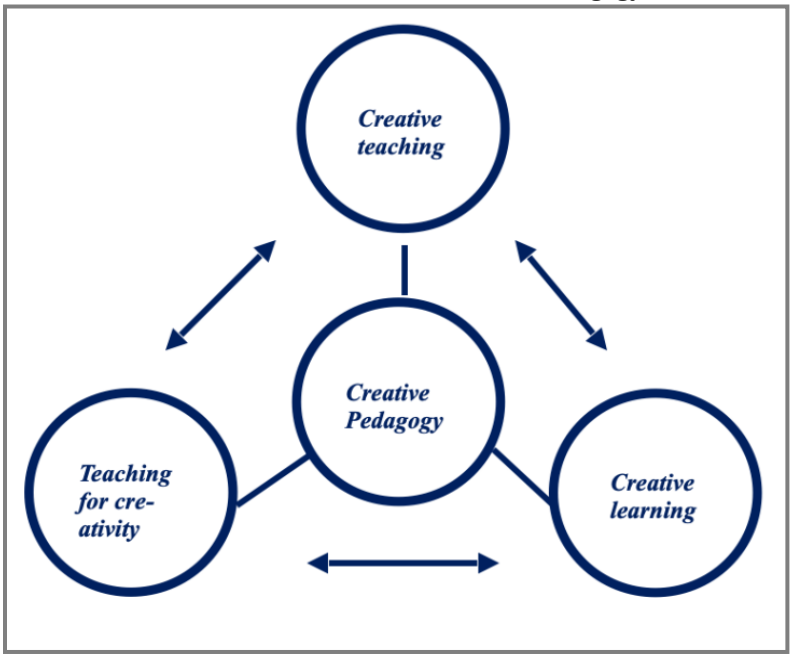
- Asking questions.
- Pedagogies based on the play.
- Immersion and connection making.
- Being original and imaginative.
- Innovation.
- Risk-taking.
- Determination.

Source: Cremin, Burnard, and Craft (2006).

Creative Pedagogies Entering Classrooms Everywhere

It is challenging to determine how exactly to implement creativity as a curriculum goal in a classroom setting. Research suggests a shift in pedagogical practices (Lin, 2014). Lin came up with a framework for creativity pedagogy. The framework provides a holistic view of pedagogical principles for fostering everyday creativity and seeks to facilitate the possibility of thinking.

The Three Elements for Creative Pedagogy



Source: Lin (2014, p. 44).

Elements for Creative Pedagogy

Creative teaching involves imaginative, dyna-mic, and innovative approaches to make learning exciting and compelling. Moreover, creative teaching is considered similar to "teaching as art" and "teaching as improvisational performance.

Teaching for creativity aims to develop learners' creative capacities and facilitates learners' agency and engagement through various means, such as devising learning strategies and exploring new possibilities. Teaching for creativity aims to stimulate learners' curiosity, motivation, problem-solving, and appreciation for creative ideas, to name a few. Pragmatic approaches and pedagogical principles such as standing back, profiling learner agency, and creating time and space are considered the core methods of developing students' creative capacities.

C*reative learning* focuses on children's spontaneous learning process. Creative learning calls for active and innovative engagement instead of passively accepting ideas by an authority (e.g., teachers, books). In creative learning, children learn through questioning, researching, exploring, investigating, and even playing aimlessly.

Source: Lin (2014).

The creative pedagogy model includes three interrelated elements: creative teaching, teaching for creativity, and creative learning. These three components complement one another and establish a shared and reflective teaching and learning process, rather than traditional pedagogical methods in which teaching and learning are two parallel processes. Creative teaching and teaching for creativity are interconnected and necessary processes (Lin, 2014).

Barriers to Creativity in Classrooms

Nurturing and facilitating creativity and creative potentials in a classroom setting could be challenging and problematic in some aspects. Here are the three main barriers that can suppress creativity in the classroom (Beghtto, 2010).

1. Convergent teaching practices.
2. Teachers' beliefs and attitudes about creativity.
3. The motivational environment & students' beliefs about their creativity.

"We show that supporting creativity is not yet another experience to be added into an already over-crowded day. Rather, it is a way of thinking and working that can be developed and used in any subject area to enhance learning in that subject (Newton, 2012, p .1)".

1. Convergent Teaching Practices

The convergent teaching approach is based on a talk design called "**IRE pattern**." IRE stands for the initiate, respond, and evaluate. Traditionally, IRE is the standard method used in classrooms by teachers. Most children are subjected to the IRE pattern as soon as they have been in preschool/nursery. Resultantly, students learn their role by the time they are finished with merely a few years of formal schooling. The IRE goes like this; the first teacher teaches, students wait for the teacher to ask questions, students raise their hands and quietly wait on the teacher to call on them, students share their response (matching between what they think and what teachers expect to hear), and finally, teachers tell whether their response is correct or appropriate.

The approach's biggest downfall is that unexpected or creative response is often not welcome or dismissed in the classroom. Research shows that even the prospective teachers desired expected ideas. Unique or unexpected ideas are viewed as potential or intentional distractions. Indeed, the students' unexpected ideas do not mean creative ideas all the time, but unexpected ideas may lead to creative ideas (Beghtto, 2010).

2. Teachers Beliefs about Creativity

Mostly teachers in a classroom setting consider creativity equivalent to nonconformity and hasty and distracting behaviour. Teachers may not have a clear idea about the understanding of creativity, which may hinder a teacher's efforts to support creativity. Confusion about what creativity is and how to nurture it would lead to many problematic beliefs and biases about creativity, including but not limited to originality bias, Big C bias, and product bias (Beghtto, 2010).

***Originality bias*:** Most of the educationists think that creativity is equal to originality. Originality is indeed the most emphasised attribute of creativity, but creativity is the synthesis of originality, individuality, and social appropriateness. Recognising creativity through the lenses of originality and appropriateness can help teachers understand that classroom limitation are not hostile to creativity. Placing a certain degree of restriction on originality and appropriateness helps avoid the danger in which a person forgets the difference between reality in the world and reality in his or her thinking (Beghtto, 2010).

Big-C Bias: When asked about creativity, most people think about grand creative ideas or products. The stress on eminent creativity has led to Big-C bias. However, creativity scholars emphasise the creativity spectrum distinguished at various levels of creative enormity, i.e., more subjective (smaller c) to more objective (larger-C) creative levels (Beghtto, 2010).

Product Bias: The expectation for a tangible product outcome is another bias related to creativity. The bias exists due to the evaluation ease for tangible products than more subjective internal construction of smaller c-creativity (Beghtto, 2010).

3. Motivational Environment & Students Beliefs

Creativity typically nourishes in environments that promote intrinsic motivation, i.e., motivation by pleasure, curiosity, immersion, and personally challenging tasks. On the other hand, creativity suffers in environments that stress extrinsic motivators, i.e., rewards or incentives for creative work, social comparison, expectation, or judgment from others. The students' self-beliefs often play an essential role in determining whether or not a child is creative in the classroom. The sense of efficacy is a personal evaluation of one's imaginative and perceived abilities to produce original ideas and solutions. Sense of efficacy is linked with a bench of positive outcomes, including student motivation, academic aspirations, and intellectual risks taking, to name a few, in a classroom (Beghtto, 2010).

Is there any Space for Creativity in Pakistani Classrooms?

Creativity as a curriculum goal is not part of the country's education policy. There is hardly any emphasis on nurturing creativity in Pakistan National Education Policy 2017 or any prior policies. The evidence on creativity among school children is also not encouraging. The current education system in Pakistan is inhabiting children creative potentials. In a study, 154 children took the Torrance Tests of Creative Thinking in a few districts of Punjab (Shaheen, 2010). The results of the study suggest that children can produce ideas that are sometimes are also original. However, children are weaker in producing abstract titles and struggle with going beyond ordinary thinking. Teaching practices in schools encourage rote memorisation and only aims towards knowledge acquisition (Shaheen, 2010).

After devolution, education has become a provincial subject; therefore, subjects like education policy, curriculum, and planning come under the provinces jurisdiction. I interviewed the trainers in Quaid-e-Azam Academy for Educational Development, which caters to school teachers training needs in the Punjab province. The aim of the interviews to see how much space creative teaching occupies in pedagogical practices in Pakistan. Teacher trainers mentioned that there is a little emphasis on nurturing creativity in teaching pedagogies. Although, in training, primary school teachers are encouraged to build critical thinking skills among students. There are parts in training that put emphasis on critical stimulation and encourage curiosity among students. Nonetheless, trainers are concerned that most of the instructions are not successfully translated into the classroom due to the various reasons including but not limited to, high teachers student ratio, personal motivational aspects of teaching, lack of facilities, the pressure of achieving results, and time constraints of learning. One of the trainers mentioned that.

> "If you look at our training modules, we emphasised an overall understanding for children—how teachers can produce a conducive environment and see this may lead to creative learning. For in-service training, we do not have any specific part or module to nature children creativity. However, our pre-service training and courses such as B-Ed have much stuff that one way another supports or leads to develop creative skills among children."

Pakistan's education system is lacking in protecting and nurturing creativity among children. The first step would be to introduce creativity as an educational reform goal. With the policy-level intervention, there is a fair chance of a change at the classroom level.

KEY TAKEAWAYS

- Creativity has been recognised as a necessary trait to survive in knowledge-based economies. It is an ultimate economic recourse and an essential trait to address complex individual, social, and global issues.
- Everyone is creative, and creativity can be nurtured.
- Creativity has been introduced as policy reform and a curriculum goal across nations, including Scandinavian countries, the United States, China, Singapore, Middle East, Australia, Canada, England, and Hong Kong.
- Creativity in the context of education differentiates between "big C" and "little c" creativity. The "big C" is a process where something historically or socially novel happens while "little c" creativity is everyday creativity or possibility thinking.
- A shift from convergent teaching and passive learning practices to creative teaching, teaching for creativity, and creative learning is desirable.
- There is plenty of literature available that practically shows how to introduce Creativity in a classroom setting, such as Newton's book, *Creativity for a New Curriculum: 5-11*.
- Evidence from Pakistan shows that the current primary education system in Pakistan is inhabiting children's creative potentials.

- Currently, Pakistan's education policy has no explicit goal that leads towards nurturing creativity among children. To keep pace with the rest of the world, and more importantly, to better educate our children, there is a need to introduce creativity as a curriculum goal.
- Nurturing creativity in the classroom is not a utopian policy goal; it may not require heavy budgeting. All it requires behavioural and pedagogical changes in the current education system, i.e., how teachers teach and how children learn.

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Unravelling Water Use Efficiency in Sugarcane and Cotton Production in Pakistan

ABEDULLAH ANJUM and UZMA ZIA

The present Policy Viewpoint explores water use efficiency between the two competing cash crops of the Kharif season, sugarcane and cotton.

It is concluded that the sugarcane crop consumes about 3.5 times more water than the cotton crop. Moreover, one litre of water used in cotton production generates about 4 times higher monetary benefit at both the farm gate and at the processing stage. Sugarcane alone consumes about 42 percent of the total annual household water demand of Pakistan.

Keywords: Cotton, Sugarcane, Water Use Efficiency, Water Pricing, Pakistan

Contribution of Sugarcane

Pakistan ranks 5th among the world's sugarcane producing countries by cultivating it on 1.3 million hectares and with a yield of about 83.3 million tons, giving an average of 62 tons/ha during 2018-19. Most of the sugarcane cultivated area is in the Punjab province (64 percent), followed by Sindh (25 percent), and Khyber Pakhtunkhwa (KP) (11 percent). Sugarcane accounts for 2.9 percent in agricultural value addition and 0.5 percent in the overall GDP (GoP, 2019a). In Pakistan, around 980,000 farmers are engaged in the cultivation of sugarcane and around 5 million employees are engaged directly or indirectly in the sugar business (Malik, 2018). Sugarcane is a very water-guzzling crop, and is grown under irrigated conditions when water is available either through surface canal or underground water.

Contribution of Cotton Crop

Pakistan is the 3rd largest raw cotton consumer and is the 4th largest cotton producer in the world. In 2019, about 1.6 million farmers were growing cotton crop on 2.37 million hectares, giving an average yield of 10.2 million bales (USDA, 2019). Most of the cotton-growing areas are in Punjab (79 percent) and Sindh (18 percent) provinces. Cotton contributes 0.8 percent to the national GDP and 4.5 percent to agricultural value addition. Moreover, the textile industry contributes about 8.5 percent to the GDP and 58.5 percent to the total trade, amounting to US$9.9 billion (GoP, 2019b). The sector employs 15 million people in the country, which constitutes 40 percent of the total industrial workforce (GoP, 2018).

This Policy Viewpoint is based on the webinar organised by the Pakistan Institute of Development Economics (PIDE) on the sugar industry in Pakistan on April 10, 2020. In the webinar, a wide range of issues were discussed from water use efficiency to market intervention and trade liberalisation.

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Pakistan Sugar Mills Association's Perspective

According to the evidence presented by the representative of the Pakistan Sugar Mills Association (Khan, 2020), sugar requires 1500-2000 litres of water per kg, while lint cotton requires 10,000 litres of water per kg. This comparison relates to the second stage of the value chain i.e. after completing the first stage of processing.[1] Based on Verma (2016), it is further added that per month water requirement is the same (150 mm) for both sugarcane and cotton crop at the farm gate stage. Based on these statistics, one may conclude that sugarcane is more water-efficient than cotton. But cotton crop takes only 4 to 5 months from planting to harvest while sugarcane takes 11 months, implying that longer crop duration of sugarcane makes its total water demand more than double to that of cotton. Despite the difference in the crop duration, per month water requirement of sugarcane and seed cotton (*phutti*) is 182 and 167 mm, respectively (Bhaskar, 2019). Our estimate also supports the existing literature that per month water requirement of sugarcane (208mm/month) is significantly higher than cotton (147mm/month). Hence, the conclusion that sugarcane is a more water-efficient crop is misleading.

The average yield of cotton and sugarcane are 286 kg/acre and 24,668 kg/acre, respectively (GoP, 2019b). We converted lint cotton to seed cotton by using the conversion factor of 0.43 (CIRAD, 2009). By using the concept of per kg water requirement for each crop, the current Policy Viewpoint estimates per acreage water requirement for both cotton and sugarcane, as presented in Table 1. We then estimate the water use ratio by dividing the water requirement of sugarcane per acre with the water requirement of cotton per acre, also presented in Table 1. The estimated water use ratio (3.4.) reveals that relieving one acre from sugarcane can provide water to about 3.5 acres of the cotton crop.

Table 1

Water Requirements and Monetary Benefits

Crops	Water requirement (litter/kg)	Yield (kg/acre)	Per acre water requirement (litter/acre)	Water use ratio per acre (sugar/cotton)
Cotton (phutti)	4300	833	3581473=a	
Sugarcane	500	24,668	12334028=b	b/a=3.4
Wheat	1909	1167	2227250=c	(b/(a+c)) =2.1
	Monetary Benefits from Water Usage (Rs/Litter)			
Crops	Net benefit at the farm-gate (Rs/litter)	Benefit ratio	Retail Level (Revenue Rs./liter)	Benefit ratio= (e/d)
Cotton (Lint)(b)	0.0100=d	(d/e)=3.9	0.013=g	g/h=3.8
Sugar	0.0026=e		0.004=h	
Wheat (c)	0.0017=f	((d+f)/2)/e)=2.3	0.021=i	((g+i)/2)/h=4.9

Source: Authors' estimations.

[1]Sugarcane converts to sugar while raw cotton (*phutti*) converts to cotton lint, cotton seed is separated from raw cotton to make edible oil.

Cotton-wheat cropping system competes with sugarcane, implying that sugarcane is substituting two crops i.e. cotton and wheat. Therefore, it is rational to compare the returns of water used in sugarcane with the returns from cotton-wheat system rather than cotton only. For this purpose, we estimated water use efficiency per annum basis. Our results reveal that relieving one acre of sugarcane can support 2.1 acres of both cotton and wheat, implying that cotton-wheat as a system is also more water-efficient than sugarcane cultivation.

Comparison of Water Use Efficiency

The yield of cotton and sugarcane is 286kg/acre and 24668kg/acre, respectively (GoP, 2019), indicating a huge difference in terms of weight. Because of the weight of sugarcane, when we estimate water requirement per kg it goes drastically down for sugarcane (i.e. only 500 litres per kg compared to 4300 litres for cotton).

Revenue is strongly influenced by the price per kg. Farmgate price of raw cotton and sugarcane are Rs.105.6/kg and Rs.4.3/kg respectively (AMIS, 2020), implying that the price of raw cotton is 25 times higher than sugarcane. Therefore, water use efficiency criterion based on the quantity (weight) of crop produced presents an erroneous picture because higher quantity (weight/acre) produced does not warrant higher monetary value. Similarly, the duration of the cotton crop is only 5 to 6 months while that of sugarcane is 11 months, implying that even if the water requirement per month is the same for both the crops, the total water requirement per crop season will be significantly higher for sugarcane because of its longer duration. Therefore, the water use efficiency criterion should be based on the monetary value each crop produces. By employing farm-gate prices for the year 2018-19 and cost of production SBP (2020), this study estimates the net return of each litre of water used in sugarcane and raw cotton. At the farm-gate, one litre of water in sugarcane and cotton production generates a monetary value of Rs.0.0026/liter and Rs.0.0100/litre, respectively. This simple analysis demonstrates that cotton production is about 4 times more water-efficient than sugarcane production. Our yearly analysis reveal that one litre of water used in cotton-wheat system generates 2.3 times higher net return than sugarcane.

This difference in the monetary value reduces slightly when the same analysis is repeated at the second stage of value chain i.e. after converting sugarcane to sugar and raw cotton to cotton lint. The difference reduces because, in the case of sugar, value addition takes place while in case of cotton lint only cottonseed is separated from raw cotton. It is important to note that one kg of sugarcane is producing less than 100 grams of sugar (SRDB, 2019) having a market value of Rs.7 (under the assumption that retail price is Rs.70/kg), while one kg of cotton contains 43 percent fibre (cotton lint) and 54 percent seed and remaining 3 percent wastes. Cottonseed is used to extract edible oil, with 10 kgs of seed cotton giving one litre of edible oil (CIRAD, 2009).

In our analysis, the total revenue is estimated from edible oil and cotton lint by using standard market prices. Wheat is converted into wheat flour, and the price of wheat flour used in the analysis is Rs.40/kg. Our results demonstrate that each litre of water used in raw cotton production generates 3.8 times higher revenue than sugarcane at the second stage of the value

chain. However, our analysis on per annum basis demonstrates that each litre of water used in cotton-wheat system generates 3.9 times higher revenue than sugarcane (Table 1). The cost of production of sugar from sugarcane and to convert cotton seed into edible oil is not known, therefore, comparison in terms of net return at the second stage of the value chain is not possible. However, if we compare the return of water use at the retail level for both sugarcane and cotton, we find a widening difference. It is well documented that 250 grams of cotton produce one shirt (Hoekstra, 2013) and each shirt has an average market value in the range of Rs.1000 to Rs.2000. If we assume the average price of a shirt at Rs.1500, 10,000 litres of water would generate Rs.6000, which is equivalent to Rs.0.6/litre at the retail level. However, one litre in the sugarcane production generates a monetary benefit of only Rs.0.005 at the retail level. Again, analysis at the retail level unravels that each litre of water used in cotton production generates about 171 times higher monetary benefits than sugarcane (Table 1).

Moreover, the textile industry processes raw cotton to finished products by providing employment that is manifolds higher than the sugar industry. However, these additional employment benefits are not included here. This demonstrates that the monetary benefits of water use efficiency in cotton production are significantly higher than that of sugarcane at both farm and retail levels if measured accurately.

Sugarcane Consumes Higher Water than Total Household Water Demand in Pakistan

Using the area allocated to the sugarcane and cotton crop during 2019, we find that the water usage in sugarcane production is sufficient to provide 100 litres/day of water to at least 42 percent of the total population of Pakistan. We take the 100 litres/day benchmark because according to the World Health Organisation (WHO, 2003), a maximum 100 litres of water per person per day is needed to ensure that most of their basic needs (i.e. drinking, personal sanitation, washing of clothes, food preparation and personal and household hygiene) are met. This demonstrates that the water crisis at the household level can be managed by avoiding cultivating sugarcane in a water stress country like Pakistan.

Water Pricing Mechanism

Lack of proper water pricing mechanism fails to discourage water-intensive crops such as rice and sugarcane in the country. A negligible fix price of irrigation water per annum per acreage (*Abiana*) leads to promoting water-intensive crops because the actual water cost is not appearing in the profit function. True water pricing mechanism in the agricultural production system will lead to eradicating water-intensive crops through farmers' profit maximisation approach. This will not only help Pakistan's agricultural sector to move towards efficient allocation of the land but also promote the adoption of water-saving technologies, especially in water-intensive crops to minimise the cost of production.

Sensitivity Analysis

- Using the per-acre cost estimated by the SBP (2019), we find that at the current *abiana* fixed rate, the net profit per acre of cotton and sugarcane is Rs.35975 and Rs.31,839, respectively—a small difference.

- When we increase the water price from a fixed-rate (of Rs. 200 per annum) to Rs.0.0026 per litre (the actual cost) the net profit of sugarcane approaches a negative value while the net profit of cotton reduces by 24 percent from Rs.35975 to Rs.26663 per acre. It is important to note that the price of 5000 litres of water tanker ranges between Rs.1000 to Rs.3000 in Islamabad while the price we induced in the sensitivity analysis is just Rs.13 per tanker of the same capacity.

Moving from fixed charge for water to a metered usage will, thus, discourage adopting water-intensive crops such as sugarcane.

Unnecessary Market Interventions

One question remains unanswered that why cotton is not competing with sugarcane at the farm level. To let cotton production compete with other crops, the government needs to refrain from interfering in the free market mechanism by eliminating subsidies and price support.

Markets distorted by bad policy lead to erroneous farmer decisions. Price supports, export subsidies, and the tariff on imports have created an artificial environment for the sugar industry. The resources spent in distorting the market can be allocated to develop high yielding varieties of cash crops (cotton, rice and sugarcane). This will certainly improve crop productivity, along with improving our external accounts.

PIDE's Recommendations

- Let the sugar market work without government intervention, by allowing it to generate signals that make farmers respond to the market.
- Remove support price, subsidy on export and control/slash high tariffs on the import of sugar.
- Abolish the current flat rate for water and appropriately price it by usage and covering the costs of maintenance and storage.
- High yielding and relatively low-risk varieties need to be introduced by involving the private sector.

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Books

Daniel H. Pink. *Drive: The Surprising Truth About What Motivates Us*. Riverhead Books, U.S. 2009. 256 page. (Hardbound).

Daniel Pink points out that Encarta was developed by a of well-paid team by Microsoft as a flagship project, but it lost out to Wikipedia that was developed by people without payment.

Modern human resource management (HRM) emerged in the industrial revolution and was based on extrinsic motivations—"carrots and sticks" such as "if you do this, you get that consequence". Thus, promotions in a hierarchy were offered as were bonuses and salary increase and some non-cash advantages for work well done. In the opposite case, instruments were reprimands, denial of promotions, bonuses and benefits and in the worst case "fired from the job". He calls these extrinsic motives because they are defined by the system with little involvement of the individual.

Pink argues that these extrinsic motivations though still widely used even in the 21st century are now obsolete in view of recent psychological research as well as growing experience with new organisation forms emerging in the digital economy.

With increasing wealth as well as the rise of the welfare state the basic needs of food, shelter and simple living have been met and thus human motivation is now looking for more. Now self-actualisation, esteem and recognition apart from pure mere financial renumeration (see Maslow, 1958). He calls this intrinsic motivation.

As examples consider the rise of "crowd-sourced" knowledge, innovation and community-building has seen the rise of Wikipedia, Linux, online teaching, creation and publishing much of which without payment. People appear to want to share in creation for the mere joy of it.

"Carrots and sticks" don't work well

Studies have shown that systems based on reward and punishment without appeal to intrinsic motivation appears have not worked well for several reasons. People become so focused on their individual performance goals. Indeed, these individual goals may not be so well aligned with the larger goals of the organisation as was often are difficult to align with the requisite objectives. The case of Nick Leeson in 1995 who caused the collapse of cost Barings in a bid to maximise his performance is well known in this regard (Greener….) (Drummond, 2008; Taris and Schaufeli, 2015). The book also cites the example of giving pre-school children a reward for drawing meant they drew less than the groups without any reward 2 weeks after the task ended. The group without a reward had kept their intrinsic motivation intact and thus kept drawing with gusto. Excessive reliance on extrinsic motivation might reduce intrinsic motivation making the task mechanical and lessening the reward (Lepper et al. 1996).

Similarly, bonuses have been found to excessively focus action and attention towards a specific result, distracting us from the bigger picture, and often reducing

potential creativity. In one study, it was found that a panel judged artists who produced art for art's sake as more creative compared to when working on commission.

Voluntary work for welfare, political activities as well as community activities remains an important aspect everywhere. Monetary rewards for such a socially responsible act of altruism could in reality detract from the nobler intrinsic motivation. How would you compensate a billionaire or a high-priced lawyer or investment banker for volunteering at a soup kitchen or a charity event? Would they even want that payment which values their work far less than their worth? Or would the intrinsic reward of such work be more valuable to them? For example, it has been shown that payment for blood donation might reduce donations or the quality of donations (see Niza et al. 2013).

The 2008 crisis also showed the powerful impact of bonuses on inducing behaviour that maximised short term gains while exposing their organisation to longer term risks. Similarly bonuses and clever schemes for benefitting senior management led to the failure of the savings and loans in the US and the famous ENRON. It has been seen that bonuses and such sharply focused incentive systems can encourage cheating. At a minimum, people get so sharply focused on what they lose sight of the bigger picture. In addition, they could get overly mechanical in their job.

Bonuses and annual performance reviews also lead to "short termism". The annual bonus or the next promotion is all that matters. This behaviour becomes addictive making reform or reengineering processes difficult and developing long term visions and plans more difficult. Thus, Drive indicates that companies most hell-bent in guiding quarterly earnings deliver significantly lower long-term growth compared to their peers.

Towards a New HRM

Drive advocates that in this new age where creative work will be at a premium and mass production and assembly line on the decline, fresh approaches to human resource management are already being developed in the newer tech and other startups.

At the heart of this new approach is the fact the new digital economy is different from the old industrial economy. He suggests that the new HRM must consider the following 3 principles which increase productivity by offering people greater agency in their work.

(1) Autonomy—the desire to have some control over your work; to be able to devise your own methods and show some creativity in your work. Thus, many companies are now allowing far more independence in terms of timing and location of work to be able to meet ultimate objectives. Work is also becoming far more creative as organisations are computing and artificial intelligence is taking over creative work and people are given ownership of their creativity in various forms.

Disruptive technology has empowered autonomy by allowing people to choose the platform economy rather than the corporate economy. Young people are choosing to offer their skills on platforms for a greater degree of autonomy and avoiding workforces with uniform cultures.

(2) Mastery—in the coming era people are expected to be quite mobile in their careers possibly even switching careers. Young people are realising that the old system of static lifetime careers limited with limited or no skill growth is

now possible. Hence everyone wants skill growth. Jobs are not an end but a growth possibility.

Premium is therefore attached to continuous training and growth in a job. Being part of a creative team is desirable as is leadership positions in teams that add value and create products, processes and new systems. Organisations that provide these opportunities attract the best talent and hence are most productive.

(3) Purpose—there is a yearning in humans to do something with a sense of purpose—to do something more than just earning a living and be part of a machine. Pink follows Victor Frankel to suggest that meaning is important to human lives (see Frankl, 1985). This involves doing something that matters; doing it well; doing it in the service of a cause larger than ourselves.

Traditionally companies have focused on profit maximisation with little regard for individual or corporate purpose maximisation. But recently, companies like Apple have focusing on making great products as a means to achieving market share and profits. The new startup culture is not emphasising problem solving to meet human needs as opposed to simply pushing products through hard marketing.

Evaluating Drive

While Pink may have pushed hard the thesis that money is not important as it was in the past, it is important to understand technological advancement has not only produced an age of plenty but is also changing our organisational forms and our approach to work. We can see the rise in demand of leadership skills, psychological testing and increased professionalism in most of the world.

In this world talent is at a premium and countries are developing their immigration policies for talent attraction (see Haque) and talent moves on the basis of opportunities not just to make money but also to develop new ideas, do startups make patents. Increasingly governments and organisations are seeking and nurturing ideas. At least 2 Nobel Prizes have been awarded to pointing out that ideas, knowledge and discovery all of which arise from human innovation and entrepreneurship.

The book is valuable to remind us of human motivations and organisational development. Perhaps it is a welcome reminder of humanity in history. 20th century industrial progress happened in military fashion seeking uniformity everywhere. Yet human progress has always depended on individual innovation and entrepreneurship. People have always demanded autonomy, mastery and purpose. And enlightened monarchs have given them as can be seen by the patronage they offered to Aristotle, Leonardo, Pascal, Newton, Shakespeare and many more. History is made by driven investigators, explorers and builders. But the industrial age and the rise of big government began to cherish uniformity and cookie cutter human resource management.

Nowhere is this uniformity more visible than in hangovers of colonial government such as Pakistan where ironclad hierarchies are cherished, and rewards are linear and guaranteed an autonomy, mastery and purpose are strictly denied. Creativity and innovation are often punished. Consequently, people are dulled midway into their careers into becoming a burden and public sector downsizing is often sought.

Drive should be on the reading list of anyone interested in HRM and organisational growth. It reviews of a large amount of recent research to make a strong, compelling case for moving past material rewards.

In a series of webinars in PIDE, we discovered that Pakistan is talent repellent. HRM practices in Pakistan are backward, unable to draw and retain talent in government and most of the private sector. Multinationals have long used Pakistani to draw and train our best talent and move it outside Pakistan as soon as they are at international standards.

The need to nurture and retain local talent has been argued by PIDE over the last 3 years (see Haque). If we want long term growth to meet the growing needs of our youthful population, we must take HR and Drive seriously. Since the government has an excessively large role in our economy as well as an overly rigid, hierarchical and uniform HRM system, a lot could be learnt from the research in this book. More autonomy, more individual initiative, innovation at every level, increased flexibility, greater diversity in job execution and training and assortment of rewards aligned to creativity in public service delivery and policy development would help lead us all to the Naya Pakistan we dream of (see Haque, 2017).

It is time we all paid more attention to HRM. Everyone talks of educating people without worrying about where the educated go. Without better HRM the demand for education will remain low and our best talent will migrate. Human capital these days is almost as mobile as physical capital (see Haque and Kim, 1995). Drive is a must read in that regard.

Nadeem Ul Haque

Pakistan Institute of Development Economics,
Islamabad.

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Sara Rizvi Jafree (Ed.). *The Sociology of South Asian Women's Health*. Switzerland: Springer Nature. 2020. 236 pages. Price USD 116 (Hardback).

In this lucidly written book, *The Sociology of South Asian Women's Health*, Sara Rizvi Jafree, emphasises how health policies have left out the cultural knowledge about the unique circumstances and experiences of South Asian women. The author deftly explored the importance of re-conceptualising health policy development with a culturally and socially appropriate background for women in South Asia. In the introductory chapter of the book, Jafree starts by giving a concise structural description of how South Asian women's health behaviour and health outcomes are affected by social systems of family, gender, faith, culture, government, schooling, and the media. Sara Rizvi Jafree aims to connect health policy efforts with knowledge of socio-environment and structural factors to propose better health policies for women. The book consists of nine chapters that are co-authored by different scholars with Jafree.

In Chapter Two, titled, South Asian Women's Health Behaviour: Theoretical Explanations, authors comprehensively discuss the diverse theoretical frameworks that are used to describe South Asian women's health behaviours, consumption, and choices. Authors acknowledge that these theories' epistemological grounds are mainly derived from Western women's lived realities. That is because researchers are hesitant to extend the scope of their analyses due to the rapidly evolving realities for South Asian women, including but not limited to frequent changes in the postmodern era, diverse ethnicities, culture, and religious beliefs in the region. In light of the discussed theories, authors conclude that in South Asian societies, gender norms related to access to health and health care are influenced and governed by culture, religion, family, state structures, and personal choices, hence difficult to change or improved. Besides the structural deficiencies in the public health sector, the bad affairs of women's health in the region are also due to a lack of social acceptance and support for the continuous health-being of women in South Asian societies.

Chapter Three, titled, Oral Narrations of Social Rejection Suffered by South Asian Women with Irreversible Health Conditions, builds on the lived experiences of four women with chronic illnesses or has experienced significant health setbacks in life. Interview based qualitative inquiry is carried out with women from Pakistan, Bangladesh, and India. Authors expand her analysis of social complexities on women's lives, living with paralysis, blindness, cancer, and infertility. Authors conclude that South Asian women's most challenging problem is not lack of resources or access to health services, but the lack of support systems and acceptance from family and communities throughout their lifespan.

In the Fourth Chapter, titled, Women's Role in Decision-making for Health Care in South Asia, authors explore the complexity of health decision-making by using the latest available Demographic Health Surveys from Bangladesh, India, and Pakistan. Authors discuss significant factors impacting health decision-making, including gender, family, education, work, and health behaviour. Authors recommend that to break the various cycle of women's poverty in South Asia, systematic and well-planned policies

are required not only for cash transfer, loan provision, but also the encouragement of education enrolment and work participation. Authors assert that micro-interventions of varying natures at the community level are essential to benefit the heterogeneous populations across South Asia.

Chapter Five, titled, Poverty, Health Coverage, and Credit Opportunities for South Asian Women starts with discussing the concept and evolution of poverty and expands on identifying factors responsible for feminisation of poverty in the context of women's ability to access healthcare. These factors are family composition, control over resources, access to education and health, inequality in social protection, and labour market inequalities. Authors provide readers with a stimulating discussion and suggest coordinated and structured efforts for poverty reduction and health coverage for South Asia women. She further suggests the need to replicate successful poverty alleviation programmes at state/micro levels and the provision of universal health insurance for women across South Asia.

In Chapter Six, titled, Refugee, Displaced, and Climate-Affected Women of South Asia and Their Health Challenges, authors provide an insightful discussion on the health issues of women who have undergone displacement, war, and disasters, forced migration, and climate change. These women face increased emotional and physical pressures than men and are at risk of increased exposure to aggression and sexual assault. Authors discuss the policy constraints, including lack of proper and disaggregated estimation of affected women population, lack of sustainable and systematic support from governments, and over-reliance on non-governmental organisations for assistance. Authors recommend systemic collection of data on women exposed to any such disasters, primary and specialised healthcare services, improved housing quality with protection, safety, and privacy, and issuance of provisional identification cards, educational opportunities, employment benefits, and protection.

Chapter Seven titled, Social Barriers to Mental Well-Being in Women of South Asia, authors discuss how the social and cultural complexities including negative construction of mental health distress, the lack of awareness, patriarchal values, marriage and reproductive burden and religious fallacies, with the lack of health delivery system in South Asia are exacerbating the mental health crisis for women. Using the secondary data, authors assess the prevalence of mental health issues in Bangladesh, India, Nepal, Pakistan, and Sri Lanka. The authors present a case study that thematically analyses the perceptions of women health practitioners in South Asia about mental health. They were asked about their experiences with mental health issues coexisting with medical problems and structural and societal obstacles to mental health care. Findings show that both reportage of the mental health issues and mental health services are unsatisfactory due to a culture of blame and shame in South Asian countries.

In Chapter Eight, titled, The Political Sociology of South Asian Women's Health, the authors discuss why political health sociology is a vital tool for reducing the social gaps of health inequality and improving women's health behaviours and outcomes in the South Asian region. Authors elaborate on how political reluctancy towards a commitment to women's health is woven in the region's socio-political and anti-feminist fabric. As a result, women's health issues linked to mental well-being, communicable and non-communicable diseases, and disability are typically ignored, and health policies are

almost non-existent for marginalised and vulnerable women in the region. To improve the women health, authors recommend the provision of quality services from primary to tertiary care, access to health care for marginalised populations, improvement the engagement of women in politics, systematic policies for poverty alleviation, compulsory participation in the education, labour laws, marriage and divorce rights, mental well-being, sports and leisure activities. Authors also stress on introduction and reforms of public health laws and an increase in the health budget.

In the last chapter, The Culture of Health Regulation and Its Implications on Maternal and Reproductive Health in South Asia, authors with a focus on maternal health, argue that cultural and traditional practices are responsible for the regressive and inefficient regulatory affairs in South Asia and health policy desperately need a shift. By using the DHS data, authors find that maternal and child health measures in South Asia are not satisfactory, which implies a gap in state regulation. To improve maternal health, authors propose a shift in cultural perceptions, both for competitive and regulatory policies, including introducing different regulatory instruments in a co-regulatory and decentralised manner and the need for regulatory bodies to raise awareness and find ways to minimise the risk of maternal and child mortality.

The book invites readers to think through complex interactions between sociocultural and political practices/norms with women's health in South Asia. It is worth mentioning that book discusses women's health comprehensively, including issues like infectious and non-communicable diseases, mental health distress, and injuries and not only maternal health in South Asia. Although the book is inclusive on many accounts, it misses the discussion on digitalisation of health care in South Asia and its impact on women in the region. The book's discussion proposes some fundamental changes not only on the delivery front for health care but also calls for change in social systems influencing health behaviour and outcomes for women in the region. Nonetheless, it is not sufficiently clear how to do healthcare financing, health budgeting, and, most critically, how to create the political will to reform social structures that adversely impact women's health outcomes and make politicians commit to women's health from a lifespan perspective. Overall, the book deals with a complex issue and guides the reader through the argument with great clarity. The book will be appealing to a wide range of readers, including policy-makers, scholars, students, or anyone interested in South Asian women's health, and deservedly so.

Saman Nazir

Pakistan Institute of Development Economics,
Islamabad.

First Call for Research Proposals

RESEARCH FOR SOCIAL TRANSFORMATION AND ADVANCEMENT

2020 RASTA Competitive Grants Programme for Policy-oriented Research

The Pakistan Institute of Development Economics (PIDE) has launched a multi-year competitive grants programme for policy-oriented research in Pakistan titled '***Research for Social Transformation and Advancement***' (RASTA) under the Public Sector Development Programme (PSDP) of the Ministry of Planning, Development and Special Initiatives, the Government of Pakistan. RASTA's mission is to develop a research network of academia, think tanks, policymakers, practitioners and other stakeholders across Pakistan producing high-quality, evidence- based policy research to inform Pakistan's public policy process.

There will be six rounds of Call for Research Proposals. In the opening round of RASTA, research proposals are invited on the following diverse set of themes allowing maximum leeway in proposing projects:

- Growth and Development
- Market and Regulations
- Cities Governance and Development
- Persisting Energy Problems of Pakistan
- Governance, Public Policy Making, and Aid Dependence

All updates will be published on PIDE/RASTA website from time to time. Applications submission deadline for the first round is **November 20, 2020** by midnight Pakistan Standard Time (PST). In pre-submission engagements webinars and workshops are scheduled to guide potential applicants. For more details and guidelines related to RASTA programme, eligibility, application process and updates, please visit PIDE/RASTA website and follow us on Twitter.

RASTA Project Management Unit
Pakistan Institute of Development Economics,
Adjacent Quaid i Azam University Campus, P.O. Box 1091,
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ARTICLE 5

5.3 *Membership:* There shall be a select category of Members of the Society. The minimum criteria of eligibility for election as Member of the PSDE are:

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or

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THE PAKISTAN DEVELOPMENT REVIEW

Editor: **Nadeem Ul Haque**

The Pakistan Development Review is an internationally refereed journal published regularly by the Pakistan Institute of Development Economics since 1961. The journal focuses on economics and related social sciences and welcomes theoretical and empirical contributions in relevant disciplines with a particular emphasis on Pakistan's socio-economic issues. The journal is published on a tri-annual basis. The journal's editorial and advisory boards consist of more than 18 renowned scholars in the fields of economics and related social sciences. The actively participate in refereeing the papers and also render valuable advice on other related matters.

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…. Those in the current generation can increase their consumption at the expense of future generations, but are discouraged from doing so by their concern for the interests of their children and perhaps of other future family members. This link between generations of the same family is buttressed by family endowments that are transferred from parents to children.

…the inequality in family incomes and intergenerational mobility over time approach equilibrium levels that depend on luck and various family parameters, especially the inheritability of endowments and the propensity to invest in children. They also depend, sometimes in surprising ways, on the rate of economic growth, taxes and subsidies, foresight about the incidence of "disturbances," discrimination against minorities, and family reputations. For example, even a progressive tax-subsidy system might raise the inequality in disposable incomes, and discrimination against minorities not only reduces their income but also the effect of their family background on income."

From "Treatise on the Family" by Gary S. Becker (1991)
Selected by Durr-e-Nayab

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Pakistan Institute of Development Economics
Quaid-i-Azam University Campus, Islamabad, Pakistan
E-mail: pide@pide.org.pk
Website: http://www.pide.org.pk
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