PhD-Dissertation on

Informality and Poverty in Pakistan: Interlinkages and Evidence

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Dedications

Dedicated to my Mother and everlasting memories of my Father (Late)

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Abstract

This study analyses the interlinkages between informality and poverty through decomposition of the impacts of informal employment with respect to educational and occupational intergenerational persistence. The analysis is done by considering different types of formal/informal occupations in Pakistan using the data from Household Integrated Income and Consumption Survey (HIICS, 2015-16). To this end, firstly we estimated multinomial endogenous switching regression model of per adult equivalent consumption expenditures of formal and informal occupations and then estimated welfare gains in terms of increased consumption expenditures by performing counterfactual analysis of movement from informal occupations to formal employment. The counterfactual estimates predict that those who are in informal employment could be better off if they are provided with formal jobs.

In addition to this, the evidence clearly suggests higher intergenerational persistence in education, occupation and earnings. Results, mainly for informal employment, reveal higher persistence at the lower end of distribution than at the upper end in all cases that include education, occupation and earning. We have not only observed strong persistence in different informal occupation but also movement from higher to lower informal occupation is established. This denotes informalization of labor market in Pakistan over the time.

Moreover, we also document evidence for statistically significant earning differences between informally and formally employed workers. Informally employed workers are rewarded less than formal workers. The difference is significant even when workers have same level of education. In other words, returns on education/schooling are dependent on

type of sector and occupation within each sector. Findings from counterfactual analysis suggest significant gains in earnings when workers move from i) informal to formal sector and ii) bottom (elementary) occupation to top (informal clerical) occupation within informal sector.

Based on the results of interlinkages between informality and poverty, this study suggests that issue of informality must be kept in mind while formulating policies of poverty eradication. In societies, like Pakistan where educational and occupational persistence is high and with the segmentation of labor market into formal and informal sector, focusing only on provision of education will not reduce the poverty because in segmented labor market, equal level of education may bring different returns both in formal and informal sector with the lower in informal sector. Therefore, in such situations a set of labor, education and social policies is required which minimizes the burden of inheritance wherein poor are poor because they were born poor is needed.

Chapter 1: Introduction

1.1 Background of the Study

There exists conflicting evidence on how informal employment[1] affect household poverty. On the one hand it has been argued that by offering job opportunities to those who would not have found employment in formal sector, it enable households to combat against poverty (Fattah 2012). In other words, it absorbs abundant labor force. Overall, informal sector is perceived to be socially stabilizing that creates employment opportunities and reduce social exclusion (ILO, 2002b). On the other hand, evidence also suggest that those working informally are often trapped in vicious circle of poverty (Ishengoma & Kappel, 2006 and Chen et al., 2006).

There might be many possible reasons in emergence of poverty as a negative consequence of informality. The reasons include lower wage, risky work environment, insecure labor contracts, absence of social security and unstable nature of informal sector itself. Employment in the informal sector, therefore, has significant contribution to household poverty, mainly through low earnings and poor working conditions (Amuedo, 2004).

In the absence of other sources of income, household poverty increases through low earnings from informal employment (Chen et al. 2005). All these factors make informality one of the main causes of poverty (Chen & Vanek (2006). Households employed in informal sector, both wage and salaried, are more likely to fall into poverty trap (Carla, 2015).

[1] See Appendix I for the detailed definition of informal employment.

Conversely, informality is also identified as a safety valve in absorbing excess labor and reducing poverty especially in periods of crises (Fattah 2012). Due to low requirements of education, skills, technology and capital, informal economy has significant jobs and income generation potential (Mahdi, 2010).

We maintain that workers enter into the informal economy not by choice but as a consequence of the lack of opportunities for employment. The likelihood of poor to rely on the informal economy is more than the non-poor for their survival. They receive fewer opportunities to be employed formally (e.g., Komter, 1996; Morris, 1995; Williams, 2006). Further, even they lack the skills and competencies to conduct even better paid informal work (Fortin et al., 1996; Mingione, 1991; Renooy, 1990). This emphasizes the involuntary nature of informality. Informal economy therefore reinforces the poverty.

Informal employment creates structural poverty, the poverty passing to next generations. As informal employment is characterized by low productivity and income, this passes on to next generations through intergenerational effects. Lower investment in education and health of younger generation cause lower educational attainment and lower level enter into labor market. The children of parents employed in informal sector end up with similar or even lower status in labor market. They are mostly limited to elementary occupations, and the circle of low productivity, low earning and poverty continues (Pietro & Urwin 2003; Nicoletti, 2008).

Pakistan faces twin problems of poverty and informality. In terms of absolute numbers, during 2004-05, almost 1.618 million employed people were found to be poor (Zaman et al., 2015), while in the year 2010-11, working poor population was recorded to be 5.1 million (Jamal, 2017). In 2015-16, this figure turns to be 7.4 million.

Most importantly, informal sector accounts for almost 72.6 % employment[2] outside the agriculture sector (Labor Force Survey, 2014-15). Growth of informal employment during 2001/02 and 2013/14 was 3.36 % per annum which was almost twelve times than the formal employment growing at 0.27 % per annum (Jamal, 2016).

High growth rate of population and migration of people from rural to urban areas not only has given rise to informal employment but also worsen the poverty situation in Pakistan. The efforts done for poverty reduction are ineffective due to occurrence of high rates of informality. Hence, only unemployment should not be considered as a good predictor of poverty reduction for policy formulation in cases where working poverty also exist.

Against this backdrop, we undertake analysis of interlinkages between informality and poverty and assess the role of informal sector in household poverty in Pakistan. We estimate contribution of informality towards poverty mainly through educational and occupational persistence across generation and the impact of informality on returns to schooling. We argue that parents' employment in informal sector, mainly father, leaves parent generation limited to low earnings. This, in turn, results into lower investment in human capital formation, the education, of children of parents who are in informal employment. Further, we show that parents working in informal sector are able to send a fraction of their children to school. This leads lower human capital accumulation, both in quality and quantity, in household employed in informal sector. The children of the parents working in informal sector end up in the same sector. The intergenerational persistence of education leads to further lower mobility in labor market.

[2] The existence of large informal sector is due to regulatory burden which prohibits the firms to operate formally. Regardless of improved ranking of Pakistan in the World Bank, doing business remains low (144 out of 190 countries) (IMF Country Report No. 17/213).

The persistence is further strengthened by lower return on education of children in informal sector, compared to formal sector. Children of parents working in informal sector are employed in informal sector with lower returns. Poverty trap strengthens further. The findings of our study challenge strategy of poverty reduction through informal sector driven skills development. We show that provision of education alone may not be suffice and it must be tailored with reforms in labor market needs an assessment.

1.2 Contribution and Significance of the Study

Almost all of the literature available on informal sector in Pakistan is limited to assessment of main characteristics of the sector (Burki & Ghayur, 1989; Ali & Hamid, 1989; Ahmad, 1990; Ghayur, 1994; Kemal & Mahmood, 1998; Hassan & Farooq, 2015). Only few studies assess how poverty forces people to join informal sector (Mumtaz, 2010 and Khan & Khan, 2009).

Of the available literature, Gazadar (2004) investigates the relationship between labor market arrangements[3] and poverty. Khan & Ashraf (2012) describe the key aspects of the informal employment and its linkages with poverty. Only a single study and that is of Nasir (2001) confirmed the existence of high rates of poverty among the informally employed persons.

These studies are limited to descriptive statistics showing the number of poor households in informal sector. None of these studies assesses the transmission channels through which informality contributes to household poverty. Further, these studies do not touch upon the informality sponsored persistence of poverty. Also, each of these studies is based on small

[3] Labour market arrangements here refer to the segmentations that may become the source of severe poverty traps. This segmentation is either due to "screening", "social collateral", "social norms" or "monopsonistic employers.

sample surveys (based on some districts or cities) and they often come up with conflicting evidence. These limits the policy contribution of these studies.

To address the problems confronted by previous researchers and to present the alternative evidence which is well grounded in theory, we analyzed the informality and poverty, in counter factual settings, using data from HIICS (2015-16) which is a nation-wide survey. The link between poverty and informality is captured through decomposition of the impacts with respect to intergenerational persistence of education and occupation.

We contribute to the literature on informality and poverty multifold. First, we offer a new methodological framework to assess the issue. Second, we identify the channels through which informality drives and strengths poverty. Third, we highlight the intergenerational effects of informal employment.

Fourth, we contribute to informed design of poverty reduction policies showing that skilling people for informal sector will not reduce poverty and the provision of education does not necessarily translate to better employment in developing countries which face higher occupational immobility. We show that labor market reforms are critical to generate a meaningful impact of poverty reduction policies.

Fifth, we provide a counterfactual analysis estimating welfare gains, reduced household poverty, resulting from moving from informal to formal sector. This can help policy makers assess costs and benefits of reducing the size of informal sector gradually. The findings of study would also help the educational and labor policy makers of Pakistan to make better decisions. We extend the research on informality and poverty from intergenerational perspective.

1.3 Objectives of the Study

In the light of preceding discussion, the specific objectives of the study include:

1. To analyze how informality contributes to household poverty.

   Evidence suggest that informality and poverty are interlinked. Pakistan is a country with high informal employment and it is increasing over the time. Poverty is also persistent along with informal employment. So, to study informal employment as one of the causes of poverty is crucial. This will help us giving the understanding of how informal sector is contributing poverty along with other factors. This will help government to draw strategies of poverty reduction.

2. To estimate the reduction in poor household if size of informal economy reduces through undertaking the counterfactual analysis of the movement from informal employment to formal employment.

   This will give us the exact contribution of informality into poverty. Based on the findings, government can suggest the way of helping the poor people in informal employment. Counterfactual estimates, with respect to different informal occupation can guide policy makers which group needs how much protection and government can target that specific group.

3. To assess intergenerational impact of informal working through gauging education immobility of children of informally and formally employed fathers.

   This objective has strong implication for equality of educational opportunities in Pakistan. This will provide us the magnitude of educational persistence across generations of formally and informally employed. Moreover, this will also give us the

different measures according to educational classification. On the basis of this magnitude, government can target that specific group in employment and education.

4. To assess the transmission of informal employment across generations i.e. to confirm sector affiliation of the father has a significant effect on the probability that the child will work in the same sector.

   Through this objective, we would be able to identify either the extent of immobility is higher among the sons of formally or informally employed. Moreover, this will also provide us the extent of immobility across different occupations in the next generation. For making the society more mobile, this will help government which sector of employment it should target and across different informal occupations which group needs more help to come out of this vicious circle.

5. To undertake a comparison of returns to education between formal and informal employment and provide a counterfactual for what will be the effect of movement from informal employment to formal employment on the returns to education for the individuals having same education.

   This objective will provide us evidence of difference in educational returns across two groups for the same level of education. Counterfactual estimates will give us the amount of returns which informally employed people can receive of their movement into formal sector. On the basis of these findings government can formulate policies regarding informal employment and poverty eradication.

1.4 Summary and Arrangement of the Study

The focus of the policies of poverty reduction should not be only on reducing the unemployment rather on the provision of better terms of employment for those who enter

into market and those who are already in employment but poor. A high level of similarity in the occupational/educational position of parents and children, higher immobility, is considered to be the evidence of unequal distribution of opportunities between different segments of society. There is need of an instrument in the form of equal opportunity policy to be used to compensate fully the disadvantageous due to circumstances.

Moreover, equal level of education may bring different returns both in formal and informal sector with the returns being lower in informal sector. Therefore, if the employment is generated in the low paid informal sector where already workers are concentrated then only the job creation cannot be a solution to escape from poverty. It also implies that education provision may not be a good policy solution to be used for poverty reduction. And, it needs to be strengthened through simultaneous reforms in labor market sector.

Rest of the dissertation is divided into 6 chapters. Chapter 2 reviews the literature regarding poverty and informality, intergenerational persistence and returns to schooling. Chapter 3 describes the theoretical model and econometric technique. Chapter 4 highlights some features of the data and construction variables based on this. Chapter 5 reports results of objectives 1 and 2. The results of objective 3 and 4 are discussed in chapter 6, whereas chapter 7 discusses the results we achieved for objective 5. Conclusion of study is provided in chapter 8.

Chapter 2: Literature Review

2.1 Introduction

This chapter begins with the literature on informality and poverty. It examines how the workers who work in informal sectors have greater chances of falling into poverty than the formally employed workers. Section 2 reviews literature related to mobility with the special focus on education and occupation of informally employed persons. Finally, this chapter provides literature on returns to education discussing how the individuals with the same qualification having the jobs in two different sectors (formal vs informal) earn different remuneration.

2.2 Informality and Poverty

Several studies have been done on informality and poverty for developing countries, but studies tackling the direct impact of informality on poverty are rare and limited to describing the characteristics of the sector. Most of the studies confirmed association between informality and poverty. For example, Sastry (2004) shows that nature of employment in informal sector (self-employment, causal wage employment, regular wage/salary employment) and poverty are closely related with each other, whereas according to Heintz and Vanek, (2007) households relying on informal, regular wage employment have relatively lower risk of poverty than the households that depend on self-employment or casual wage income.

Chen et al., (2005) argues that informality is associated with low and volatile earnings. Workers lack access to basic public services and protections, and relatively are in higher risks of poverty compared to those in formal employment. Poverty rates tend to be higher in informal versus formal employment (Bangura, 2010) and the threat to poverty rises with

the movement from formal to informal employment (Heintz, 2008). A significant association between poverty and participation in the informal economy is identified by Williams (2014).

Loayza et al. (2009) show that impact of informality on growth is negative, while its effect on the incidence of poverty is positive. Maurizio (2012), while studying the links between informality, income segmentation, and poverty, finds a positive relationship between informality and poverty. Persistence of high rates of informal employment and poverty is also confirmed by Perry et al., (2007) and World Bank (2006).

Study by Chen and Vanek (2006) reveals that poverty is a consequence of informality and reliance of households on informal sources of employment increases the probability of facing higher poverty risk than those that rely on formal sources of employment. Further, for analyzing patterns and trends of alternative definitions of informality, Gasparini and Tornarolli (2009) find high rates of informality and almost four times (on average) differences in poverty rate between informal and formal workers. Moreover, a strong relationship between informality and intensity of poverty in Venezuels is observed by Cartaya (1994).

Yet in existing literature, only a few studies are available tackling the direct impact of informality on poverty (Kume & Trebicka, 2016; Canelas, 2015; Nazier & Ramadan, 2014; Devicienti et al., 2009; Dorantes, 2004). Kume & Trebicka (2016) points out, workers who find it difficult to get job in formal sector and urgently requires covering their expenditures join the informal sector. Canelas (2015) explores that poverty and informality are interrelated phenomenon even though controlling for many relevant variables.

Devicienti et al., (2009) explores that the association between poverty and informality is of dynamic in nature i.e. employment in informal sector in the past may causes a household to fall in poverty in future and a household experiencing continuous episodes of poverty may experience continuous episodes of informal employment in future. Nazir & Ramadan (2014) identify informality a weak and significant determinant of falling into poverty.

Amuedo-Dorantes (2004) discovers having job in informal sector increases the probability of becoming poor approximately by 8% and 4 % among male and female headed households, respectively. Additionally, household poverty enhances the likelihood of having employment in informal sector by 3% and 6 % among male and female headed households, respectively.

In addition to this, there exist causal relationship between poverty and informality i.e., in one hand poverty become the reason of joining informal sector[4] and on the other hand poverty results from accepting job in informal sector through low earnings. This tow-way relationship between informality and poverty is empirically examined by only a few studies (Kume & Trebicka, 2016; Canelas, 2015; Nazir & Ramadan, 2014; Devicienti et al., 2009; Dorantes, 2004).

The inverse relationship, from poverty to informality is not much investigated empirically[5] but at the theoretical level, the direction of relationship is well defined.[6] Factors like residential segregation, labor discrimination and spatial labor mismatch etc. along with

[4]That we try to capture through decomposition of the impacts with respect to educational and occupational intergenerational mobility.

[5] This may be due to the existence of complex relationship between informality and poverty. Moreover, information regarding personal characteristics, employment, and human capital that effect the work is available on the individual level while poverty is observed at household level. In order to address this issue, most of the studies (Amuedo- Dorantes 2004) carried out the analysis at household level by considering the personal information, human capital and employment of household heads.

[6] "*Theoretically, informality could be attributed to micro and macro factors. Micro factors include firm size, productivity and the cost of entering the formal sector Macro factors include economic characteristics such as the tax rate, excessive regulations, weakness of the legal system, corruption, inequality in income distribution, poverty and financial constraints*" (Abd El-Fatah 2012).

poverty may often lead towards informal jobs. Furthermore, waiting for the job and the cost of entry in the formal sector is unaffordable to poor household as it become necessary for them to accept a job in informal sector to fulfill their immediate necessities. So, engagement of a poor household in informal employment compared to non-poor exhibits the fact that informal employment is of involuntary in nature and represents some poverty aspects.

2.3 Intergenerational Mobility

Interest in intergenerational relationship by the economists has a long history. It refers to the correlation between parents and children's socioeconomic status. Higher correlation refers to higher association between parents and children's socio-economic status and in turn corresponds to lower mobility. Consequently, this higher persistence leads to higher injustice and higher inefficiency in a society (Brunetti & Fiaschi, 2015).

Literature on mobility have focused mainly on income but other social outcomes such as health, social class, education or occupation can also be used to measure intergenerational association. Occupation[7], like wealth, income and education being a symbol of socioeconomic status of parent generation is used as a criterion in constructing social status classification. It has a link with economic status and educational background. Therefore, most of the studies on intergenerational relation have focused on educational and occupational mobility.

Measuring occupational mobility has some advantage over measurement of intergenerational mobility by income or social class etc.[8] In doing the analysis of mobility, sociologist favor occupational measures whereas economists' emphasis is on

[7] Classification of occupation is provided in Table II of appendix II.
[8] For detail, see Bjorklund and Jantti (2000).

income/earnings mobility. An extensive literature is available on mobility concerning social class, education, occupational status and earning.

2.3.1 Educational Mobility

Theoretical and empirical literature discusses three transmission channels namely biological, economic and direct education to education[9] in determining the child's status. There is a separate literature on these channels. Biological channel discusses the Genetic transformation of ability and is often measured by IQ. Some of the studies which tried to discover the transmission of ability from parents to children are of Anger and Heineck (2008), Leeuwen et al., (2008), Black et al., (2009), Björklund et al., (2010).

Anger and Heineck, (2008) address the association between parents and children abilities through the scores obtained by two short IQ tests and find positive link between word fluency and the speed of cognition even after controlling for family characteristics and educational attainment. Black et al., (2009) find correlation of 0.38 and 0.32 between father and son IQ scores both at level and log form using the Norwegian data. Similarly, the estimated correlation between fathers' and sons' IQ by Björklund et al., (2010) is 0.347 using the military enlistment tests. They are of the view that effect of family background on the IQ is substantially larger.

The analysis of IQ transmission by Leeuwen et al., (2008), predict that intelligent parents do not provide such circumstances to their children which promote their intelligence. The differences in intelligence were found to be associated with genetic differences. In economic channels, one of the examples is of credit constraint faced by the poor families.

[9] Direct effect of parent's education on child's education is due to many possible mechanisms. One is the possible effect of income on education, as high qualified parents generally have higher incomes than low qualified parents, so due to low income low investment in next generations human capital. The other is time allocation of educated parents in enhancing the child activities, and productivities.

Poor families are unable to borrow money against the expected future earnings of their offspring. This constraint strengthen the association between socioeconomic status of the parents and their children's' educational achievements.

Carneiro and Heckman (2002) suggests that only 8.0 % of youth face the issue of short-term liquidity constraint affecting their schooling decision. But the long run factors such as parental environment and genes forming both cognitive and non-cognitive skills are crucial for the success in schooling. Studying 4 Latin American countries namely Mexico, Chile, Colombia and Peru, Alfonso (2009) shows enrollment gap cannot fully explain by the current income level. The effect of short-term credit constraint decreases when family variable i.e. parental education and asset ownership is controlled.

Attanasio and Kaufmann (2009) argue that credit constraint plays an important in determination of schooling decision of the poor Mexicans. Black and Devereux (2010) argues due to credit constraints, families with low income may be unable to do investment in their children's human capital. For increasing their child human capital, they need extra income.

Therefore, it is expected that for credit constrained families, intergenerational elasticity (IGE) will be higher indicating the presence of non-linearities. Jua´rez (2015), points out that in the process of transmission of education, the impact of inherited cognitive abilities is lower than the impact of economic situation of the family and the current level of consumption is not as much important as long run economic situation.

Finally, the last channel identified is the direct effect on the schooling attainment of the children is of father's education. This direct effect is known as the nurture effect. Direct of parental education on their offspring education could be due to many possible underlying

mechanisms. Binder and Woodruff (2002) find the children born in low income families have low rate of completing upper and secondary levels. By doing the analysis of 42 countries around the world, Holmlund et al., (2008) is of the view that parent's and children's schooling are linked with each other through income.

Higher parental education corresponds to higher level of education of children and mother's education has a greater influence on children's schooling. Checchi (1997) and Jerrim et al., (2015) conclude that income is the key factor relating different components of intergenerational transmission mechanism either it is higher access to education or returns to education.

Pastore and Roccisano (2015) while doing the analysis of intergenerational educational mobility for eight developing countries came to conclusion that parental income has some correlation with children's education and there exist great association between parents and children's education. Huang et al., (2016) for China, find that father's income is affected by his own education. Fathers with high level of education earn higher income and make better investment in children's education. Therefore, highly educated fathers have highly educated sons.

Considering the four generations data of Malaysian Family Life Survey (MFLS), Lillard and Wills (1994) conclude the direct effect of education on children's schooling is two-third, while the other one-third comes from unobserved factor affecting both parents and children's educational achievements. The direct influence of parent's education is more pronounced in the children of the same sex i.e. mother's education has larger influence on daughter's education and the father's education has greater impact on son's education.

Moreover, the influence of father's education is smaller than the influence of mother's education. Similarly, Azomahou and Yitbarek (2015) for Africa reached to same conclusion. They are of the view association between mother and children is stronger and mothers has greater influence on daughters than sons. Using the Adult Education Survey of Turkey, Tansel (2015) undertakes a cohort analysis. The findings suggest that intergenerational association is low for younger cohort than the older ones. The impact of mother's education on child's education is higher than father's education and this association is strong for the parents with poor educational background.

Another study for Turkey by Gürbüz and Polat (2016) shows that in simple probit regression the effect of father's education is found to be higher than the mother's education but with IV estimates the impact of mother's education become stronger on daughters. This indicates the existence of gender inequality in the transmission of education even when there is improvement in schooling environment. This exhibit that improvement in environmental factor is not proved to be advantageous in the promoting the female's education.

In contrast to this, Fessler (2012) argues that the influence of father's education on both sons and daughters, is greater than the influence of mother's education. Chevalier (2004) almost reached to the similar conclusion. According to author both paternal and maternal education has larger impact on their offspring's, but this effect is only on the same sex that is father's education only matters for son's education and mother's education has larger effect on daughter's education.

Hertz et al., (2007) show that pattern of persistence in educational attainment is different across the region with the highest intergenerational association in Latin America and the

lowest in Nordic countries. Similar results are found by Daude and Robano (2015) while studying for persistence in educational achievement in 18 Latin American countries. According to Dickson et al., (2013) direct causal impact of parental education on children's schooling start at early stages of life i.e. at age 4 and in the later years of life i.e. at age 16 it become visible.

Checchi et al., (2008) conclude that high polarization in educational opportunities caused high persistence in educational attainment between father and children with no education and tertiary education. Belzil & Hansen (2003) explore that almost 68 % variation in schooling attainment of children is explained by household factors and in them the impact of parental education is more significant. Study by Torul and Oztunali (2017) shows the existence of considerable heterogeneity in the intergenerational educational persistence both at level and trend across European countries.

Kishan (2018) finds a close association between sons and fathers' status for India. Although, a decreasing trend is observed in intergenerational persistence of education but still there exist correlation of 0.48 between father and sons for the youngest cohorts. Opposite to this, Jalan and Murgai (2008) find the lower trend in intergenerational correlation of education while studying the individuals lying in the age group of 15-19 years.

Likewise, Maitra and Sharma (2009), after considering the endogeneity, conclude no significant relationship between parental and children (15 to 24 years old) schooling attainment which means intergenerational education mobility has increased over the time. Mothers' education has strong association with both daughters and son's education, but

this correlation is only with the school enrollment. As far as the father's education is concerned, it has an impact on son's education at post-secondary and college level.

Similarly, Majumder (2012) observe an improvement in educational mobility, but this improvement is only for the second generation. The results of the study by Azam and Bhatt (2012) for India are different from those obtained by Jalan and Murgai (2008), Maitra and Sharma (2009) and Majumder (2012). Although their findings suggest an upward mobility in educational attainment across the generations but a significant correlation at the top end rather than at the lower end.

2.3.2 Occupational Mobility

An empirical/economic analysis of occupational mobility is still a less explored issue specifically in the context of developing countries even though it is considered as one of the critical issues in most of the literature. One of the possible reasons might be the unavailability of longitudinal data sets which provides even better estimates of intergenerational mobility than the estimates obtained by using cross section data sets.

Observing the trends of stability and mobility for Canadian economy, Jocas and Rocher (1957) asserts that son's occupation is determined by father's occupation. Constant and Zimmermann (2003) found education as one of the most important factors affecting occupational choice for immigrants and natives of Germany where Germans are more likely to choose profession similar to that of father's profession.

Knoll et al., (2013) finds high persistence of occupational choice across fathers and children in Germany. In this study, separate analysis is done for those children who grew up with their biological fathers and who did not, to examine the impact of nature and

nurture related factors on occupational choice.[10] The results indicate a significant fraction of correlation between fathers' and children's occupation is explained by nurture related factors rather than nature related factors.

Lindquist et al., (2012) find that the impact of adoptive parents i.e. post-birth factors is as twice as the impact of biological parents i.e. pre-birth factors. For own-birth children, the individual impact of biological parents for intergenerational transmission of entrepreneurship is almost similar to the sum of the effect of post-birth and pre-birth factors for adopted children.

After analyzing intergenerational persistence of self-employment for informal sector, Pasquier-Doumer (2011) concludes that children of self-employed may have a better outcome in terms of profit and sale only if they choose familial tradition in the same sector. Otherwise, if the activity is different from that of father's activity than there is no transmission of valuable skills and no better outcome.

Sorenson (2004), in describing the mechanisms behind the transmission of self-employment from one generation to second generation, states that children of self-employed have greater preferences for autonomy relative to other children, their risk tolerance capacity and willingness to accept greater uncertainty is higher and for them occupational opportunities are determined by their parent's social status. So, the probability of following their father's profession is higher if compare with other children.

Laferrere (2001), argues that liquidity constraints and family environment are crucial in the determination of self-employment. For children, having entrepreneurial background, liquidity constraints seem to be less stringent than for the sons of wage workers. Successful

[10] Genetic endowments are nature related factors whereas parent's advice and influence come under nurture related factors.

entrepreneurs are capable of transferring financial wealth to their children, so these constraints are lessened by parent's help. Informal transfer of human capital i.e. valuable work experience, reputation or other managerial human capital also seems important in terms of unpaid experience which in turn decreases liquidity constraints.

Parlevliet (2008) concludes that major proportion of persistence of formal employment across generations comes from salaried/paid work as the children following the foot prints of their parents prefer to work as a salaried worker. The probability of following is about 0.63. On the other hand, contribution of paid informal worker is higher in informal employment persistence and the probability of following is almost 0.48. Family, friends and colleagues are the main channel through which people find their jobs and their contribution is about 60 %. Di Pietro and Urwin (2003) analyzed that the probability of following father's occupation is higher for the sons of mangers, professionals, entrepreneur than for the sons of manual workers.

Brunetti and Fiaschi (2015) state that interaction between income incentives, opportunities and occupational structure results in different occupational status of an individual. Baron (1980) after deriving a structural model based on the Rogoff's data, analyzed the mobility trends through intergenerational mobility matrix and confirm invariant mobility trends. Nicoletti (2008) while considering the issue of employment and co-residence selection claims that at the top of occupational prestige distribution, intergenerational transmission is weak than at the bottom.

2.4 Returns to Schooling

An extensive literature is there, discussing the effect of education on earnings. Several studies confirm the lower returns to education for informal sector in comparison with

formal sector. Tackling the endogenous sectoral allocation (public, formal private and informal sectors) and endogeneity of education, Kuepie, et al., (2009) find the evidence of higher returns to schooling in all sectors.

Endogeneity is corrected by using the control function approach and for sectoral sample section, an approach proposed by Lee (1983) based on Heckman was employed. Further, for measuring the strength between education and earnings piece wise spline function is used. Schooling returns are found to be higher for public sector followed by formal private sector and informal private sector. This study also finds the evidence of convex returns to schooling for all sectors.

Similarly, to control for sectoral sample selection bias and endogeneity, a variety of econometric methods[11] are applied by Yamasaki (2012) for estimating returns to education in public, formal private and informal sector. Moreover, the issue of heterogeneity is tackled by applying quantile regression and piece wise linear spline function. Along with this, wage differentials between sectors were estimated through Blinder-Oaxaca decomposition method.

Rate of returns were found to be highest for formal private sector and lowest for informal private sector. Another multi-sector study is of Gindling (1991), tackling the issue of sectoral selection bias by applying Lee (1983) Two-step correction method for more than two sectors and finds positive returns to education for all sectors. The impact of education on returns are found to be strongest for public sector than private formal and informal sector.

[11] Lee (1983), Dahl 2(2002), Wooldridge (2002), Variant 1 & 2 of Dubin and & McFadden (1984) i.e. developed by Bourguignon et al. (2007).

Tegoum (2009) used propensity score and Epanechinikov kernel matching for addressing the issue of biasedness that may arise due to endogeneity of education, while for the correction of sample selection bias, method proposed by Bourguignon et al., (2004) in estimating returns to education in case of possession of the first school leaving certificate (FSLC) and first cycle of secondary education (general certificate of education ordinary level, GCE-OL) for different sectors is employed.

The author concludes that probability of joining the formal sector increases with the level of education and there is positive impact of education on the incomes of informal sector workers. Gong and Soest (2002) observe an increase in the probability of formal sector employment with the wage differentials. Along with this an increase in wages for both formal and informal sectors with the improvement in education level is identified but with much stronger effects in the formal sector.

Pisani and Pagan (2004), while analyzing the role of education in determination of employment either in formal or informal sector and its effect on earnings through employing the switching regression model, finds education as a primary determinant of employment in informal sector. Returns to education are positive both for formal and informal sector but informal sector exhibits higher returns than formal sector. Similarly, Funkhouser (1997a), in doing the analysis for formal and informal sector finds much stronger effect of education on returns in the formal sector.

Arias and Khamis (2008) through the application of marginal treatment effects developed by Heckman and Vytlacil (2001, 2005, 2007) and Heckman et al. (2006) concludes non-existence of significant differences between the earnings of formal salaried workers and self-employed and finds higher returns to education for formal sector than informal sector.

After controlling for sectoral selection bias, Tansel (2001) reaches to a conclusion of decreasing probability of covered, uncovered[12] and self-employment with the attainment of high level of education and this decrease in probability is higher for uncovered wage employment.

2.5 Literature: Pakistan

Many descriptive studies have been carried out on the informal sector of Pakistan. Burki and Ghayur (1989) while examining the characteristics of the workers in the urban informal find's higher average earnings of self-employed and employees when compared with the government employees. Ali and Hamid (1989) analyze the problems that working women face in the informal sector, whereas Ahmad (1990) analyzes the problems of the overall informal sector and suggests policy measures for their solution.

Ghayur (1994) works on the need for labor market information system of informal sector. Kemal and Mahmood (1998) focus on the stylized facts, such as the characteristics of the self-employed and informal sector enterprises; the labor productivity and capital-intensity. Hassan and Farooq (2015) search for gender discriminatory practices that home based women workers have been facing. According to them, gender discriminatory practices are at their worse level for example, exploitation, behavioral problems and restricted mobility caused by some specific socio-cultural build-up of the society.

Whereas concerning the relationship between informality and poverty, not even a single empirical study is available in the case for Pakistan. Among the descriptive studies, Mumtaz (2010) and Khan and Khan (2009) assert that poverty forces the individuals to join informal sector. Gazadar (2004) investigates the relationship between labor market

[12] Covered and uncovered wage employment here refers to protected and unprotected employment by social security programs.

arrangements[13] and poverty. Khan and Ashraf (2012) describes the key aspects of the informal employment and its linkages with poverty. Only a single study and that is of Nasir (2001) confirmed the existence of high rates of poverty among the informally employed persons.

There are only few studies (Javed & Irfan, 2012; Shehzadi, 2006; Havinga, et al., 1986) on the issue of mobility in case of Pakistan. Only, the study by Javed and Irfan (2012) explores intergenerational mobility explicitly. They conclude that in determining the economic position of offspring, father's socioeconomic status is one of the most crucial factors. It is basically initial endowments and social connection that determines the future life chances. There are 42 % chances that the son will not attend the school if he belongs to an illiterate father and 72 % chances that the son will get employment in an elementary/basic occupation if his father is in the same category.

Only a few empirical studies are available on schooling returns in informal sector of Pakistan. Guisinger and Irfan (1980) conclude that earnings of the workers in the formal are 25 times higher than the workers in informal sector irrespective they have similar education and experience. Khan (1983) concludes that for both men and women, earnings in formal sector are more irrespective of their educational qualifications.

According to Ahmad et al., (1991), differences in earning are due to differences in education, age, experience. In contrast, Burki and Abbas (1991) assert that investment in human capital has the same reward in both, formal and informal sector, while Burki and Ubaidullah (1992) findings indicate that mostly informally employed workers earned a high rate as compared to earnings of the government employees. Burki and Abbas (1991),

[13] Labour market arrangements here refer to the segmentations that may become the source of severe poverty traps. And this segmentation due to either "screening", "social collateral", "social norms" or "monopsonistic employers.

Sargana, (1998) and Gillani & Ali (2013) reach on the conclusion that education is paying more to the self-employed group.

Each empirical study is based on small sample surveys (districts or cities) and they often come up with conflicting evidence. Due to this, these studies are unsuitable in guiding towards any policy formulation. Further, the complex phenomena (persistence of low education, low skill, low returns) that works behind relating informal employment with poverty is still unexplored even though at international level.

This study contributes to the literature in many ways. First, the link between poverty and informality is going to be capture through decomposition of the impacts with respect to intergenerational persistence of education and occupation. Second, it provides evidence for which no other study linking poverty with informality. Third, it improves on methodology and estimation techniques through controlling the selection bias. Fourth, it presents the results for workers belonging to different occupations and these results, yet unavailable in the literature (specifically for informal employment).

2.6 Conclusion

This chapter has reviewed three strands of literature; poverty and informality, intergenerational persistence and returns to education. Literature relating poverty and informal employment is rare, mostly based on studying a one-way relationship i.e. ignoring the causal relationship and being usually descriptive. Moreover, the research about the process causing severe poverty traps for informally employed persons is not available.

Further, although different studies on intergenerational persistence are available, but there is not even a single study with the special focus on informal sector. Many of the studies on intergenerational persistence have not tackled the issues of selection bias which can arise

due to selection into employment and co-residence. The studies which tackled this issue only adopted Heckman-type correction methods. But for measuring the intergenerational mobility, these methods are not suitable.[14]

Many studies are available which have estimated the earning function for different sectors. Some (Ewoudou & Vencatachellum, 2006; Pisani & Pagan, 2004; Chong, 1999; Gindling 1991), have controlled the sectoral allocation, while some other (Yamasaki, 2012; Kuepie et al., 2009; Tegoum, 2009) have corrected for endogeneity of both sectoral allocation and education. But none of the study have estimated the earning function for different occupational categories specifically for informal sector.

The literature review presented above suggests poverty rate is higher among the workers who have informal employment. A common view in the literature is that poverty is one of the reasons of accepting the jobs in informal sectors. Different household factors and the urgent need of meeting different expenditures are the main reasons of accepting the informal jobs indicating the fact that informal employment is of involuntary in nature.

However, literature confirms that obtaining the employment in the informal sector do not improve their financial conditions as the individuals are paid lower wages in this sector. Therefore, this study also reviewed the research papers on comparative analysis of returns to education between formal and informal employment which confirms the existence of substantial differences in wages of both type of employment with informal employment being low.

Some studies on mobility are also reviewed as we are of the view when an individual is informally employed the chances of falling its next generation into poverty are also high

[14] Nicoletti (2008).

due to transfer of education and occupation from father to child. The high correlation between parents and children is confirmed by many studies which are reviewed here. We attempt to fill the gap identified through review of literature.

Chapter 3: Theoretical Framework and Econometric Specification

3.1 Introduction

The chapter provides the theoretical and empirical bounds within which we build our analysis of impact of informality and poverty. First section discusses the theoretical foundations and builds a framework detailing the underlying mechanisms involved in the assessment of how informality is associated with household poverty. The second section provides the econometric outline of the empirical estimation methods, techniques and the associated models which we intend to estimate to achieve the objectives of study. The econometric models are constructed to measuring the impact of informality on poverty, intergenerational persistence of education and occupation across informally employed individuals and the effect of informality on returns to education.

3.2 Theoretical Model

Both poverty and informality are highly persistent phenomena. Informal employment represents a large share of total employment in many Asian countries including Pakistan (72.6 %). The informal economy in Pakistan (as is typical of the 'unorganized' sector) like other developing economies has low productivity with heavy bias towards unskilled labor and causes poverty (Ali, 1990; Nasir 2001; Akhlaque et al., 2006).

Existing literature notes that presence and sustainability of poverty-based informality are causes of systemic resistance to economic uplift, industrialization, and transition into formal economy (Murphy et al. 1989; Krugman 1991). Many scholars developed models of multiple equilibria in which firms have an option to either operate in formal economy (marked by high productivity and wages, and fixed input costs) or in informal one (identified by low productivity and input costs).

For these firms the transition from informal to formal sector is incentivized by creating higher demand for their products. This situation exists when the overall average income is high, i.e. when other firms are in formal sector and industrialized and give competitive paychecks. Therefore, the decision to industrialize depends on the actions of other firms.

Docquier et al., 2012 develop a complete theoretical model of implications of informality for long run growth (developing nations) by considering human capital accumulation, wage inequality (formal and informal sector) and child labor. In this model, wage inequalities tend to lower down the accumulation of human capital among the children of informally employed persons and promote child labor.

The existence of trade-off between education of children and their future income generates poverty trap. In the absence of informality, income convergence between the developed and developing nations can be achieved but its presence in developing nations prohibits this convergence so that they may not come out of poverty trap. For this thesis, theoretical foundations are based on Docquier et al., 2012. The theoretical model given below cover the following broader sectors; production, preferences of individuals regarding decision of consumption expenditures on different heads, dynamic and competitive equilibrium and lastly implications of informality for human capital and poverty.

3.2.1 Production

Assume, there are two sectors of production formal and informal sectors in an economy (labeled *f* and *i*) with two types of adult workers (high skilled and low skilled). Let, h_t be the proportion of high-skilled adults and $(1 - h_t)$ be the proportion of low skilled adults at time t, and N_t is the total labor force of adults. The size of high and low skilled worker is denoted by; $H_t = h_t N_t$ and, $L_t = (1 - h_t)N_t$, alternatively.

The model assumes that i) informal sector is less productive and consist of only low skilled labor, ii) marginal productivity of labor in informal sector is constant, iii) formal sector consist of both high and low skilled labor, iv) there is decreasing marginal productivity of labor[15] in formal sector. Total output Y_t, produced in an economy is the sum of output produced in the formal sector, $Y_{f,t}$ and output produced in the informal one, $Y_{i,t}$. Output produced individually in each sector is given by;

$$Y_{f,t} = A_t H_t^{\alpha} L_{f,t}^{1-\alpha} \quad (1)$$

$$Y_{i,t} = BL_{i,t} \quad (2)$$

Here α represents the elasticity of output with respect to high-skilled labor, A_t represents the state of technology, H_t and $L_{f,t}$ is the total number of high-skilled and low skilled workers employed in the formal sector, respectively. $L_{i,t}$ is the total number of low-skilled workers employed in informal sector. B is a scale factor associated with the technology in the informal sector.

Total factor productivity (TFP), denoted by A_t in the formal sector is assumed to be endogenous,[16] whereas B is assumed to be constant (in informal sector. Further, there is improvement in human capital which leads to stagnation of technology and obsoleting of means of production). With reference to the AK model, the elasticity of TFP with respect to the skill ratio equals $1-\alpha$, i.e.,

$$A_t = A_0\left(H_t/L_{f,t}\right)^{1-\alpha} \quad (3)$$

[15] An economic principle governing the production, which states that "while increasing one input and keeping other inputs constant initially increase output, further increases in that input will have a limited effect, and eventually no effect or a negative effect, on output".

[16] It notes that internal processes, policies and investment capital, instead of external factors, are mainly responsible for economic growth i.e. enhancement of a nation's human capital will lead to economic growth by means of the development of new forms of technology and an efficient and effective means of production

For simplicity we can write B in terms of scale factor A_0 i.e., $B = \tilde{\gamma} A_0$. B is also minimum wage in the informal sector. Profit maximizing conditions of firm is given by;

$$Y_{f,t} - w_{h,t} H_{\ t} - w_{l,t} L_{f,t} \tag{4}$$

and

$$Y_{i.t} - w_{l,t} L_{i,t} \tag{5}$$

Employment level is chosen by the firms in formal and informal sectors through equalizing the marginal productivity of high- and low-skilled workers with their wage rates $w_{h,t}$ and $w_{l,t}$ respectively under the given conditions.

In the formal sector, these conditions are;

$$w_{h,t} = A_t \alpha \left({}^{L_{f,t}}\!/_{H_t} \right)^{1-\alpha} \tag{6}$$

$$w_{l,t} = A_t (1-\alpha) \left({}^{L_{f,t}}\!/_{H_t} \right)^{-\alpha} \tag{7}$$

In the informal sector; Output and employment can be described by complementary slackness conditions;

$$ {}^{w_{l,t}}\!/_{\tilde{\gamma} A_0} \geq 1, \qquad Y_{i,t} \geq 0, \qquad \text{and} \qquad ({}^{w_{l,t}}\!/_{\tilde{\gamma} A_0} - 1) Y_{i,t} = 0 \tag{8}$$

These conditions state that, when wage $w_{l,t}$ of low-skilled workers is equal to the constant marginal productivity $\tilde{\gamma} A_0$ of labor in both the sectors (as informally employed persons are there in both formal and informal sector) then the production in informal sector will be positive[17].

When the wage $w_{l,t}$ of low-skilled workers in the formal economy exceeds the marginal productivity of labor in the informal sector then firms in the informal sector will produce

[17] $w_{l,t} = \tilde{\gamma} A_0 \; then \; Y_{i,t} > 0$ and when $w_{l,t} > \tilde{\gamma} A_0 \; then \; Y_{i,t} = 0$

no output. In formal sector, low skilled laborers are employed informally and are given higher wages ($w_{l,t} > \tilde{\gamma} A_0$) than their marginal productivity thus making the production cost higher. In this situation, informal sector will not produce any good.

3.2.2 Preferences

Each worker of type $k \in \{h, l\}$ at period t chooses consumption $c_{k,t}$ and the proportion $q_{k,t} \in [0,1]$ of children sent to school to maximize utility. The utility function is logarithmic and depends on consumption $c_{k,t}$ and the average future wage (expected) $\overline{w}_{k,t+1}$ of children.

$$U_{k,t} = ln\,(c_{k,t}) + \beta ln\,(w_{k,t+1}) \qquad (9)$$

Here β is the rate of parents' preferences for the income of children. The average future wage of children is;

$$w_{k,t+1} = (1 - q_{k,t}) w_{l,t+1} + q_{k,t} w_{h,t+1} = w_{l,t+1}(1 + q_{k,l}\sigma_{t+1}) \qquad (10)$$

Informal sector employment is identified with significantly lower levels of wages (Baskaya & Hulagu, 2011). Parents employed herein have low earnings and they have little chances to access credit markets which results in inability to borrow for investment in children education (Becker & Tomes, 1986). This, in turn, results in a minimum number of children attending the formal schooling.

In eq. (10) $1 - q_{k,t}$ is the proportion of informally working children and are not admitted in school and earn $w_{l,t+1}$ wage rate (child labor). Decision of working parents to send their

children to school has a fruitful result of education and this in turn causes upward economic mobility[18].

Here σ_{t+1} is skill premium in the next period and its values is $(w_{h,t+1} - w_{l,t+1})/w_{l,t+1}$. It indicates that average future wage of children depends upon skill premium over human capital. Monetary cost of educating a child is $\tilde{e}$. Presence of informal sector provides the opportunity to non-educated children to work in this sector. Children employed in informal sector (child labor; children of the parents employed in the informal sector), receive a fraction $\eta\epsilon[0,1]$ of the low-skilled wage rate due to lack of experience and physical strength compared to adults. The budget constraint of both formally and informally employed person is;

$$c_{k,t} = w_{k,t} - n_k q_{k,t}\tilde{e} + n_k(1 - q_{k,t})\eta w_{l,t} d_t \qquad (11)$$

Where, n_k is the exogenous number of children of a k-type adult, and d_t is a dummy variable, taking the value 1 if informal sector produces some output and 0 otherwise. Incorporating equations (10) and (11) into utility function and then maximizing it with respect to $q_{k,t}$, we obtain estimated value of education for children of both types of parents (formal and informal workers);

$$\widehat{q_{k,t}} = \frac{\beta\sigma_{t+1}(w_{k,t}+n_k\eta w_{l,t}d_t) - n_k(\tilde{e}+\eta w_{l,t}d_t)}{(1+\beta)n_k(\tilde{e}+\eta w_{l,t}d_t)\sigma_{t+1}} \qquad (12)$$

Optimal level of education is[19];

$$q^*_{k,t} = \begin{cases} 0 & if\, \hat{q}_{k,t} \le 0 \\ \hat{q}_{k,t} & if\ 0 \le \hat{q}_{k,t} \le 1 \\ 1 & if\ \hat{q}_{k,t} > 1 \end{cases} \qquad (13)$$

[18] Mayer and Lopoo (2008) maintain that investments on human capital of children have higher returns in terms of educational and economic well beings. Educational and economic/occupational immobility in turn causes sustaining of poverty from one generation to another.

[19] By putting values of all parameters in equation (12), if estimated values is greater than 1, then it means employed workers are providing education to all of their children. But if estimated value of education is less than or equal to zero, then no education is provided to the children. As a consequence, it raises the probability of children (next generation) with low human capital to work informally (Nazier & Ramadan, 2015) and caught into poverty trap.

3.2.3 Dynamics and Competitive Equilibrium (Across Generations)

It is assumed, evidence suggests, that high-skilled parents educate all their children, i.e., $\hat{q}_{h,t} > 1$, which implies that $q^*_{h,t} = 1$. In contrast to this, low-skilled parents only educate an endogenous fraction $q_{l,t} \epsilon [0,1]$ of their children[20]. Denoting the fertility ratio by $n = n_h/n_l$, we have the dynamics of skill ratio across generation (of both skilled and unskilled) as;

$$\frac{h_{t+1}}{1-h_{t+1}} = \frac{n_h h_t + n_l q_{l,t}(1-h_t)}{n_l(1-q_{l,t})(1-h_t)} = \frac{n}{1-q_{l,t}} \frac{h_t}{1-h_t} + \frac{q_{l,t}}{1-q_{l,t}} \quad (14)^{21}$$

The adults evolve according to;

$$\frac{N_{t+1}}{N_t} = n_h h_t + n_l(1-h_t) \quad (15)$$

Labor market clearing conditions are;

$$H_t = \overline{H_t} \quad (16)$$

i.e. human capital should be constant.

$$L_{f,t} + L_{i,t} = \bar{L}_t + \eta n_l (1-q_{l,t}) \bar{L}_t d_t \quad (17)$$

i.e. demand for low skilled workers in formal sector ($L_{f,t}$) and informal sector ($L_{i,t}$) is equal to labor supply of low skilled adults ($\bar{L}_t$) and efficiency units of children (i.e. the fraction of children of informally employed workers not sent to school) who work.

$$L_{i,t} > \eta n_l (1-q_{l,t}) L_t \qquad whenever\ d_t = 1 \quad (18)$$

[20] The decision regarding the education and child labour of children is taken by the household with respect to adult labor market and their income. The presence of high youth unemployment increases investment in informal education of children (Bazin & Bukhut, 2009). Continued poverty, large family size, illiteracy and ignorance of poor parents, low family income, high population growth and the tradition of making children learn the family skill are the most common factors of child labour.

[21] n_h is the number of children of high skilled workers and n_l is the number of children of low skilled persons sent to school and term in the denominator, n_l in the denominator represents those children of low skilled workers not sent to school.

i.e. adults required for functioning of informal sector should be higher than the number of working children in informal section. That is, there are adults and children who work side by side in informal sector, but the informal sector will only work when the number of adults employed in informal sector is greater than the children working in informal sector.

3.2.4 Implications of Informality (for human capital development and poverty)

Considering the formality regime and putting the value of TFP from (3) into (6) and (7), we will get the wages and skill premium;

$$w_{h,t} = A_0\alpha \tag{19}$$

$$w_{l,t} = A_0(1-\alpha)(\tfrac{h_t}{1-h_t}) \tag{20}$$

$$\delta_t = \tfrac{\alpha(1-h_t)}{(1-\alpha)h_t} - 1 \tag{21}$$

Hence, in the formality regime, the skill premium δ_t depend upon the human capital. It indicates when the proportion of high-skilled workers in the economy increases, it decreases the skill premium and when h_t tends to zero, the skill premium equals infinity.

Again, plugging (3) into (6) - (8) and considering, $Y_{i,t} > 0$, wages and the skill premium in the informality regime are;

$$w_{h,t} = A_0\alpha \tag{22}$$

$$w_{l,t} = A_0(1-\alpha)/\gamma \tag{23}$$

$$\delta_t = \tfrac{\alpha\gamma}{(1-\alpha)} - 1 = \bar{\delta} \tag{24}$$

The last condition states that in presence of informal sector, the skill premium δ_t is constant and independent of the proportion h_t of high-skilled workers. It means no high skill is

required for employment in informal sector. So, informality only arises in economies where levels of human capital are very low, i.e. when $h_t < \frac{1}{1+\gamma}$ (from 20 and 23).

If the initial proportion of high-skilled workers is not high enough as in the case of informal employment i.e., $h_0 < 1/(1+\gamma)$, then the skill ratio of high-skilled to low-skilled workers remains low in the next generation. Since only a smaller proportion of children of informally employed workers attend the school, whereas majority of them start working in their childhood as informal worker therefore next generation of informally employed persons acquire low human capital (educational and occupational immobility).

Hence, accumulation of human capital is affected by informality. The wages of low skilled workers derived in informality regime are constant, so plugging (23) into (12) we obtain $q_{l,t}$ (proportion of the informally employed children sent to school) equal to;

$$q_{l,t}^{*} = \frac{\beta\,(1-\alpha)(1+\eta n_l)}{(1+\beta)[e\gamma+n(1-\alpha)]n_l} - \frac{1}{(1+\beta)\sigma_{t+1}} \qquad (25)$$

But in a situation where next period proportion, h_{t+1} of high-skilled workers is not sufficient to achieve the threshold proportion $1/(1+\gamma)$ that defines informality, then $q_{l,t}$ is constant and equal to[22];

$$q_{l,t}^{*} = \frac{\beta\,[\alpha(1+\gamma)-1](1-\alpha)(1+\eta n_l) - n_l(1-\alpha)[e\gamma+\eta(1-\alpha)]}{(1+\beta)[e\gamma+n(1-\alpha)][\alpha(1+\gamma)-1]n_l} \equiv \bar{q}_l$$

Substituting the wage rates derived from the formality regime i.e. plugging (19) and (20) into (12), we will get the optimal level of education for children of informally employed person in formality regime.

$$q_{l,t}^{*} = \frac{\beta(1-\alpha)h_t}{(1+\beta)en_l(1-h_t)} - \frac{\alpha-h_{t+1}}{(1+\beta)(1-\alpha)h_{t+1}} \equiv q_l(h_t, h_{t+1}) \qquad (26)$$

[22] this value is obtained by incorporating the value of σ_{t+1} in eq.25

Under formality regime, human capital dynamics is;

$$\frac{h_{t+1}}{1-h_{t+1}} = \frac{n}{1-q_l(h_t,h_{t+1})}\frac{h_t}{1-h_t} + \frac{q_l(h_t,h_{t+1})}{1-q_l(h_t,h_{t+1})} = \varphi(h_t, h_{t+1}) \qquad (27)$$

Plugging human capital dynamics in optimal level of education i.e. in (26);

$$q^*_{l,t} = \frac{\beta(1-\alpha)}{(1+\beta)en_l} z_t - \frac{(1-\alpha)z_{t+1}}{(1+\beta)\alpha(1+z_{t+1}) - z_{t+1}} \equiv q_l(z_t, z_{t+1})$$

The above equality states that optimal level of education of children's of informally employed workers under formality regime is not constant. As education level of informally employed person in formal sector[23] is evolving over the time, therefore it might be said that it will converge to education/human capital acquired by the children of formally employed persons.

From overall discussion, it can be concluded that if investment on education of children's of informally employed persons is low, then there are higher chances of intergenerational correlations in education and occupation as well. According to many studies[24] parental education affects the schooling outcome of their children directly and also indirectly through the economic situation. When there is persistence of education, this also indicates the persistence of informal employment across generation.

3.2.5 Poverty Trap

Constrained by lower earnings and inability to participate in credit market, parents working in informal sector make lower investments on their children's education and send only a fraction of their children to school. The remaining children work in informal sector. That

[23] Persons in informal employment outside the informal sector specifically are; "*Employees in formal enterprises not covered by national labour legislation, social protection or entitlement to certain employment benefits, such as paid annual or sick leave, contributing family workers working in formal sector enterprises, Paid domestic workers not covered by national labour legislation, social protection or entitlement to certain employment benefits, such as paid annual or sick leave and own account workers engaged in the production of goods exclusively for own final use by their household (e.g., subsistence farming, do-it-yourself construction of own dwelling)".*

[24] Jua´rez (2014), Javed and& Irfan (2012), Binder and& Woodruff (2002), Havari and& Savegnago (2013).

is why skill development in the next generation of informally employed individuals remain low. Therefore, same education, occupation and in turn income persists in the next generation. This persistence in turn become the source of poverty trap.

Under informality regime, dynamics of the skill ratio z_t are governed by;

$$z_{t+1} = \frac{n}{1-\bar{q}_l} z_t + \frac{\bar{q}_l}{1-\bar{q}_l} = \varphi(z_t) \quad (28)$$

In this equation slope, $\frac{n}{1-\bar{q}_l} < 1$ if $n < 1 - \bar{q}_l$ (this condition is satisfied only when fertility ratio i.e. *n* is low enough and the education cost $\tilde{e}$ are sufficiently high).[25] So, when there persists low skill among the children of informally employed workers, this situation becomes the source of poverty trap among informally employed workers.

3.3 Econometric Modelling

This section details the econometric techniques which are applied to measure the contribution c of informality towards poverty mainly through educational and occupational persistence across generation and the returns on schooling.

3.3.1 Informality and Poverty

To analyze the factors of informality discrete choice model, Logit/Probit, Least Square Dummy Variable (LSDV), Generalized Method of Movement (GMM) and Multinomial Logit Model (MNL[26]) are the most frequent techniques employed in the literature (Rukundo, 2015; Aikaeli & Mkenda 2014; Dougherty & Escobar, 2013; Doğrul, 2012; Arunatilake & Jayawardena 2010; Wamuthenya 2010).

[25] n is basically the ratio of high skilled workers to low skilled workers, and it means that if in a country low skilled worker are higher, then n will be lower and, in this situation, there will be poverty traps. So, for Pakistan if low skilled workers are higher than informality becomes the source of poverty traps.

[26] When a variable is composed of two options (informal and formal), then logit/probit model are the most appropriate techniques, but in case of more than two choices (e.g. public, private, informal and unemployed) multinomial logit model is applied.

Probit, Probit with instrumental variable (IV), Probit with sample selection (Heckman Probit) and bivariate dynamic random effect models[27] are used in the previous studies for examining determinants of poverty (Canelas, 2015; Nazier & Ramadan, 2014; Devicienti et al., 2009; Dorantes 2004).

Besides probit, OLS models are also employed in the literature assessing the determinants of poverty where poverty is mostly defined either in terms of consumption expenditures or income per capita (Salami & Atiman, 2013; Ranathunga 2010; Vijayakumar & Olga, 2012) Probit and OLS estimation would become inappropriate and produce biased results as these approaches assumes selection of informality is an exogenous process when it is actually endogenous.

The decision of choosing informality by the individuals depends on their own characteristics (observed and unobserved) and based on these characteristics an individual self-select into different occupations. In other words, individuals' characteristics may affect their decision of choosing informal occupations. Therefore, both of these techniques may produce erroneous and biased estimates.

To be exact, informality and poverty are not likely be the outcome of independent decision of an individual. We maintain that errors/unobserved factors of the outcome equation (poverty) correlates with the errors/unobserved factors of the selection equation (choice of informal sector). Unobservable of selection equation has an influence on the outcome variable of interest. For each occupational choice, Bourguignon, et al. (2007) has

[27] Although in case of binary dependent variable (poor and non-poor) probit/logit models are most appropriate but in the presence of endogeneity Probit with IV is preferred. Probit model with sample selection involves two steps. First stage estimates the factors affecting the informality and second stage involves what influences the poverty. Bivariate dynamic random effect model is applied in case of panel data and in this individual's poverty status at time t is assumed to depend on the same individual's poverty status at t-1.

established this correlation resulting in consistent estimates of the coefficients of outcome equation (poverty).

Although, probit models with sample selection overcome this problem but it corrects for the selection bias when selection is among the two choices. Therefore, in cases, where there are more than two sectors (when the selection is multivariate) then selection bias is controlled by two step correction method, Multinomial Endogenous Switching Regression, as proposed by Lee (1983), Dubin-McFadden (1984) and Dahl (2002).

The Dubin-McFadden's method has an edge over the other two methods as the latter place the strong constraints as to how the errors across the selection and outcome equations are linked (Seo, 2016d; Bourguignon et al., 2004; Schmertmann, 1994). As analyzed by Bourguignon et al. (2007) assumptions proposed by Lee (1983) "*that the covariance of the errors in the earnings equation for sector s and the errors in the occupational sectors are all of the same sign. In other words, unobservable determinants of the choice of alternative 1 against any other alternative should be correlated in the same direction with unobservable determinants of outcome y1."*

It indirectly means that assumptions imposed by Lee which addresses the issue of selection bias suggests that all the correlations are expected to be equal that is correlation coefficient among all the choices is same. Furthermore, Lee's method is only applicable when sample size is small (Bourguignon et al., 2007). In contrast to Lee, (1983) and Dahl, (2002), a more flexible correlation structure among the parameters is suggested by Dubin–McFadden, (1984).

Bourguignon et al., (2007) proof that the restriction on correlation structure of error terms can create biased estimates. The authors enhanced the Dubin-McFadden (1984) model

named as DMF variant 1 and DMF variant 2[28]. Their model consists of multiple correction terms linking the selection bias to the allocation of individuals to each other alternatives (Zheren, 2008).

A two-stage frame work for the choice of informal or formal employment decision and its outcome in terms of poverty is modelled below. In the first stage, selection model for informal employment is estimated whereas in the second stage, outcome model to account for the effect of informal employment on poverty is estimated.

Let Z^* be a latent variable which captures the poverty outcome of choosing informal employment with respect to formal employment. The specification of this variable is given by;

$$Z_i^* = A_i\alpha + \mu_i \qquad \text{with} \qquad Z_i = \begin{cases} 1 & if \quad Z_i^* > 0 \\ 0 & otherwise \end{cases} \qquad (1)$$

The above condition states that if an individual chooses informal employment i.e. $Z_i = 1$ then he/she may face poverty as an outcome of informality. Variables affecting the poverty are represented by vector *A.* These variables can be classified into household and individual socioeconomic characteristics e.g. family size, female to male ratio, employment ratio, age, schooling years, marital status etc. (The descriptive statistics and definition of variables is provided in Appendix IV (Table III and VIII)).

Suppose individual faces two choices; 1) informal employment, and 2) formal employment. These can be defined as follows;

$$\text{Regime 1: } pov_{1i} = x_{1i}\beta_1 + \varepsilon_{1i} \qquad if \quad Z_i = 1 \qquad (2a)$$

[28]As stated by Bourguignon et al. (2007) that DMF variant 2, which allows for normal error terms in the outcome function, is less robust than original DMF and DMF variant 1. Therefore, this study has applied both the variant of Dubin-McFadden (DMF1 and DMF2).

Regime 2: $pov_{2i} = x_{2i}\beta_2 + \varepsilon_{2i} \quad if \quad Z_i = 0$ (2b)

Where pov_{1i} and pov_{2i} are the poverty outcomes in case of informal employment and formal employment, respectively. x_i represents the variables included in A_i. Error terms μ_i , ε_{1i} and ε_{2i} are assumed to have trivariate normal distribution with mean zero, while covariance matrix is defined in the following manner;

$$cov(\mu, \varepsilon_1, \varepsilon_2) = \begin{bmatrix} \sigma_\mu^2 & \sigma_{\mu 1} & \sigma_{\mu 2} \\ \sigma_{1\mu} & \sigma_1^2 & . \\ \sigma_{2u} & . & \sigma_2^2 \end{bmatrix}$$

Where $\sigma_\mu^2 = var(\mu), \sigma_1^2 = var\ (\varepsilon_1), \sigma_2^2 = var\ (\varepsilon_2),\ \sigma_{\mu 1} = cov(\mu, \varepsilon_1)$ and $\sigma_{\mu 2} = cov\ (\mu, \varepsilon_2)$. The variance of selection equation σ_μ^2 is normalized to 1. As simultaneous observation of pov_{1i} and pov_{2i} is not possible, so covariance between ε_{1i} and ε_{2i} is undefined and indicated by dot. Correlation of μ with $\varepsilon_1$and ε_2 indicates that the expected values of ε_1 and ε_2 conditional on sample selection are non-zero.

$$E[\varepsilon_{1i}|Z_i = 1] = \sigma_{1\mu}\left(\frac{\varphi(A_i\alpha)}{\phi(A_i\alpha)}\right) = \sigma_{1\mu}\lambda_{1i} \qquad \text{where} \qquad \lambda_{1i} = \left(\frac{\varphi(A_i\alpha)}{\phi(A_i\alpha)}\right)$$

$$E[\varepsilon_{2i}|Z_i = 0] = \sigma_{2\mu}\left(\frac{\varphi(A_i\alpha)}{1-\phi(A_i\alpha)}\right) = -\sigma_{2\mu}\lambda_{2i} \quad \text{where} \qquad \lambda_{2i} = \left(\frac{\varphi(A_i\alpha)}{1-\phi(A_i\alpha)}\right)$$

If estimated values of $\sigma_{1\mu}$ and $\sigma_{2\mu}$ are statistically significant then decision to choose informal employment and poverty are correlated and indicative of endogenous switching and selection bias. λ, represents inverse mills ratio (IMR) and is computed from selection equation and included in outcome equation to correct for selection bias. Now this model can be extended for multiple occupational choices under informal employment and multiple outcomes accordingly.

Evidence clearly suggests that occupational choice has a vital role in impacting economic wellbeing in the labor market. The adoption of an occupation determines the current and future earnings of individuals which are closely related to household consumption, health, and socio-economic standing in the society (Harper & Haq, 1997; Freeman, 1971).

There arises a conundrum that, is economic wellbeing the result of an individual's occupation or the result of some other factors? Lower wage is mostly common in rudimentary and sales/customer occupations. The poorer laborers are centered mainly in elementary occupation (Feder & Derek Yu, 2019). Analyzing the distribution of workers across occupational groups and the earning patterns within an occupational group and across the groups are the determinants to solve the puzzle that how far the occupational choices are likely the causes of difference in poverty.

Stage 1: Selection model of multiple occupations under informal employment

Let Z^* be the latent variable that captures the outcome in terms of poverty if individual chooses different occupations; $j(j = 1 \dots \dots \dots N)$ under informal employment with respect to other occupations k. This latent variable is specified as follows;

$$Z_{ij}^* = \bar{L}_{ij} + \eta_{ij} = A_i\alpha_j + \mu_{ij}$$

$$\text{with} \qquad Z_i = \begin{cases} 1 & iff \quad Z_{i1}^* > \max_{k\neq 1}(Z_{ik}^*) \quad or\ \varepsilon_{i1} < 0 \\ \vdots & \vdots \qquad\qquad \vdots \\ N & iff \quad Z_{iN}^* > \max_{k\neq N}(Z_{ik}^*) \quad or\ \varepsilon_{iM} < 0 \end{cases} \qquad (3)$$

According to above specification, if an individual works as an informal worker in different occupations than any other occupation under formal employment i.e. $j \neq k$ then this derives

him towards poverty. Deterministic component[29], $\bar{L}_{ij}$ in equation (3) is equal to $A_i\alpha_j$ and is uncorrelated with μ_{ij}. Error term μ_{ij} is assumed to have Identical Gumbel distribution, therefore under the hypothesis of Independence of Irrelevant Alternatives (IIA), selection model (1) guides towards multinomial logit model (McFadden, 1973).

Stage 2: Multinomial Endogenous Switching Regression Model

In the second stage, the effect of informal employment on poverty is modeled by applying selection correction model of Bourguignon et al., (2007). If an individual faces N occupational choice under informal employment as mentioned previously then poverty equations corresponding to each possible choice is defined as (with reference category *j=1* for formal employment);

$$\begin{array}{lll} occupation\ 1: & pov_{i1} = x_i\beta_1 + \eta_{i1} \quad if\ Z_1 = 1 & (4a) \\ \vdots & \vdots & \vdots \\ occupation\ N: & pov_{iN} = x_i\beta_N + \eta_{iN} \quad if\ Z_N = N & (4n) \end{array}$$

Where pov_{ij} is the poverty of i^{th} household in occupation j and x_i is the vector of individual's and household's characteristics. Unobserved stochastic components are captured by η_{ij} and expected value of η_{ij} conditional upon x_i and A_i equal to zero, whereas variance of η_{ij} conditional upon x_i and A_i is equal to σ_j^2. However, the error term, μ_{ij} of selection equations is correlated with error term, η_{ij} of outcome equations which reveals non-zero expected value of η_{ij} conditional on the sample selection.[30]

[29] When a variable is predicted with almost hundred percent accuracy and almost have the exact same value e.g. age then it is called deterministic component.

[30] Estimation of equations from 4a to 4n, separately by OLS will produce inconsistent results. This inconsistency can be removed by considering the correlation between the error term of occupational choice equations (3) and the error term of poverty equations (4a-4n).

When this correlation is taken into account then the model is termed as "multinomial endogenous switching regression model", (equations 5a-5n).[31] The selection bias corrected poverty outcome model given below provides us consistent estimates of β_j after its estimation through full information maximum likelihood (FIML) estimation.

$$occupation\ 1:\ pov_{i1} = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{i1}) + \sum_j \rho_j m(P_{ij})\frac{P_{ij}}{(P_{ij}-1)}\right] + \omega_{i1} \quad if\ Z_i = 1\ (5a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$occupation\ N:\ pov_{iN} = x_i\beta_N + \sigma_N\left[\rho_N m(P_{iN}) + \sum_j \rho_j m(P_{ij})\frac{P_{ij}}{(P_{ij}-1)}\right] + \omega_{iN} \quad if\ Z_i = N\ (5n)$$

Where ρ_{1j} is likelihood of choosing strategy j by household i. In MNL model it is calculated as,

$$P_{ij} = \frac{e^{b_J z_i}}{1+\sum e^{b_J z_i}} \qquad \text{Where J= 1,…..,j}$$

Where P_{ij}, the correlation between error terms of employment and poverty equation varies from -1 to 1, whereas m_{ij} are selection bias correction terms for each informal occupation analyzed in the model. A significant value of selection correction term suggests presence of endogeneity and the presence of selection bias.

Counterfactual Analysis

One of the advantages of using switching regression model is that it allows doing the counterfactual analysis. Counterfactual analysis allows us to compare the poverty outcome in case of choosing informal employment and what would have happened to poverty outcome if the individual moves to formal employment from informal employment. For this, firstly the expected poverty of the individuals doing the job informally is going to be derive in the following manner; with reference category j=1 for formal employment.

[31] For further detail see Bourguignon et al., (2007) and Di Falco (2014).

$$E(pov_{i2}|Z_{i2}) = x_i\beta_2 + \sigma_2\left[\rho_2 m(P_{i2}) + \sum_{k\neq 2}^{N} r_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] + \omega_{i1} \quad (6a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$E(pov_{iN}|Z_{iN}) = x_i\beta_N + \sigma_N\left[\rho_N m(P_{iN}) + \sum_{k=1\ldots N-1} r_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] + \omega_{iN} \quad (6n)$$

After this, counterfactual expected poverty can be obtained in the hypothetical case for the individuals in informal employment by assuming if they are in formal employment then what would have happened on their expected poverty. Under this expected poverty can be obtain as;

$$E(pov_{i1}|Z_i = 2) = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{i2}) + r_2 m(P_{i1})\frac{P_{i1}}{(P_{i1}-1)} + \sum_{k=3\ldots N} \rho_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] \quad (7a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$E(pov_{i!}|Z_i = N) = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{iN}) + \sum_{k=2\ldots N} \rho_k m(P_{i,k-1})\frac{P_{i,k-1}}{(P_{i,k-1}-1)}\right] \quad (7n)$$

Difference between (6a) and (7a) or (6n) and (7n) allows us to calculate treatment effect which is the effect of moving towards formal employment on poverty of the individual that is currently doing the job as an informal worker.

3.3.2 Intergenerational Persistence

As argued in the theoretical model that informally employed workers, due to low earnings, afford to send only an endogenous fraction of their children for attending school. This investment on the human capital of children in their early life heavily influence the outcomes in terms of educational, occupational and income persistence (Mayer & Lopoo 2008).

Therefore, studying the educational and occupational persistence is of immense importance to suggest that how there exists a poverty trap among the workers employed in informal

sector. Confirmation of educational persistence and Parents' sector affiliation can help explaining a part of intergenerational persistence in earnings/poverty across generations.

Intergenerational persistence of education

Educational immobility is considered as one of the main mechanisms at play through which people caught into poverty trap. Different ways of measuring the mobility (education and occupation) has been accomplished in literature. The most followed approaches in intergenerational mobility literature are construction of Markov Mobility Matrix and computation of intergenerational elasticity (IGE) or intergenerational correlation (IGC).

Markov Mobility Matrix is basically the cross tabulation of the characteristics of children with those of their parent's characteristics. It tells us the proportion of the children having lower/higher position in education/occupation as compare to their parents that is movement from one state to another state.

This method has been widely used when the variables being used are discrete in nature and or in ordered classes (e.g. different levels of education and occupational classes). Starting with the Baron (1980), transition matrix approach has been used by Peters (1992), Sjogren (2000), Carmichael (2010), Fessler and Schneebaum (2012), Majumder (2013), Azam and Bhatt (2015), Tansel (2015), Brunetti and Fiaschi (2015), Haung et al., (2016), Malik and Jamil (2017), Neidhöfer et al., (2017) and Kishan (2018).

Through this approach the causal relationship which exist between parental educational/occupational status and that of the children cannot be measured as it is purely a descriptive measure. Another possible drawback of the transition matrix is floor and ceiling effect. It suggests that there exists a space the exit from which is not possible, i.e.,

moving upward from the ceiling and downward below the floor is not possible and the middle groups depict intergenerational mobility.

Therefore, most of the studies (Azam, 2015; Daud & Robano, 2015; Tansel, 2015; Azomahou & Yitbarek, 2016; Haung et al., (2016); Emran & Shilpi, 2018; Neidhöfer *et al*., 2017; and Asher, 2017) followed the IGE and IGC approach for measuring intergenerational persistence[32].

For measuring the IGE, children's educational / occupational characteristics are simply regressed on parent's characteristics while controlling for other variables. This method is suitable for the cases where the levels of achievements are in continuous form e.g. income or completed years of schooling.

The coefficient associated with the parental characteristics represents the magnitude of intergenerational persistence. A high/low value of coefficient points out low/high mobility. However, one of the issues with IGE is downward bias caused by the truncation which is the consequence of co-residency criteria[33] (Francesconi & Nicoletti, 2006; Emran, Greene & Shilpi, 2016).

Therefore, apart from, IGE, IGC[34] regression is also used to measure the influence of parental characteristics on children's characteristics. The downward bias caused by truncation is less than one third in IGC (Emran, Greene & Shilpi, 2016). IGE estimates

[32] Some other studies employing the IGE and IGC approach are of Binder and Woodruff, 2002; Carneiro and Heckman,2002; Blezil 2003; Attanasio and Kaufman, 2009; Maitra and Sharma, 2009; Daud 2011;; Fessler and Schneebaum, 2012; Checchi et al., 2013; Pastore, and Roccisano, 2015; Azam and Bhatt, 2015

[33]This defines membership in a household at the time of survey. Some of the members e.g. children are not present in the household due to residing in other cities for higher education or jobs purpose.

[34] "*IGE shows how a one year of higher schooling of parents affects the schooling attainment of children. IGC shows what proportion of the variance in children's schooling can be attributed to the variance in parents' schooling"* (Emran et al., 2018). IGC is an absolute measure because it is not affected by changes in policy related to free primary education which increases average schooling and therefore reduces the variance, while IGE is a relative measure which factors out the cross-sectional inequality of education across generations by considering ratio the of variance (Azomahou & Yitbarek, 2016). Correlation Coefficient explains the dispersion in child's schooling carried out by parental schooling (Azomahou & Yitbarek, 2016).

from OLS can also be biased upward if ability/skills and other characteristics are transferred from parents to offspring.

According to evidence (OECD, 2008) the inherited skills are of little importance in income mobility analysis, and when the focus is on educational outcome then it can be assumed nature factors do not vary too much across the individuals as these factors are more crucial for the case of earning /income transmission (Daude, 2011). Furthermore, the measurement errors in parental educational attainment are much smaller than income or earning variables.

Another estimation problem is omitted variable bias that is associated with parent's education. It is argued by Wendelspiess and Jua´rez (2015), taste and preferences for education might have an influence on parental education and if these are transferred to the next generation then endogeneity problem may possibly be arising.

In this situation, the instrumental variable (IV) technique is the most suitable strategy (Dickson et al., 2013) that can remove the biases caused by nature and nurture factors in OLS estimates. This technique with a variety of instruments is applied by Chevalier (2004), , Black et al., (2005), Chevalier et al., (2005), Oreopoulos et al., (2006), Maurin & McNally (2008), Carneiro et al., (2008), Maitra & Sharma (2009), Holmlund *et al*., (2011), Stella (2013), Havari and Savegnago (2013), Javed & Irfan (2014), Jua´rez, 2015, Gürbüz & Polat (2016), Haung et al., (2016), and Kishan (2018).

Due to above mentioned reasons, both descriptive and empirical analyses are applied in this study. Firstly, mobility across generation is calculated for different groups (age and education wise) from the mobility matrix. Secondly, an empirical exercise is done by simply expressing the educational/occupational outcomes of children as a function of

parental achievements. For measuring the transmission of education from father to son, because daughters are only a small percentage of data, we have employed a series of regression techniques. The following OLS regression model is estimated;

$$ES_{ij} = \alpha_0 + \alpha_1 EF_{ij} + \varepsilon_{ij} \qquad (1)$$

Where *i* takes the values *1,...,I* denoting families and j takes the values *1,…,j* representing sons in family *i*. ES_{ij} is completed years of schooling of son *j* in family *i* and EF_{ij} denotes father's completed years of schooling in family *i*. α_1 is the intergenerational regression coefficient[35]. ε is error term with independent and identical distribution across generations i.e. mean zero and constant variance. As mentioned above in most of the literature, two alternative measures are extensively used to quantify the importance of parental education. The first measure is alpha coefficient and the second is correlation coefficient. In first measure, the estimated coefficient, $\widehat{\alpha_1}$ indicates intergenerational inertia across generations. On the other hand, $1 - \widehat{\alpha_1}$ measures intergenerational mobility. A higher value of $\widehat{\alpha_1}$ corresponds to higher persistence that is lower mobility. The value of $\widehat{\alpha_1}$ equals to one implies child schooling achievement is completely determine by parental educational background. In other words, it indicates perfect immobility.

On the other hand, $\widehat{\alpha_1}$ equals to zero represents perfect mobility and corresponds to the limited or no role of parental education in determination of child's education. We can also normalize the educational attainment of individuals by their corresponding standard deviations to show possible increase or decrease in $\widehat{\alpha_1}$ is not only because of an evolution

[35] For the case of intergenerational persistence in schooling, intergenerational regression coefficient is basically the slope of level-level regression.

of the distributions of the educational attainments (namely the term, $\frac{\sigma_1}{\sigma_0}$). After applying this method, a correlative interpretation of the model is possible;

$$ES_{ij}/\sigma_1 = \alpha_0 + \beta_1 EF_{ij}/\sigma_0 + \varepsilon_{ij} \qquad (3)$$

Intergenerational correlation coefficient, β_1, is then given by the following expression:

$$\beta_1 = \alpha_1 \frac{\sigma_0}{\sigma_1}$$

Where σ_0 and σ_1 are the standard deviation of educational attainment of parents and children, respectively. Here the changes in β_1 can be interpreted as the evolution of the correlation between fathers' and sons' education levels.

Regression coefficient α_1 can be expressed as;

$$\alpha_1 = \beta_1 \frac{\sigma_1}{\sigma_0}$$

This shows that IGE equals the correlation coefficient between parent and child education weighted by the ratio of the standard deviations of education across generations. Hence, a decrease in intergenerational correlation or inequality in education across generation can cause a decrease in intergenerational elasticity.

In other words, estimation of β_1 for different periods present the evolution of correlation between parents' and children's educational attainment. Correlation is considered by Becker and Tomes, (1986), Checchi, Fiorio, and Leonardi (2013) as straightforward measure of equality of opportunity. Due to lack of consensus over the suitability of these measures, reporting both of these seems to be crucial (Jäntti & Jenkins, 2015).

Intergenerational Persistence of Occupation[36]

[36] The details of variables for this model is provided in Table XII of appendix V.

For measuring the mobility in informal occupations firstly, transition matrix approach is applied as is used in the measurement of educational mobility. In regression analysis, firstly, probit model is used, because of the dichotomous nature of dependent variable (1 for informal, 0 for formal). After this, multinomial logit model is applied by categorizing the informal employment variable in different occupations. This method of estimation provides different slope coefficients of independent variables for each outcome of the dependent variable. Keeping one set of coefficients as the base model, other sets of coefficients are interpreted relative to this base model. So, if dependent variable has J-outcomes, then J-1sets of coefficients have to interpret.

3.4 Informality and Returns to Education[37]

Education being a vital source for getting an employment and an agent for fighting against poverty worldwide generally and in developing countries particularly is deemed as an efficient policy instrument. Quality education opens the door of better jobs and higher wages. Generally, education is an important ingredient for development but its role in economic uplift is debated and depend upon how it facilitates obtaining of better jobs.

Traditional theories proposing similar returns for employees of identical human capitals in formal and informal sectors seem failed when it comes to imperfect and segmented labor markets. Every labor market[38] has variations when it comes to wages, nature of contracts, job seasonality etc. In some employment sectors, education has little influence for instance in self-employment, whereas in case of wage employment returns vary for employees in formal and informal sectors with the identical human capital/education.

[37] The details of variables for this model is provided in Table XVII of appendix VI.
[38] There are mainly four types of markets; Rural, public, private formal and informal (Kuepie, 2009).

Worker's years of schooling have little reward in informal sector than in formal sector. Therefore, studying the impact of education and years of schooling is important vis-a-via sector (formal and informal) of employment. This can be considered as an indirect effect of informality on poverty.

Estimating returns to education for informal and formal employment is important to see how education can be used as policy instrument for poverty reduction. When there are rewards of education for employees in informal sector, increasing educational qualification will be advantageous to employees. Moreover, if education has equipped workers of the informal sector to be more efficient and resourceful, the educational expenditure incurred by household and government will be fruitful.

If there is a presence of wage gap between formal and informal sectors for employees with similar education, this may point to the presence of problem in the labor market and need an intervention to prevent wage discrimination. Uninformed public polices can thus cause disadvantages to employees in informal sector and thus will degrade the economic indicators of a country.

Mincer (1974) has developed the model of human capital earnings. Earlier Becker (1962, 1964), Schultz (1960, 1961) and Mincer (1958, 1962) have provided the human capital theory. Based on this model, to measure the effect of education on earnings of the individuals (formal/ informal employment), following equation is specified.

$$ear_i = \beta_0 + \beta_1 edu_i + X_i\beta_2 + \varepsilon_i$$

where *ear* represents earnings; *edu* shows completed years of schooling; X is a set of covariates associated with earning; ε is an error term showing the omitted variables and supposed to be independently of X and *edu* ; and *i* is an index for a specific individual in

the sample. Measuring this equation with simple Ordinary Least Square (OLS) method for two different sectors will produce the biased estimates arising from either self-selection of workers into different types of employment or due to non-participation into employment (Tansel & Kan, 2012).

Selection and level of earnings are affected by many factors, observed and unobserved. Workers in the formal and informal employment not only differ in earnings, but also in terms of personal and household characteristics. For controlling unobservable characteristics, we applied multinomial[39] endogenous switching regression model of earnings. In this respect a two-stage frame work for the choice of informal or formal employment decision and its outcome in terms of earnings is modelled. In the first stage, selection model for informal employment is estimated whereas in the second stage, outcome model to account for the effect of informal employment on earning is estimated.

Let Z^* be the latent variable that captures the outcome in terms of earnings is specified as follows;

$$Z_{ij}^* = \bar{L}_{ij} + \eta_{ij} = A_i\alpha_j + \mu_{ij} \tag{1}$$

$$\text{with} \qquad Z_i = \begin{cases} 1 & iff \quad Z_{i1}^* > \max_{k\neq 1}(Z_{ik}^*) \quad or\ \varepsilon_{i1} < 0 \\ \vdots & \vdots \qquad\qquad \vdots \\ N & iff \quad Z_{iN}^* > \max_{k\neq N}(Z_{ik}^*) \quad or\ \varepsilon_{iM} < 0 \end{cases} \tag{2}$$

In the second stage, the effect of informal employment on earning is modelled

$$\begin{aligned} &occupation\ 1: \quad ear_{i1} = x_i\beta_1 + \eta_{i1} \qquad if\ Z_1 = 1 && (3a) \\ &\vdots \qquad\qquad\qquad\qquad \vdots && \vdots \\ &occupation\ N: \quad ear_{iN} = x_i\beta_N + \eta_{iN} \qquad if\ Z_N = N && (3n) \end{aligned}$$

[39] As we are interested in doing the analysis of earnings for informally employed persons in different occupations, therefore to control for sectoral selection bias this model is suitable.

Where ear_{ij} is the earning of i^{th} household in occupation j and x_i is the vector of individual's and household's characteristics. Unobserved stochastic components are captured by η_{ij}.

The selection bias corrected earning outcome model given below provides us consistent estimates of β_j after its estimation through full information maximum likelihood (FIML) estimation.

$$occupation\ 1:\ ear_{i1} = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{i1}) + \sum_j \rho_j m(P_{ij})\frac{P_{ij}}{(P_{ij}-1)}\right] + \omega_{i1} \quad if\ Z_i = 1 \ (4a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$occupation\ N:\ ear_{iN} = x_i\beta_N + \sigma_N\left[\rho_N m(P_{iN}) + \sum_j \rho_j m(P_{ij})\frac{P_{ij}}{(P_{ij}-1)}\right] + \omega_{iN} \quad if\ Z_i = N \ (4n)$$

The equations for counterfactual analysis firstly the expected earnings of the individuals doing the job informally is going to be derive in the following manner; with reference category j=1 for formal employment.

$$E(ear_{i2}|Z_{i2}) = x_i\beta_2 + \sigma_2\left[\rho_2 m(P_{i2}) + \sum_{k\neq 2}^{N} r_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] + \omega_{i1} \qquad (5a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$E(ear_{iN}|Z_{iN}) = x_i\beta_N + \sigma_N\left[\rho_N m(P_{iN}) + \sum_{k=1\ldots N-1} r_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] + \omega_{iN} \qquad (5n)$$

After this, counterfactual expected earnings can be obtained in the hypothetical case for the individuals in informal employment by assuming if they are in formal employment then what would have happened on their expected earnings. Under these expected earnings can be obtain as;

$$E(ear_{i1}|Z_i = 2) = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{i2}) + r_2 m(P_{i1})\frac{P_{i1}}{(P_{i1}-1)} + \sum_{k=3\ldots N}\rho_k m(P_{ik})\frac{P_{ik}}{(P_{ik}-1)}\right] \quad (6a)$$

$$\vdots \qquad\qquad \vdots \qquad\qquad \vdots$$

$$E(ear_{i!}|Z_i = N) = x_i\beta_1 + \sigma_1\left[\rho_1 m(P_{iN}) + \sum_{k=2\ldots N}\rho_k m(P_{i,k-1})\frac{P_{i,k-1}}{(P_{i,k-1}-1)}\right] \quad (6n)$$

Chapter 4: Data and Variables

4.1 Introduction

This chapter provides detailed information on data used in the study and sources of data. Information on rational for using respective variables and the construction/classification thereof is also presented. Particularly, construction of poverty and informality variables is discussed in detail. Further, the chapter provides the definition of explanatory variables used in the regression analysis[40].

4.2 Data

Data from Household Integrated Income and Consumption Survey (HIICS, 2015-16) conducted by Pakistan Bureau of Statistics (PBS) is used for this study. HIICS (2015-2016) is carried out in four provinces of Pakistan, Punjab, Sindh, KP and Baluchistan, excluding Federally Administered Tribal Areas (FATA)[41].

The survey collects information of 24238 households divided into 8083 rural and 16155 urban households. After determination of sampling areas by PBS, the survey was divided into 48201 and 101989 enumeration blocks for urban and rural areas respectively. These enumeration blocks are given the name of Primary Sampling Units (PSUs). From these only 1605 urban and rural primary sampling units (PSU)[42] were considered for this survey through clustering sample.

HIICS is the only survey which provides the data required to estimate household income and expenditure, and therefore to carry out poverty analysis. In addition to income and expenditure, HIICS also includes information on work and employment, education, and

[40] Details on variables/data used in informality and poverty, educational and occupational mobility and returns to education estimations can be found in Appendix IV, VI and VII.
[41] FATA was merged in Khyber Pakhtunkhwa in 2019.
[42] Although 1668 PSUs were fixed from the four provinces comprising of 26688 households, but 63 PSUs were dropped because of bad law and order condition.

other characteristics of households and individuals. Therefore, it is possible, to identify patterns of poverty for different types of employment.

Poverty and Informality: As discussed above, HIICS (2015-16) provides data for 24238 households. Of these 24238, we have extracted the information of 19314 households which have heads who are employed. Excluding further the agriculture sector from our analysis[43] we were left with only 15254 households. These are the households which feed into our assessment of impact of informality on poverty.

Educational Mobility: We focus only on employed father-son pair for doing the analysis of educational and occupational mobility. Data of employed person is extracted from the employment and income section of HIICS for the selected households. This section provides the information of 115910 individuals. Among these individuals, only the last month employed persons (43480) are selected[44] for analysis.

We use information from roster of the survey to identify father-son pairs, using information from "relation to head" column. This matches the pairs living in [45] together. This information is then merged with the variables of employment and income section using household identification code.

Among 43480 employed individuals, 19314 are identified as household head and 15319 as son/daughter. The remaining 8847 are the other household members (Table 4.2). After excluding agriculture sector, we were left with 30497 individuals. We further drop 38 individuals (0.12 %) for whom no information on income was available restricting our sample to 30459 individuals.

[43] In the measurement of informal employment, all enterprises that are engaged in agricultural activities are also not considered by Labour Force Survey of Pakistan (LFS).
[44] Employment status and the nature of work done by these individuals is given only for last month employment and this information is used for construction of informal employment variable along with defining different occupational categories.
[45] Either they are head's son/daughter, grand-child, spouse, father/mother, brother/sister etc.

From these 30459 employed individuals, the total number of head and children who were working till the time of survey is 25802. Given very different dynamics of daughters' jobs and income, for example they may live outside the hole after marriage, and a very small number of daughters who were working, 1317 (5.1 %), we drop them from our analysis. This was also required as the father's education have a different impact on daughters' education than it has on son's education.

All the information on females is excluded for doing the intergenerational mobility analysis because of smaller number of observations for working daughters and other reason outlined above[46]. We were the left with 24485 working individuals with 15066 fathers and 9419 sons. After this every employed father is matched with his employed son. Finally, 4598 father and son pairs who are employed at the same time were obtained.

Table 4. 1: Frequency Distribution of Employed Persons

	Frequency	Percent
Head	19314	44.4
Spouse	3929	9.0
Son/Daughter	15319	35.2
Grand Child	268	0.6
Father/Mother	593	1.4
Brother/Sister	2434	5.6
Nephew/Niece	201	0.5
Son/Daughter-in-law	859	2.0
Brother/Sister-in-law	220	0.5
Father/Mother-in-law	22	0.1
Grand Father/Mother	2	0.0
Real Uncle/Aunty	14	0.0
Servants/Their Relatives	123	0.3
Others (Specify)	182	0.4
Total	43480	100.0

[46] and also excluding the education category "others" (113 observations)

Returns to Education: Initially the sample consist of 43480 employed individual. After excluding the agriculture sector, we have left with 30497 employed individuals. From these informally/formally employed individuals, the income information of 0.12 % (almost 38 individuals) was not given and 0.5 % of the remaining sample is not provided with the information on education. Hence after dropping these individuals we have left with 29862 individual sample.

4.3 Dependent Variables

4.3.1 Informal Employment

Conceptual frame work for defining the informal employment is provided by the 17th ICLS.

Table 4. 2: Criteria for Informal Employment

Formal	Informal[47]
workers of the firms which are employing more than 10 workers	workers of firms which are employing less than 10 workers[48]
Self-employed persons who are working as managers, professionals and technicians are considered to be formally employed persons	self-employed (excluding the agricultural sector activities[49])
wage workers which are entitled to pension	paid employees which are not entitled to pension[50]
managers, professionals, technicians and armed force workers	contributing family workers
	own-account workers

In general, worldwide the existing surveys do not provide information whether the individual is in informal sector or in formal sector. No direct question is asked regarding the formal/informal employment of a respondents. Further, the production units are not

[47] Labour Force of survey of Pakistan consider "Household unincorporated enterprises owned and operated by (a) own-account workers or (b) employers with fewer than 10 persons engaged (agriculture excluded)" to be in informal sector
[48] For the case of Pakistan, this criterion is used by Guisinger and Irfan (1980), Burki and Ghayur (1989), and Nasir (2001)
[49] In Pakistan, agriculture sector is excluded when measuring the informal sector employment at official level but paid domestic workers are included. Additionally, it does not considered the activities which are performed as secondary jobs.
[50] According to Jamal (2015) the formal sector of Pakistani labour market can be differentiated from informal sector on the basis of social security coverage and provision of old age benefits such pension.

classified as formal or informal and job activities which an individual is performing are also not classified as formal or informal employment.

This lack of information hinders the direct measurement of magnitude of informal employment and its relationship with poverty. This is also one of the limitations of HIICS (2015-16) data set. Therefore, based on literature multiple criteria have been employed in this dissertation as reported in Table 4.2.

These informally employed persons are further divided into 5 occupational categories[51]. From the HIICS data, different occupational categories[52] were extracted according to the nature of the job performed by the workers. This variable captures the informal employment and is used as dependent variable in employment selection equation.

4.3.2 Poverty

We use consumption-based measure of poverty. There are several reasons of this consideration. Firstly, current consumption is less volatile over the time because the influence of negative income shocks on consumption is very low. This is especially true for the economies which are highly dependent on agriculture, because there is considerable fluctuation in the income of households on seasonal basis (Deaton and Zaidi (2002); Jamal (2002).

Secondly, the households where the individuals are self-employed, there is risk involved in measurement of income. Incomes of these households are measured with significant errors. If it is used for measuring the poverty then it will create serious biasedness in the

[51] Clerks, sales workers, craft related workers, machine operators, elementary occupations. Comparing the similar categories from the formal sector could not become possible due to very low percentage of formal employment in each occupational category. Around 27% labour force is employed in formal sector, and decomposing it for occupation and then further into different types and leave of education would have created the sample size issues.

[52] See Pakistan Standard Classification of Occupation (2015)

results. Furthermore, according to Gazdar (2004) and Jamal (2002) expenditure is a more reliable proxy for permanent income in creating the poverty rankings.

We need a poverty line and single index for poor to measure poverty. Until 2001, there was no uniform measure in Pakistan for measuring poverty (Shirazi, 2012). At that time, Planning Commission of Pakistan developed an official poverty line at official level. This official poverty line (OPL) was develop on the basis of food energy intake requirement of 2350 calories per adult equivalent per day where in the urban areas this caloric intake requirement is set at 2150 calories and 2450 calories in rural area[53].

In monetary term, this line was set at Rs.637.54 per capita per month without considering separate estimation of urban and rural poverty. Later on, this poverty line was adjusted for inflation for the next years. The threshold level of poverty reached at Rs.1745 per adult equivalent per month by 2010-11.

It was realized that poverty measurement, based on food energy intake (FEI), is not a representative one. Then the government incorporated costs of basic needs (CBN) for capturing non-food expenditures in the new formula in 2016 to make the poverty line more transparent and coherent. Using this methodology, however, the poverty line was set at Rs. 3030.32, per adult per month.

[53] "There are three flaws in the new methodology. In the revised methodology, the reference group covers households that lie in the 10th to 40th percentile of the distribution of per adult equivalent consumption expenditure. Although it is a usual practice to consider consumption patterns of the bottom of the population distribution (lowest quartile or quintile) for the poverty estimation. Minimum requirement is kept at 2,350 calories per adult equivalent per day. However, the rural lifestyle in general requires a greater consumption of calories than the urban lifestyle. It is not irrational to assume that for any given level of income, rural households are likely to consume more calories, on average, than their urban counterparts. In the standard CBN methodology2; a basic food basket of items is selected, the quantities in the basket are adjusted for the minimum nutritional requirements; and then the cost of acquiring the basket is calculated. In contrast, Pakistan Economic Survey reveals that to obtain a food poverty line, the average spending on food of households in the reference group is translated into a certain level of calorie intake. The worrying factor in this exercise however is the non-adjustment of regional and provincial differences in the cost of living (food and non-food expenditure)."

In this study, poverty status is measured by comparing per adult equivalent[54] expenditure per month of the household's head (Jamal, 2002; Cheema et al., 2008; Hyder, 2010). Poverty line estimated by Jamal (2017) is used for this objective. The author used the data of HIICS (2015-16) and estimated the poverty line at Rs.4250 and Rs.3792 adult per equivalent unit (or Rs.3627 and Rs.3153 per capita) per month for urban and rural areas respectively to consume minimum calories[55] during the year 2015-16. Whereas, population weighted average national poverty line, however, turns out as Rs.3928 per adult equivalent unit (or Rs. 3294 per capita)[56].

The head count ratio (HCR) is widely used for aggregation of the poverty into an index and is also employed by this study. It identifies the proportion of the households whose incomes/consumption expenditures lie below poverty line. Formally, the headcount ratio is

$$P_0 = \frac{H_p}{M}$$

Where H_p is the number of households who are poor, and M is the total number of households in the sample. It can also be written as

$$P_0 = 1/M \sum_{i=1}^{M} I(C_i < Z)$$

Here, M represents the total number of the households, C_i indicates consumption expenditures and Z is poverty line. $I(C_i < Z)$ is an indicator function showing if this

[54] "OECD-modified scales" proposed by Hagenaars et al., (1994) which assigns a value of 1, 0.5 and 0.3 to the household head, each additional adult member and to each child (age less than 14), respectively are used for this study to estimate per adult equivalent consumption expenditure.

[55] The minimum requirement of the calories for the rural and urban areas is set at 2550 and 2230 calories per day per adult.

[56] This poverty line is used because we are using the same data which Jamal (2017) used for the construction of poverty line. Additionally, official poverty line is estimated in Pakistan in 2001. This poverty line is then adjusted by consumer price index (CPI) for the coming years. Now this poverty line has become outdated because it does not fully reflect the changes in income and consumption pattern. Further, it does not reflect the variation carried out in consumption patterns specifically in non-food segment and poverty situation is misrepresenting due to urban bias which is likely to be created due to the adjustment of poverty line by employing Consumer Price Indices (CPI).

expression is true then it will take the value 1 and the household would be counted as poor. Simply, the average of this function is termed as head count index.

Modelling the complex relationship between informal employment and poverty is not a simple task. In measuring the poverty, income earned by different members of the household, consumption basket and composition of the household is to be considered. Therefore, it is realized that poverty is estimated at household level and attributed to every member of that household, whereas job characteristics is measured at individual level. This complexity is circumvented by restricting the analysis to household heads' sample (Amuedo-Dorantes, 2004[57]; Devicienti et al., 2009; Nazier & Ramadan, 2014; Canelas, 2015; Kume, 2016).

4.3.3 Education and Occupation of Son

The variable of education is recorded into six categories. The individuals who have never attended the school are defined as having no education, those with 1 to 5 years of schooling are considered to have primary education, 6 to 8 years as middle, 9 to 10 as matriculation, 11 to 14 as graduation and above this as post-graduate (these categories are defined for doing the analysis of educational mobility through transition matrix). These variables with coding scheme are given below;

Table 4. 3: Coding Schemes: Educational and Occupational Mobility Analysis

Variables	Coding Scheme
Education	Completed years of Education of Son
Occupation	(0) formal employment (1) informal clerks (2) informal sales workers (3) informal craft related workers (4) machine operators (5) elementary workers

[57] Since, a significant proportion of household income consist of household heads earnings, hence, if the earnings of household head are low it can explain the situation of household poverty.

In mobility analysis, two cohorts of sons are considered; age less than 25 and age greater and equal to 25.

4.3.4 Monthly Earnings

We have used monthly wages for the analysis of returns to education. Monthly earnings in Pakistani rupees (PKR) are available for employed workers in HIICS. The previous Pakistani studies used monthly (Shabbir, 1994; Nasir, 1998; Siddiqui & Siddiqui, 1998) and hourly (Guisinger et.al, 1984; Hyder, 2007 and others) wages as response in Mincer's semi logarithmic earnings function. As we are controlling for hours worked, so use of monthly wages is justifiable.

4.4 Control Variables

There are many explanatory variables affecting informality and poverty. Individual's characteristics as well as household characteristics are found to affect the informal employment and poverty. Explanatory variables were selected on the basis of the relevance to the study as well as data availability.

4.4.1 Individual Characteristics

Age is an important factor affecting the probability of working in informal sector. Older workers have higher possibility of working in the informal sector than younger workers (Kume, 2016 & Devicienti et. al., 2009) due to preference of the firms for younger workers over older ones and the presence of larger entrepreneurial spirit in older people than younger workers (Devicienti et al. 2009). Likewise, age is expected to decrease poverty because of increased command over economic resources over the passage of time (Kume, 2016). The relation however is non-liner.

Those who are 34 years of age fall into less than 35 years category but who are above 35 are recorded into 3 categories with the interval of 10 years (Table, 4.4). Education is considered as a stock of human capital embodied in individuals. Hence, educated workers are more likely to be employed in formal sector.

As it is argued by Dorantes (2004) and& Canelas (2015) that educated workers have attractive employment offers characterized by high wages, pension coverage and opportunities for advancement because they are assumed to be more productive as compare to low educated workers who in turn only have access to the jobs which lack work contract and low dismissal costs. This in turn effects the poverty status of households through low earnings and no job security.

Table 4. 4: Coding Schemes of Variables

Variables	Coding Scheme
Informal Employment	(0) formal employment (1) informal clerks (2) informal sales workers (3) informal craft related workers (4) machine operators (5) elementary workers
Age (informality and poverty)	(1) less than 35 (2) 35-44 (3) 45 to 54 (4) above 54
Age (returns to education)	(1) less than 25 (2) 25 to 34 (3) 35 to 44 (4) 45 to 54 (5) above 54
Son's Cohort (Mobility Analysis)	(1) <25, (2) >25
Education	(0) illiterate (1) primary (2) middle (3) metric (4) graduation (5) post-graduation

HIICS provide 10 discrete and 10 nominal categories[58] of education. From this information continuous variable is constructed[59]. This variable of education is recorded into six

[58] Polytechnic diploma, FA/FS.c/I.COM, B.A/B.Sc/B.COM/B.Ed, MA/MS.C/M.Ed, Degree in Engineering, medicine, law and agriculture, M.Phil/PhD and years of schooling from one to ten class.

[59] Duration of Polytechnic diploma is considered 3 years: thirteen years of schooling after matric, Duration of FA/FS.c/I.COM consist of 2 years: twelve year of schooling, Duration of B.A/B.Sc/B.COM/B.Ed is 2 years: fourteen year of schooling after matric, Duration of MA/MS.C/M.Ed is 2 years: sixteen year of schooling after matric, Duration of Engineering and Medicine and Law is of 5 years after intermediate: number of schooling is 17 years, Duration of Agriculture degree if we consider 2 years then total number of schooling is 16 years, Duration of M.Phil is 2 years and PhD is of three/five years, so total number of schooling is 21 years.

categories as mentioned above. These categories, with coding scheme are given in Table 4.4.

Marital Status separates married people from those who are single or widowed or divorced. It is assumed that needs for the household increases with the marriage of individual, therefore, it effect the wages. The effect of marital status is controlled by Aslam (2009), Hyder (2007) and Nasir (1998) for Pakistani data and they reported it effect positively and significantly on the participation decision of individuals in the labour market.

4.4.2 Household Characteristics

Further, household's characteristics for example household size, dependency ratio and number of household member working are also expected to affect the probability of informal employment and poverty. Larger family size may decrease the likelihood of accepting informal jobs which pay low wage. It might be due to increase in reservation wage of the household head (Dorantes, 2004).

Household size, through changing the per-capita income of the household affect the poverty of the household. Increase in dependent persons also increase the likelihood of falling into poverty. In this paper, a dependent person is a child aged below or equal 14 and old whose age is equal and above 65[60], regardless of his/her employment status.

The reason for this is, even if they are employed, these members have low productivity that is not enough for covering their living costs. The dependency ratio is calculated by dividing the number of dependent members by the household size. Increase in household size increases the likelihood of poverty of informally employed workers (Devicienti et al. 2009

[60] Article 11.3 of the Constitution of Pakistan says " No child below the age of fourteen years shall be engaged in any factory or mine or any other hazardous employment." Similar safeguards have been provided in Article 37of Constitution. Section 50 of Factories Act 1934 reads as under: "Prohibition of employment of young children. - No child who has not completed his fourteenth year shall be allowed to work in any factory." The same criteria is used by Malik (1996).

& Canelas, 2015). Increase in working members can increase the likelihood of working informally (Kume, 2016). According to Kume (2016) and Canelas (2015), the increase in the number of employed in the household lowers the chances of falling into poverty.

According to studies, cultural constraints and systematic exclusion faced by the poor also limit the opportunities to participate in economic activities. Low participation, in turn lowers per capita income (Malik,1996). Considering this we hypothesize that the lower the ratio of number of workers to number of adults and lower participation rate in a household, the lower the per capita income.

It is considered, a high female-male ratio may be poverty-enhancing. In Pakistan, female members are mostly constrained by their religious norms and customs for working outside the home. Their attitude towards participation in the labour market is rather discouraging. Therefore, in this study it is argued that misperception about the female participation beyond household chores caused by religious and culture norms, is one of the key contributing factors in lower per capita income in rural Pakistan. This proposes that a high female to male ratio, as it concerns in the study area, may cause lower per capita income.

Chapter 5: Results and Discussions: Informality and Poverty

5.1 Introduction

This chapter presents the results for assessment of informality and poverty. Firstly, the summary statistics of informal employment and incidence of poverty are reported at national, regional and provincial level. The incidence of poverty by occupation is then analyzed at regional and provincial level. Further, education wise distribution of informal and informal workers is also presented. Section (5.3) present the results based on different regressions methods including i) Probit, ii) Ordinary Least Squares (OLS), and iii) two-step selection correction models controlling for sample selection bias from sector choice and labor force participation. In order to get a comparative perspective, all these models are estimated for formal and informal employment in different occupations separately.

5.2 Descriptive Analysis

5.2.1 Incidence of Poverty: At National Level, By Province and Region

Table 5. 1: Head Count Index of Poverty

	Region	Head Count Index of Poverty (H)
Overall		38.6
Region wise	Urban	33.3
	Rural	59.8
Province wise	KP	31.1
	Punjab	42.2
	Sindh	35.8
	Balochistan	46.4

Authors' calculations based on data from HIICS (2015-16)

Table 5.1 displays estimates of poverty in Pakistan. According to estimates, overall 38.6 % of the population is found to be poor at national level. One can clearly notice that the

incidence of poverty in rural population (59.8%) is higher than that for urban population (33.3%). Patterns of poverty also differ by province. Balochistan has the highest level of poverty of 46.4% while KP has the lowest incidence of poverty at 31.1%. The incidence of poverty in Punjab is higher than KP and Sindh. This may be due to higher percentage of informally employed persons than Sindh and KP.

5.2.2 Distribution of Employment into Informal-Formal Employment and Incidence of Poverty by Informal-Informal Employment, Region and Province

a) Decomposition of Informal Employment

There can be multiple reasons for this regional variation in incidence of poverty. However, given the scope of study, we focus on employment structures across the regions. Evidence suggest that informal employment is associated with low productivity, poor working conditions, low incomes, no social securities and few opportunities for advancement (Lewis, 1956; Haris & Todaro, 1970; Jütting et al., 2007; Mumtaz & Nadia, 2010). It is in this context that we examine the distribution of employment by formal and informal sector in different regions of Pakistan.

Table 5. 2: Distribution of Formal-Informal Employment (%)

		Informally employed HH	Formally employed HH	Total
Overall		74.8 (11409)	25.2(3845)	100(15254)
Region wise	urban	73.1	26.9	100(11986)
	rural	81.0	19.0	100(3268)
Province wise	KP	69.0	31.0	100(3024)
	Punjab	77.1	22.9	100(6571)
	Sindh	76.1	23.9	100(4035)
	Balochistan	72.9	27.1	100(1624)

Table 5.2 shows the distribution of informal employment. It is evident from this table that almost 74.8 % of household heads are engaged in informal job activities for their

livelihood, more in rural areas (81.0 %) than urban (73.1%). All the provinces have larger informal employment and the size of employment in informal sector ranges from 69.0 % to 77.1 %.

The reasons for higher level of informal employment compared to formal employment include i) manifold increase in the cost of doing business due to deterioration in macroeconomic conditions of the country compelling the private businesses to avoid the formal taxation structure ii)security issues, extensive corruption in registration process along with difficult and lengthy procedure of registration, establishing and running a business And iii) involvement of risk and uncertainty accompanied by difficult entry and exit discourages the urban entrepreneur to establish formal enterprise (Jamal, 2015).

Most importantly however expansion in informal sector employment denotes the decline in bargaining power of the workers and slackening of the labor market (Amjad, 2005). Placement of high cost on the employer of formal sector and inflexibility in hiring and firing workers attributable to regulatory framework could also be resulted in advancement in informal employment. All this results in weak and unprotected labor market, workers and in turn has impacted poverty and welfare of a household.

In urban areas, internal migration of workers (from rural to urban areas) could also be one of the possible reasons of increase in informal employment. Manufacturing and services sectors which has been located in urban areas, attract workers from rural areas. As a result, workers from rural agriculture sector relocate to urban areas in search of job. Largely, the skills required to get employed in services and manufacturing sector lacked in these workers. Many of them, therefore, end up as an informal worker and accept jobs which are low paid further worsening their conditions.

b) Incidence of Poverty by Informal-Formal Employment, Region and Province

The one important question concerning the informal employment is the percentage of workers who are poor, and a related question is whether the poor workers in the informal employment is considerably greater than the formally employed workers who fall below the poverty line. Table 5.3 sheds some lights over the distribution of poverty among formal and informal workers by region and provinces.

Table 5. 3: Head Counts in Poverty by Formal-Informal Employment (%)

Poverty/region		Overall Head Counts in poverty	Formally Employed in Poverty	Informally Employed in Poverty	Median Income of formally Employed	Median Income of Informally Employed
Overall		32.0	16.3	37.2	32000	15000
Region	Urban	25.87	11.97	30.99	35000	16500
	Rural	54.28	38.65	57.95	23000	12000
Province	KP	25.9	16.1	30.3	32100	16916
	Punjab	36.8	16.4	42.8	30000	15000
	Sindh	25.1	10.5	29.6	32000	15000
	Balochistan	40.9	28.9	45.4	33166	17000

Table 5.3 clearly shows a stronger association between sector of employment and poverty outcome. The difference in the poverty headcount ratio between informal and formal workers is sizeable. The incidence of poverty for overall informal workers is more than double (37.2 %) compared to formal workers (16.3 %). A rural-urban comparison of poverty reveals that the incidence of poverty is higher in informal sector both for rural and urban areas. Compared to 11.97% households living in poverty in urban areas who work in formal sector, 30.99% household employed in informal sector live in poverty. Same holds true for rural areas where 57.95% households employed in informal sector face poverty. The ratio is 38.65% for households employed in formal sector. The pattern persists across the provinces (Table 5.3).

The findings from Table 5.3 clearly validate the major hypotheses of this study that informality is directly related to poverty outcome and households employed in informal sector have higher poverty compared to counterparts working formal sector. Markets where informal employment makes a dominant portion and the workers get low wages than the stipulated wages (Choudhary et al., 2016) [61] along with poor working and living conditions, the chances of falling into poverty would become higher.

b) Distribution of informal and poor informal workers with respect to education:

Table 5.4 illustrates education wise distribution of the informal/formal and the poor informal/formal workers, respectively. A consistent reduction in incidence of poverty with the movement from no education to post-graduation could be observed. This reflects the fact, through acquisition of education, human capital increases which helps in overcoming the poverty prevalence and if the head of the household is educated then entire family reaps the benefit of his education. In labor market, education increases the chances of getting formal employment. It is evident, from the table a high percentage of workers with no education, primary and matric is in informal employment that is almost 86.0 % of informally employed individuals' falls in the educational categories of no education, primary and matric. While among the formal workers, 57.0 % are graduate and post-graduate.

It is also evident that poor informal workers are mainly concentrated in the first three education levels; illiterate, primary and secondary. So, it can be said education not only increases the chances of formal employment but also decreases the chances of being poor.

[61] 47.6 % informal workers in the informal are paid the wages which are below the minimum wages whereas in the formal sector only 17.5 % of the workers are paid below the minimum wage.

Table 5. 4: Informal and Poor Informal Workers with respect to Education (%)

	Informal Workers	Poor Informal Workers	Formal Workers	Poor Formal Workers
No education	34.1	47.9	9.4	20.6
Primary	18.1	19.9	6.9	12.8
Metric	34.5	27.1	26.6	35.9
Graduation	11.4	4.7	31.6	20.4
Post-graduation	1.9	0.4	25.5	10.2
Total	100	100	100	100

This indicates that lack of education is one of the significant factors contributing to informal employment and poverty. The negative associate between education and informal economy is pointed out by Arby et al., (2010), and also confirmed by the Table 5.4. The individuals with high level of education have lower chances of working informally and falling into poverty; only 1.9 % of the informal workers have higher education and a negligible percentage of highly educated and informal workers is poor i.e. 0.4 %. Whereas illiterate workers form a significant portion of informal employment and poor i.e. 34.1 and 47.9 % respectively. This indicates poverty is more concentrated among the illiterate. One of the key lessons is that provision of education may not suffice to reduce poverty. The poverty outcomes to a large extent depend on where the persons get employed.

Table above shows, a consistent reduction in incidence of poverty with the movement from no education to post-graduation. This reflects the fact, through acquisition of education, human capital increases which helps in overcoming the poverty prevalence and if the head of the household is educated then entire family reaps the benefit of his education. In labor market, education increase the chances of getting formal employment.

As it is evident, from the table almost 82.0 % of formally employed individuals falls in the educational categories of matric, graduation and post-graduation. Moreover, a high percentage of workers with no education, primary and matric is in informal employment.

So, it can be said education not only decreases the chances of being poor but also increases the chances of to be employed in formally. Those who are in formal employment also earn relatively higher wages than their informal counter parts (see Table 7.5 in chapter 7).

d) Incidence of Poverty by Occupation

The incidence of poverty with respect to different informal occupational groups is reported in table 5.5. Results suggest that the workers who are engaged in elementary occupations[62] have highest incidence of poverty (56.2 %) whereas the poverty is lowest (13.9 %) among the informal clerical workers[63]. Lower incidence of poverty among informal clerical workers might be due to low number of observations or due to higher income than other occupations.

Table 5. 5: Distribution of Informal Employment and Incidence of Poverty (Occupation wise)

Formal-Informal Employment/Poverty		Head Counts in Formal Employment	Head Counts in Informal Occupation	Head Counts in Poverty (%)
Formal employment		25.2(3846)		16.3
Informal Employment	informal clerical workers		4.4(674)	13.9
	informal sales workers		24.9(3801)	32.2
	informal craft workers		16.5(2517)	33.7
	informal machine operators		11.5(17550)	33.4
	informal elementary occupation		17.4(2661)	56.2

[62] According to Standard Classification of Occupation, Pakistan (2015), elementary occupations fall in the occupational group which requires the skill of level 1. The occupations at this skill level, generally involves simple physical or manual task.

[63] Clerical workers require the skill of level 2. The occupations at skill level 2 involve "*the performance of tasks such as operating machinery and electronic equipment, ability to read information, to make written records of work*" PSCO (2015). Even, sales, craft workers and machine operators, all comes under this skill level.

The percentage of formally employed workers who are poor is only 16.3 %. Informal workers are classified into that categories of work which requires uncomplicated and manual tasks. Much of the labor force in this study is found to be in informal employment. Given this fact, the skill of workers not only depend on his/her educational achievement and technical knowledge but also on the type of job through which he acquires some specific skill.

According to Gazdar (2004), "*the level of skill is likely to be endogenous to the type of work that a person gets an opportunity to do*". Therefore, it can be argued that there are some structural divisions in the labor market letting some workers to get a premium on skills acquisition. Hence, for the two persons having the same educational background but in two different sectors, one offering on the job acquisition of skill and receiving some premium over it, the poverty status will be different. In other words, it may not be greater initial skill that tends toward lower poverty but actually a premium. We provided evidence on it from our data in Table 7.4 of chapter 7.

Alderman and Kozel (1989) found that the average wage differential between the formal and informal sector in Pakistan is mainly due to differences in skills (measured in terms of work experience and education), and there is significant premium on wages in the formal sector, specifically for college graduates. A smaller premium was found for less educated individuals.

To sum up, incidence of poverty is found to be higher among the informally employed persons than formally employed persons and this difference is sizeable. Considering different occupations among those who are informally employed, highest incidence of poverty is observed for those who are in elementary occupations. The lack of education is

one of the significant factors contributing to informal employment and poverty. The individuals with high level of education have lower chances of working informally and falling into poverty.

5.3 Regression Analysis

Our analysis of informality and poverty begin by simple probit regression. This analysis is done by firstly, regressing the poverty status on household head's individual and family-based characteristics. Secondly, dummy of informal employment is introduced in the model to check its impact on poverty. Thirdly, informal employment is decomposed into different occupations for evaluating the impact of different occupations on poverty.

Further, Ordinary Least Square (OLS) is applied by replacing the poverty variable with per adult equivalent expenditures. A continuous variable, log of household expenditure, or a binary variable may be used to statistically correlate household characteristics with poverty status or consumption behavior (Jamal, 2005). However, it is argued that poverty status as binary variable (poor/non-poor) is computed from household expenditure, therefore, by using this variable one may lose much of the information available about the actual relationship between expenditure and its explanatory factors.

It is, therefore recommended that the analysis is best carried out with the expenditure variable rather than the poor/non-poor status of households. Households' per capita income (informal employment) which is also used for construction of the poverty variable is employed by Hieu et al., (2014) as dependent variable for evaluating informal employment impact on poverty. Finally, multinomial endogenous switching regression model is applied not only to tackle the problem of potential sectoral selection bias[64] but also to estimate the

[64] . The problem of sectoral selection is associated with non-random selection of the sample i.e. when only one sector is used for estimation ignoring the other sectors.

treatment effects on poverty if the workers move from informal employment to formal employment. The findings of counterfactual analysis are crucial to design policies for effective formal/informal occupation adaption to deal with the low skilled/pay informal occupations for example elementary occupation and skill development policies. Public policies can indeed play an important role in helping the individuals to raise their skill levels and to join occupation offering the higher returns.

5.3.1 Probit Results

The estimates of probit regression are reported in Table 5.6. First column reports the estimates association between informal employment and poverty without controlling for other variables. Informal employment is found to have statistically significant and positive impact on the poverty. The results are suggestive that, if the household head is employed informally then, he has higher probability of falling into poverty as compared to formally employed person. The coefficients obtained through probit model only explains the direction of change, not the change in dependent variable with respect to change in independent variable. Therefore, marginal impacts are also reported.

The second column shows that informally employed have 22.7% higher chances of being falling into poverty compared to formally employed. This probability declines to 8.5% when controlling for the other variables in the regression implying that extent of poverty is also sensitive to person's own and household characteristics. The analysis is also carried out with occupation wise segregation of informal employment. Except for informal clerical workers, all informal occupations are positively and significantly associated with poverty relative to formal employment.

The highest association, is observed between elementary occupation and poverty, showing that if an individual is employed in elementary occupation then his chances of being poor than formal workers are 39.9 % higher pointing out towards precarious and vulnerable nature of elementary occupations.

These results are in line with the studies of Cooke and Lawton, (2008), Canelas (2015), Nazier and Ramadan, (2014), Derek U. (2019) and Aisa et al., (2019). It is found by Feder and Derek U., (2019) workers in elementary occupations have faced significantly higher probability of falling into poverty. Informality and poverty are concentrated in low skilled occupations (Nazier & Ramadan, 2014). Occupations; such as managers, professionals, clerical supports, plant and machine operators are associated with lower probability of falling into poverty compared to craft and related trade workers. Whereas elementary occupation is associated with higher probability of being poor. Similarly, services workers, skilled agriculture workers and elementary occupation workers have higher probability of falling into poverty (Canelas, 2015). The reason is, those employed in elementary and sales and customer service occupations were low paid (Cooke & Lawton, 2008). Elementary appears as the occupation associated with a higher risk of poverty, than Clerks, Services and sales, Craft and trade, Plant and machinery. Occupations (Technicians, Professionals, and Managers) are associated with significantly lower probabilities of poverty (Aisa et al., 2019). Elementary occupations, workers face a risk of being in poverty that is 20 times higher than the managers. Thus, occupations are revealed to be key determinants of the economic situation of workers.

Age, has a small negative and statistically significant effect on income poverty, reflecting the increased command on economic resources as the individual ages (Devicienti et al., 2009). People with education level of medium to high have a lower risk of being poor than people with low education (Devicienti et al., 2009; Canelas, 2015; Kume and Trebicka, 2016). The number of working members in the household decreases the probability of being in poverty (Devicienti et al., 2009). Conversely, the risk of poverty increases with the number of the household members (Devicienti et al., 2009; Kume & Trebicka, 2016).

Table 5. 6: Probit Estimation of Poverty Equation

Dependent variable: Poverty (1/0)	Coeff. (std. error)	dy/dx (std. error)	Coeff. (std. error)	dy/dx (std. error)	Coeff. (std. error)	dy/dx (std. error)	Coeff. (std. error)	dy/dx (std. error)
Informal Employment	0.658***	0.227***	0.293***	0.0858***	---	---	---	---
	(0.027)	(0.00883)	(0.032)	(0.00921)	---	---	---	---
Informal Clerical Workers	---	---	---	---	-0.0996	-0.0233	0.0573	0.0161
	---	---	---	---	(0.0648)	(0.0146)	(0.07)	(0.0189)
Informal Sales Workers	---	---	---	---	0.521***	0.159***	0.242***	0.0685***
	---	---	---	---	(0.0321)	(0.00964)	(0.0365)	(0.0101)
Informal Craft related workers	---	---	---	---	0.563***	0.175***	0.267***	0.0761***
	---	---	---	---	(0.0354)	(0.0111)	(0.0404)	(0.0114)
Informal Machine Operators	---	---	---	---	0.554***	0.171***	0.172***	0.0481***
	---	---	---	---	(0.0393)	(0.0127)	(0.0444)	(0.0124)
Elementary Occupations	---	---	---	---	1.140***	0.399***	0.675***	0.207***
	---	---	---	---	(0.0344)	(0.0113)	(0.0411)	(0.0126)
Control	No	No	Yes	Yes	No	No	Yes	Yes
Constant	-0.983***	---	0.524***	---	-0.983***	---	0.302*	---
	(0.0242)	---	(0.176)	---	(0.0242)	---	(0.178)	---
Pseudo R square	0.0331		0.1797		0.0667		0.1916	
Observations	15254	15254	15254	15254	15254	15254	15254	15254

1. standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%. 2. Regression is controlled for age, schooling years, marital status, family size, gende ratio, employment ratio, dependency, provincial and regional dummies. The results are also controlled for non-linear impacts by including the square of age.

5.3.2 OLS Results

Table 5.7 provides results with per adult equivalent consumption expenditure as dependent variable as proxy of poverty. The results show that if household head is employed in informal sector, the household would have RS. 2,674 lower consumption expenditures relative to formally employed household head. The difference is statistically significant at 1 %. After controlling for the other factors, the difference reduces to RS. 1,526.

Table 5. 7: OLS Estimates of Adult per Equivalent Consumption Expenditures

Dependent variable: Per adult equivalent consumption expenditures	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)
Informal employment	-2,674***	-1,526***	---	---
	(62.21)	(63.04)	---	---
Informal Clerical Workers	---	---	-1,274***	-1,589***
	---	---	(137.8)	(125.4)
Informal Sales Workers	---	---	-2,307***	-1,358***
	---	---	(75.46)	(73.44)
Informal Craft Workers	---	---	-2,648***	-1,579***
	---	---	(84.59)	(83.38)
Informal Machine Operators	---	---	-2,757***	-1,506***
			(95.04)	(92.72)
Elementary Occupations	---	---	-3,522***	-1,890***
	---	---	(83.19)	(87.45)
Control	No	Yes	No	Yes
Constant	7,526***	2,606***	7,525***	2,784***
	(53.80)	(380.0)	(53.20)	(381.7)
Observations	15,254	15,254	15,254	15,254
R-squared	0.108	0.280	0.128	0.282

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%. 2. Regression is controlled for age, schooling years, marital status, family size, gender ratio, employment ratio, dependency, provincial and regional dummies. The results are also controlled for non-linear impact by including the square of age.

In the next step we introduce informal employment in different occupations. We find that household head who is in elementary occupation would have the lowest per adult equivalent consumption expenditure, about Rs. 3,522 lower than household heads who are in formal employment. When we control the results for other household characteristics,

the difference in amount of consumption expenditures declines to RS. 1,890. The difference however remains statistically significant despite all controls.

It is imperative to note here that OLS and Probit model may produce biased estimates as these approaches assumes selection of informal occupations is an exogenous process while it is potentially endogenous. The decision of choosing occupation by the individuals depends on their own characteristics and based on these characteristics an individual self-select into different occupations. In other words, individuals' characteristics may affect their decision of choosing informal occupations. Moreover, it can be argued that workers will prefer those sectors/occupations which offer the higher wages. But there are some selection criteria too either from workers side or employed side. In case of segmented market ignoring the selection bias can produce misleading results.

In order to overcome the problem of selection bias, firstly, maximum likelihood (ML) procedure and then two-step correction estimation is proposed by Heckman in 1976 and 1979. By employing Heckman two step-correction procedure, Funkhouser (1997) and Arias and Khamis (2008) controlled the selection bias of sectoral allocation in the formal and informal sector. But, the problem with Heckman model is that it corrects for the selection bias when selection is univariate. Therefore, in cases, where there are more than two sectors (when the selection is multivariate) then selection bias is controlled by two step correction method proposed by Lee (1983). This method has been developed by Lee (1983) from Heckman two step model (1979).

Although many studies (Gindling, 1991; Saavedra & Chong, 1999; Tansel, 2001: Ewoudou & Vencatachellum, 2006) have employed this model to correct for selection bias for more than two sectors but it has been criticized for its strong assumptions about the joint

distribution of error terms by Bourguignon et al., (2007). Furthermore, according to Bourguignon et al., (2007), this method is only applicable when sample size is small.

Hence in the next section, to deal with the issues of endogeneity and sectoral selection bias, we estimate the multinomial endogenous switching regression by applying Bourguignon et al., (2007) selection correction terms. Along with this, counterfactual analysis is also undertaken. "Selmlog" command is used for the estimation of the model. This command is only applicable on linear models and when the selection/choice variables is polychotomous. Therefore, as opposed to univariate probit as in the Heckman model, multinomial logit model is applied in the first stage of this model. We use per adult equivalent consumption expenditures as measure of poverty.

5.3.3 Multinomial Endogenous Switching Regression model (Two-Step selection correction method)

To control for the bias created by the heterogeneity of characteristics between formally employed individuals and informally employed individuals as well as endogeneity of employment decision, we estimate simultaneous equation model of employment and per adult equivalent consumption expenditures, which is called Multinomial Endogenous Switching Regression model. This technique has been applied by Huesca and Llamas (2018) to analyze the impact of employment in different sectors (formal self-employed, informal self-employed, formal wage earners and informal wage earners) on wage for Mexico.

This technique is based on the concept that decision of choosing employment in formal and different informal occupations is an endogenous process rather than an exogenous one. The decision of choosing different occupation depends on individual self-selection, based

on different characteristics. These unobserved characteristics affect employment decision and income and in turn poverty status.

a) Test for the validity of the exclusion restriction

Two-step selection correction method/regression requires exclusion restrictions for identification of the model i.e. choice (employment) model should consist of selection instruments in the Z variables.

Table 5. 8: Parameter Estimates-Test on the Validity of the Selection Instruments

Independent variables	Informal or formal employment (1/0) (PROBIT)	Per adult equivalent expenditures formal employment (OLS)
Age	-0.0315***	12.47
	(0.00803)	(52.25)
Age square	0.000146*	0.284
	(8.83e-05)	(0.561)
Schooling years	-0.128***	302.7***
	(0.00259)	(16.20)
Marital status	0.255***	864.9**
	(0.0556)	(346.0)
Family size	-0.0105**	-299.4***
	(0.00462)	(28.25)
Gender ratio	0.00483	-118.7
	(0.0132)	(82.55)
Employment Ratio	0.318***	3,835***
	(0.0920)	(562.0)
Dependency	0.177***	-114.3
	(0.0676)	(418.9)
Urban	0.00954	2,187***
	(0.0321)	(212.3)
Punjab	-629.239 ***	1,105***
	(0.0460)	(280.0)
Sindh	1398.227 ***	475.4*
	(0.0427)	(267.8)
Balochistan	-1104.625***	2,503***
	(0.0454)	(282.9)
Constant	2.321***	-1,878
	(0.199)	(1,310)
Observations	15,254	3,846
Pseudo/ R squared	0.2331	0.233

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%

There is no well recognized method to check for exclusion restrictions. Di Falco et al. (2011), Di Falco and & Veronesi (2012), Yamasaki (2012), Shiferaw et al. (2014), Parvathi

and Waibel (2015), and Tesfaye and Tirivayi (2018) used falsification test for admissibility of instruments in choice/selection equation and in turn identification of the model. According to falsification test, instruments should have direct effect on informal employment decision (multinomial logit selection equation) but not on the outcome variable (per adult equivalent consumption expenditures) of those who are in formal employment.

In our study, we use age and age square as selection instruments in the per adult consumption expenditure function. The Wald test on these variables shows that they are credible to be used as exclusion restrictions as they significantly and jointly affect the decision to join informal employment in the multinomial regression but does not jointly affect the per adult equivalent consumption expenditure of formally employed persons.

It might be the case that increase in BMI could change the consumption expenditure. There can be different reasons of no effect of age on consumption expenditures. As, poverty is seen in the context of informal employment, therefore there is possibility of lower per adult equivalent consumption expenditures. Consumption expenditures on food is mainly done through employment income. In case of being an informal worker, over the time there is no significant increase in income. So there is possibility that consumption expenditure also remain the same. As noted by Schiller (2001), one of the most obvious reasons for which people are poor is that they do not earn enough income. In such condition BMI cannot respond to age and age square. It is pointed out by Peter et al, (2015) that increase in BMI started at the age of 20 years and continues to the age of 59 years and decreased afterwards to the age of 80 years. In our case, 50.0 % of sample include the individuals from 15 to 44 years of age and remaining 50.0 % are above than 45 years of age. Therefore, increase in

consumption expenditures might be cancelled out by the decrease in consumption expenditures.

It is also indicated by Agostini (2014), caloric consumption over the life cycle has inverted U shape curve. There is rapid increase in consumption between upto the age of 16 years and after that it increases but at slower pace until the age of 60, then it starts declining. The sharp rise during the youth is consistent with consolidation of body height and weight during the puberty. Correspondingly, the fall in consumption after middle age can be explained by the fact that elderly people lose weight and spend less energy. Cağlayan and Astar (2012) also find the similar results. Negative and significant relationship is observed between age and consumption expenditures.

It is also argued by Kirkpatrick and Tarasuk (2003), Nayga (1995) and Kostakis (2014) increase in age increases the probability of reducing food expenditures. According to Banerjee (2014), across the different age groups food and clothing expenses (as a share of total expenditure) remain more or less flat. There is also a physiological decline in food intake with aging. The reasons may include alterations in the hedonic qualities of food (decreased odor and taste), increased gastrointestinal satiation signals, increased leptin levels (Morley, 2001). Like this study, age and age square of the household head is found to be insignificant in case of rural region (Gounder, 2102; Cağlayan & Astar, 2012).

Moreover, we are controlling selection bias through age and age square. Unlike endogeneity, it is not necessary for selection instruments to be purely exogenous. These can cause the variations in both the equations.

Moreover, selection of instruments is based on the data. These variables are excluded by the data itself though we are not negating the theory.

b) Results: Multinomial Logit Model (Selection Equation)

The first step in this model requires the estimation of multinomial choice model and prediction of probabilities which are then incorporated in second stage regression.

Table 5. 9: Parameter Estimates of Informal Sector Employment-Multinomial Logit Model (Selection Equation, First Stage)

Base Category-Formal Employment	Informal clerical workers	Informal Sales Workers	Informal Craft Workers	Informal Machine Operators	Informal Elementary Occupation
schooling	0.0457***	-0.216***	-0.268***	-0.274***	-0.356***
	(0.0115)	(0.00584)	(0.00657)	(0.00720)	(0.00716)
Age	0.0726**	-0.0909***	-0.0399**	-0.00310	-0.0872***
	(0.0342)	(0.0160)	(0.0187)	(0.0221)	(0.0187)
Age square	-0.00104***	0.000713***	5.17e-05	-0.000490*	0.000480**
	(0.000387)	(0.000176)	(0.000209)	(0.000252)	(0.000208)
Marital status	0.635***	0.440***	0.363***	0.823***	0.337***
	(0.231)	(0.113)	(0.126)	(0.161)	(0.128)
Family size	-0.0359**	0.00414	-0.0326***	-0.0164	-0.0446***
	(0.0178)	(0.00926)	(0.0113)	(0.0122)	(0.0118)
Gender ratio	0.00170	0.00352	0.0204	-0.0176	0.0328
	(0.0447)	(0.0269)	(0.0301)	(0.0341)	(0.0315)
emp_ratio	-0.467	0.798***	0.389*	0.353	1.070***
	(0.329)	(0.187)	(0.212)	(0.239)	(0.217)
Dependency	-0.691***	0.394***	0.213	0.298*	0.776***
	(0.231)	(0.137)	(0.156)	(0.177)	(0.165)
Constant	-3.954***	2.895***	2.404***	1.411***	4.765***
	(0.820)	(0.400)	(0.455)	(0.525)	(0.453)
Observations	15,254	15,254	15,254	15,254	15,254
Wald test on selection instruments (χ^2)	4.50**	32.15***	4.54**	0.02**	21.83***
Log likelihood	-22688.974				
Pseudo[65] R^2	0.1158				

1. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%
2. Regional and Provincial dummies are also added in the regression

The results of multinomial choice model are reported in Table 5.10. The analysis is conducted considering formal employment as base category. The results of multinomial logit model (Table, 5.9) show that the coefficient of age is negative and significant for sales workers, craft workers, machine operators and elementary workers reflecting the fact as people become older their likelihood of working in these occupations decreases. As the older people are considered more experienced worker, therefore, their chances of obtaining

[65] We also estimated McFadden R Square. The value of both the estimates are found to be the same.

the work as formal work would become higher (it is also depicted in Table 7.3 of descriptive statistics that percentage of older people is higher in formal occupations). Schooling is associated with lower likelihood of individuals to work informally except for informal clerical workers as compare to working formally. Marital status is affecting positively and significantly all choices of informal occupations. This means, being married increases the chances of persons to accept informal occupations than unmarried persons. As far as other control variables are concerned results are mixed.

As the coefficients of multinomial logit model are not depicting the magnitude of change in dependent variable brought about by a unit change in explanatory variable, therefore, the marginal impacts are also computed and reported in Table 5.10.

Table 5. 10: Parameter Estimates of Informal Sector Employment-Multinomial Logit Model; Marginal Effects (Selection Equation)

Dependent variable (occupations)	Clerks	Sales Workers	Craft Worker	Machine Operators	Elementary Workers
Schooling	0.00681***	-0.00343***	-0.0125***	-0.00919***	-0.0231***
	(0.000303)	(0.000853)	(0.000715)	(0.000600)	(0.000587)
age	0.00320***	-0.0136***	0.00153	0.00583***	-0.00591***
	(0.000872)	(0.00251)	(0.00226)	(0.00209)	(0.00177)
Age square	-3.33e-05***	0.000157***	-3.19e-05	-9.21e-05***	3.91e-05*
	(9.88e-06)	(2.80e-05)	(2.56e-05)	(2.42e-05)	(2.02e-05)
Marital status	0.00688	0.0179	-0.00399	0.0572***	-0.00800
	(0.00592)	(0.0187)	(0.0156)	(0.0159)	(0.0126)
Family size	-0.000552	0.00580***	-0.00348**	-0.000298	-0.00453***
	(0.000458)	(0.00154)	(0.00143)	(0.00117)	(0.00123)
Gender ratio	-0.000173	-0.00115	0.00255	-0.00333	0.00380
	(0.00113)	(0.00447)	(0.00374)	(0.00326)	(0.00319)
emp_ratio	-0.0260***	0.0844***	-0.0263	-0.0225	0.0816***
	(0.00838)	(0.0298)	(0.0256)	(0.0223)	(0.0209)
Dependency	-0.0265***	0.0284	-0.0168	1.80e-05	0.0719***
	(0.00594)	(0.0229)	(0.0196)	(0.0170)	(0.0168)
Observations	15,188	15,188	15,188	15,188	15,188

1. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%
2. Regional and provincial dummies are included in the regression

It is depicted that each additional year of schooling lowers the likelihood of working as

informal sales worker, informal craft workers, informal machine operators and elementary workers, respectively relative to be employed as formal worker. The highest impact of schooling is found for elementary occupations. As the schooling is more important variable of all the other control variables and is significant in almost all the regression, therefore, we have interpreted only this variable for most of the regression.

As usual, in estimating the consumption expenditures model by BFG technique the dependent variable is the per adult equivalent consumption expenditures, and six equations are estimated including six selection terms representing the chosen labor segment. It is observed that the coefficients display the expected signs for both sectors and occupational categories except for schooling years. The negative relation could be due to high percentage of individual with illiterate, primary and matric in all the informal occupations. The results may also contradict due to application of different estimation techniques. Also, in the presence of larger informal employment at households' level, schooling may affect the pr adult equivalent consumption negatively suggesting a "trade off" where resources have to be cut from other "expenditures". Given a lower income, the schooling expenditure share may be relatively higher (in ratio terms).

Coefficients that measure selection bias are statistically significant, except for the informal clerk segment, suggesting that in this labor segment the existence of non-observable factors in the process of determination of consumption expenditures is not a problem. The fact that coefficients of selection correction terms shows a negative sign, would mean that under this occupational classification consumption expenditures would be lower, if the worker decided to participate in the counterpart occupation. Being a formal worker is the best choice in order to achieve a higher level of consumption expenditure.

Table 5. 11: Multinomial Endogenous Switching Regression – Per Adult Equivalent Consumption Expenditure (BFG Corrected Estimates: Second Stage)

	DMF1						DMF2					
Dependent variable (consumption expenditures)	Formal	Clerks	Sales Workers	Craft Workers	Machine Operators	Elementary Workers	Formal	Clerks	Sales Workers	Craft Workers	Machine Operators	Elementary Workers
Schooling	-356.1*	-368.8	-231.7**	-239.4*	-57742.2	-28.86	-298.7	-365.6*	-220.8**	-197.7**	-183.0*	-34.47
	(200.3)	(299.3)	(92.8)	(144.5)	(94.26)	(56.57)	(184.3)	(192.1)	(91.62)	(89.97)	(95.25)	(68.8)
Family size	-424.2***	-251.5**	-289.1***	-341.5***	-285.7***	-155.3***	-399.5***	-223.3***	-268.2***	-318.5***	-283.3***	-159.0***
	(92.96)	(106.3)	(69.92)	(90.55)	(76.01)	(44.4)	(85.05)	(79.35)	(59.6)	(65.45)	-66.31	-54.3
Gender ratio	97.04	208	144	101.4	60.97	-60.67	71.69	182	132.2	79.06	64.46	-57.71
	(219.9)	(195.1)	(125.5)	(161.8)	(125.4)	(74.78)	(205.7)	(180.1)	(128.4)	(100.1)	(132.8)	(81.81)
emp_ratio	4,322***	4,537**	1,866*	673.6	960.2	1,397**	4,623***	4,543***	1,763**	801.9	833.8	1,426**
	(1,527)	(1,840)	(1,090)	(1,301)	(746.3)	(605.2)	(1,760)	(1,313)	(842.1)	(801.7)	(865.9)	(637)
Dependency	-96.73	1,704	438	-262.9	131.9	140.4	162.9	1,775	252.3	-156.6	-80.52	192.8
	(1,326)	(1,531)	(793.4)	(901.7)	(604.3)	(486.8)	(1,166)	(1,184)	(634.3)	(570.5)	(642.4)	(514.8)
_m1	-494.4	6,702	14,465***	2,346	12,009***	2,603	600.6	6,441	17,751***	5,694	15,972***	6,432***
	(1,255)	(9,195)	(5,442)	(4,209)	(3,803)	(1,764)	(2,476)	(9,988)	(4,819)	(3,614)	(5,323)	(2,470)
_m2	-9,899**	-1,336	-6,417*	-7,037**	-1,482	-2,627	-13,169*	-3,342	-7,015	-7,199*	-7.909	-6,037
	(4,634)	(1,503)	(3,579)	(3,546)	(4,220)	(2,728)	(7,845)	(2,422)	(4,993)	(3,851)	(5,099)	(4,500)
_m3	-6,881	1,478	-227.8	-8,395	-1,314	-718.6	-5,803	2,834	1,801	-4,469	2,918	574.2
	(6,336)	(5,158)	(991.5)	(6,941)	(3,554)	(2,073)	(5,692)	(4,757)	(1,168)	(5,433)	(3,300)	(3,004)
_m4	49,589***	11,062	18,150*	4,073	12,152	-7,195*	52,607***	11,663	25,778***	6,414**	21,145*	-6,555
	(14,703)	(12,629)	(9,343)	(2,533)	(9,215)	(4,134)	(16,276)	(12,578)	(8,701)	(3,242)	(11,508)	(7,263)
_m5	-23,198	-2,547	-2,547	-10,561	198.6	1,757	-24,598	223.6	-1,084	-8,325	693.6	3,960
	(15,387)	(12,478)	(5,350)	(8,640)	(919.4)	(2,681)	(16,085)	(15,653)	(5,984)	(7,716)	(1,587)	(5,808)
_m6	-3,460	12,376	23,514***	7,272	20,101***	1,828***	2,341	12,001	27,137***	11,914***	24,623***	4,164***
	(7,834)	(11,410)	(6,688)	(6,119)	(5,979)	(664.6)	(8,563)	(11,049)	(6,442)	(4,548)	(7,449)	(1,300)
Observations	3,846	674	3,801	2,517	1,755	2,661	3,846	674	3,801	2,517	1,755	2,661

1. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%
2. Regional and Provincial dummies are also added in the regression

In order to test the presence of unobservable on the occupational choice process, an F test was conducted to prove that all selection correction terms are zero. The null hypothesis that all selection correction terms are zero cross all segments of occupation is rejected. The results of the per adult equivalent consumption expenditures multinomial endogenous outcome equation are reported in Table 5.11.

Family size has significant and negative impact of consumption expenditures. Increased family size decreases consumption expenditures for all types of informally employed workers except for elementary workers. Similarly, the coefficient of completed years of schooling is negative and significant indicating increased schooling years are associated with lower consumption expenditures. When number of employed increases, consumption expenditures increases. Increase in number of dependent increases consumption expenditures.

Table 5. 12: Test on Coefficients of Selectivity Variables

	Formal	Clerks	Sales Workers	Craft related workers	Machine Operators	Elementary
			DMF1			
m1 =m2=m3= m4 =m5 =m6=0	50.59*** (F6,3846)	9.35 (F6,674)	42.29*** (F6,3801)	18.40*** (F6,2517)	25.97*** (F6,1755)	14.37** (F6,2661)
			DMF2			
m1 =m2=m3= m4 =m5 =m6=0	52.53*** (F6,3846)	11.17 (F6,674)	42.62*** (F6,3801)	20.68*** (F6,2517)	25.13*** (F6,1755)	16.78*** (F6,2661)

c) Treatment Effects/Counterfactual Estimates: Evaluating Formal employment Impacts

In this section, we use treatment effect model to evaluate the implication of choosing formal employment on per adult equivalent consumption expenditures for each informal occupation. Table 5.13 provides results of expected gains in per adult equivalent consumption expenditures of the movement form informal employment (for each of the

five informal occupations) towards formal employment. Column (1) and (2) of the table show the actual expenditures when individuals are in specific informal occupation and counterfactual estimates if they would have been in formal employment, respectively.

In 3rd column of the table, treatment effects on consumption expenditures, as the difference between columns (1) and (2), of each informal occupation are presented. This counterfactual analysis allows us to identify the highest and lowest expected gains in terms of increased consumption expenditures if informally employed persons in these occupations have the opportunities of working formally. It is evident from this analysis, the movement from informality to formality is associated with increased consumption expenditures for all occupations.

Table 5. 13: Consumption Expenditures Effect from Counterfactual Analysis

Occupation	Expected expenditure	Counterfactual Expected Expenditures	Treatment Effect	% increase
DMF1				
Informal clerks	5112.626	6291.37	1178.74***	23.06
Informal sales workers	5420.611	6327.67	907.06***	16.73
Informal craft workers	5069.126	6319.59	1250.46***	24.67
Informal machine operators	5138.461	6308.65	1170.18***	22.77
Informal elementary occupation	4488.956	6334.18	1845.23***	41.11
DMF2				
Informal clerks	5115.379	6289.062	1173.68***	22.94
Informal sales workers	5413.275	6317.626	904.35***	16.71
Informal craft workers	5062.635	6306.371	1243.73***	24.57
Informal machine operators	5125.842	6295.791	1169.94***	22.82
Informal elementary occupation	4481.401	6311.338	1829.93***	40.83

*** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10.

By comparing the actual mean per adult equivalent consumption expenditures for informal employment in different occupations it can be concluded that households' head who are in elementary occupation are those with lowest per adult equivalent consumption expenditures. They have almost Rs. 1845.23, more consumption expenditures if they would have been in formal employment. This indicates how vulnerable the individuals are who are in elementary occupations. Therefore, the highest expected benefits in terms of increased consumption expenditures are for the elementary workers that is 39.52 % if they could move from informal elementary employment to formal employment (Table 5.13).

However, the difference between actual and counterfactual expected expenditures of informal sales workers is lowest i.e. Rs.907.06. This may be due to the fact that informal sales worker is considered to be relatively a better occupation than elementary occupation, hence their earnings are higher and can afford to spend more on consumption items. Therefore, as the difference is lower, so the lowest expected gains are for informal sales workers of their movement towards formal employment that is of 16.73 %.[66]

These results imply expected gains may vary in size across the occupations but the movement from informality to formality is associated with significant and high consumption expenditures for each occupation. Individually, each occupational category is composed of more than 50 types of jobs. It cannot be possible to determine which type of job they would get, rather we can easily show the movement from one occupation to other occupation.

[66] The lowest gain for informal sale workers than for informal clerks could be due to highest number of observations compared to other categories which overestimated the expected mean for this category, whereas informal clerks represents the lowest number of observations causing the underestimation of expected mean.

To check the robustness of the estimates, we undertake counterfactual analysis for the group of workers who are almost equally suitable for formal and informal sector. The analysis excludes the workers who have education level less than matric as these workers cannot be employed formally. The results, reported in Appendix IV (Table VI to Table X), exhibit that the results are robust and significant gains are possible for a move from informal sector to formal sector.

5.4 Conclusion

Our overall analysis depicts, statistically significant and positive effects of informal employment on poverty.

Both descriptive and regression analysis confirms that incidence of poverty is higher among the informally employed persons than formally employed persons and this difference is sizeable. Considering different occupations among those who are informally employed, highest incidence of poverty is observed for those who are in elementary occupations. From the regression analysis it is identified, individual and household level characteristics also have an influence on the poverty. Furthermore, counterfactual estimates obtained from multinomial endogenous switching regression analysis predicts that those who are in informal employment can make better off if they are provided with formal jobs.

Chapter 6: Results and Discussion: Intergenerational Mobility

6.1 Introduction

Governments are often encouraged to introduce the policies to reduce poverty. But these policies will not work until government is not well aware of the causes of poverty. Therefore, to reduce the poverty an in-depth analysis of different channels by which the people caught into poverty trap is essential. Informal employment creates structural poverty, the poverty passing to next generations. As informal employment is characterized by low productivity and income, this passes on to next generations through intergenerational effects. Lower investment in education and health of younger generation cause lower educational attainment and lower level enter into labor market. The children of parents employed in informal sector end up with similar or even lower status in labor market. They are mostly limited to elementary occupations. And the circle of low productivity, low earning and poverty continues. Therefore, it is required to assess the educational and occupation mobility of children whose parents are in informal sector. The societies where the educational and occupational immobility is high poverty reduction efforts based on promoting the education will not work.

Therefore, this chapter provides results for intergenerational mobility in education, occupation and income. Transition matrix of education and occupation are computed for analyzing the trend of mobility. Transition matrix presents the probability of sons achieving a particular education or occupation status given the status of fathers. Educational mobility matrix is constructed for different levels of schooling.

To capture the impact of time varying factors, cohort wise analysis is undertaken estimating the mobility for i) sons younger than 25 years of age and ii) sons older than 25 years of at

the time of survey. The process is repasted for occupation. Next, dynamics of intergenerational mobility between father and son's educational/occupational outcomes have been analyzed using regression analysis which include application of i) probit model, ii) multinomial logit model iii) variants of OLS and iv) Instrumental Variable techniques.

6.2 Descriptive Analysis

Table 6.1 reports the percentage distribution of educational achievements of fathers and sons who are currently in employment. The results show that only 19.9 % of the sons never attended the school while this ratio is 42.8 % for the fathers. It indicates an overall improvement in educational attainment of son's generation. Almost similar situation is observed for graduation and post-graduation level of education. The son's generation has higher educational attainment compared to their father's generation.

Table 6. 1: Percentage Distribution of working Father-Son with respect to education

	All Sons	Sons of Working fathers	All Fathers
Never attended school	19.9	42.8	41.9
Up to Primary	17.1	18.6	18.1
Middle	17.9	11.9	11.7
Matriculation	20.9	15.5	15.9
Graduation	16.8	7.4	8.3
Post-Graduation	6.9	3.5	3.8
Others[a]	0.5	0.4	0.3
Total	9419	4598	3058

[a] others include Deeni Madrasa (Hifze Quran/Proper Education), Non Formal Education, Vocational Training etc.

Table 6.2 reports the percentage distribution of fathers and sons in formal and formal sector along with in different occupational categories. As depicted in the table, the proportion of the sons joining the informal sector (88.0 %) is higher compared to father's generation (81.6 %). When comparing it with the formal sector, only a small proportion of individuals

(fathers and sons) seems to work in the formal sector that is 18.0 and 12.0 % of sons and fathers are working formally. This denote informalization of labor market in Pakistan over the time. Further, it may also reflect lower lack of access to opportunities in formal sector. Most importantly, it shows the transfer of informality from one generation to other generation.

Table 6. 2: Father and Son's Occupation[67] (% distribution)

		All Sons	Sons of Working Fathers	Working Fathers
Occupation	Formal	15.9(1495)	12.0(554)	18.4(562)
	Informal	84.1(7924)	88.0(4044)	81.6(2492)
	informal clerical workers	5.2	4.6	3.7
	informal sales workers	31.5	30.3	31.4
	informal craft workers	24.7	27.5	22.0
	informal machine operators	12.1	10.9	15.4
	informal elementary occupation	26.5	26.7	27.4
	Total	100(7924)	100(4044)	100(2492)

Source: Author's own calculation

Table 6.2 further shows that distribution of father and sons in informal sector by different occupations. The ratio is higher in low informal occupations as compare to high informal occupation. Informal clerical employs only 4.6 % sons and 3.7 % fathers working in informal sector. In general, it can be said no improvement in son's occupational position has been observed when comparing with father's generation combined.

6.3 Transition Matrix

The relative position of son-father pairs is assessed through transition matrix. Transition matrix for education and occupations mobility are computed. A transition matrix shows upward and downward movement of sons' achievements against their fathers.

[67] See Pakistan Standard Classification of Occupation (2015)

Assessing the educational and occupational mobility is necessary because these are transmitting channels of poverty from one generation to next generation. It is argued that children of parent employed in informal sector end up with similar or even lower status in labor market. The informally employed people compare to formally employed have lower propensity of investment in their children's human capital due to imperfections in human capital market which impedes the upward mobility, either in education, occupation or income. This results in lower socio-economic status in the next generation. Less is known about the educational and occupational mobility for the case of Pakistan.

6.3.1 Educational Mobility

Table 6.3 shows a strong persistence in educational achievements. In other words, the probability of transmission of education status of fathers to sons is high for all educational categories.

At lower end intergenerational persistence is found to be higher in case of informal workers compared to formal workers. The chances of the sons of never getting enrolled in the schools whose fathers have never attended school is 33.84 %, while for the sons whose fathers are formal workers the chances are 21.74 %. The likelihood of obtaining graduation or post-graduation degree for the same sons of informal worker are less than the sons of formal workers. This probability is 8.06 and 30 %, respectively. The sons with informal working father and never attended school have higher probability of completing primary and middle level of education, while the sons in case of formal working fathers and never attended school have higher likelihood of completing graduation degree.

Table 6. 3: Son's Education against their Father's Education

Education of Fathers	Education of Sons[68](Informal Employment)						
	Never Attended School	Primary	Middle	Matric	Graduation	Post - Graduation	% (N)
Never Attended School	33.84	20.38	20.19	17.54	7.87	0.19	100(1055)
Primary	10.31	26.23	23.09	23.99	14.57	1.79	100 (446)
Middle	9.28	19.93	22.68	32.99	13.06	2.06	100(291)
Matric	4.8	9.32	16.38	39.55	25.99	3.95	100(354)
Graduation	2.15	4.3	15.05	20.43	44.09	13.98	100(93)
Post-Graduation	0.00	0.00	6.25	12.5	56.25	25.00	100 (16)
Education of Fathers	**Education of Sons (Formal Employment)[69]**						
	Never Attended School	Primary	Middle	Matric	Graduation	Post - Graduation	% (N)
Never Attended School	21.74	13.04	13.04	21.74	26.09	4.35	100(23)
Primary	0.00	0.00	31.25	31.25	12.50	25.00	100(14)
Middle	14.29	0.00	7.14	28.57	35.71	14.29	100(16)
Matric	0.00	0.00	2.04	28.57	42.86	26.53	100(49)
Graduation	2.6	0.00	1.30	6.49	48.05	41.56	100(77)
Post-Graduation	1.27	1.27	1.27	2.53	26.58	67.09	100(79)

The sons of informally employed fathers with primary, middle and matric levels of education also have lower chances of obtaining post-graduation degree than sons of formally employed fathers. At higher end intergenerational persistence is found to be higher in case of formal workers compared to informal workers i.e. 25.0 and 67.0 % respectively.

[68] qualitatively similar results were documented for rural and urban sons [see appendix table XI]
[65]Regions wise analysis of mobility cannot be done due to small sample size.

It is also apparent from the table, when educational status improves in father's generation, educational status in son's generation also goes up (second last column of the table).

Urban and rural region both exhibit lower upward mobility at lower educational level[70]. It means that if parents have completed primary education, then the probability of attaining same level of education for sons is 31.76 and 24.93 % in rural and urban areas. Most importantly, the probability of son to complete 14 years of education, the graduation, is zero and less than 1 % (0.24 %) in rural and urban areas respectively when the father works in informal sector.

Moreover, it is also figured out from the table that intergenerational persistence is higher in rural areas comparatively in urban areas at lower levels of education. One of the possible reasons could be the poverty which makes it difficult for uneducated fathers to invest in children's schooling. Therefore, either they remain uneducated or achieve low levels of education. Consequently, this may create persistent poverty in income over generations. These results are similar to that of Javed and Irfan (2012).

Overall, these results are indicative of unequal distribution of opportunities and have important policy implications. In this situation, anti-poverty policies focusing on uneducated/low educated people are required which provide them assistance to escape from lower mobility.

To capture the impact of developmental changes happening over the time, we undertake cohort analysis. The entire sample (informal employment) is divided into two cohorts, sons with age<25and age ≥25 respectively. The results, as reported in Table 6.4, indicate that for middle and graduation the probabilities that the sons will acquire the same education is

[70] The results for rural and urban sons for informal workers are documented in appendix table XVI.

smaller for cohort having age less than 25 compared to sons older than 25 years showing that intergenerational transfer of education, immobility, has decline to some extent over the time.

Table 6. 4: Son's education against their Father's education (informal employment) by Cohort (%)

		Education of Sons						
Education of Fathers		Never Attended School	Primary	Middle	Matric	Graduation	Post - Graduation	% (N)
Never Attended school	<25	35.86	21.21	17.41	16.9	8.62	0.00	100(580)
	≥25	31.37	19.37	23.58	18.32	6.95	0.42	100(475)
Primary	<25	11.84	28.95	19.3	20.18	17.98	1.75	100(288)
	≥25	8.72	23.39	27.06	27.98	11.01	1.83	100(218)
Middle	<25	8.55	21.05	22.37	33.55	13.16	1.32	100(152)
	≥25	10.07	18.71	23.02	32.37	12.95	2.88	100(139)
Matric	<25	4.62	7.51	17.92	43.35	25.43	1.16	100(173)
	≥25	4.97	11.05	14.92	35.91	26.52	6.63	100(181)
Graduation	<25	0.00	5.13	17.95	30.77	43.59	2.56	100(39)
	≥25	3.7	3.7	12.96	12.96	44.44	22.22	100(54)
Post-Graduation	<25	0.00	0.00	0.00	0.00	100	0.00	100 (6)
	≥25	0.00	0.00	10.0	20.0	30.0	40.0	100(10)

Moreover, sons older than 25 years of age and fathers with graduation have 3.7 % probability to remain unenrolled in the schools, whereas zero % chance for sons to remain unenrolled, who are less than 25 years of age. Whereas the sons less than 25 years of age and fathers with matric level of education have 43.35 % probability to reach to same level of education and 4.62 % chances of never attending the school.

This shows a little bit increase in enrollment of the sons belonging to younger cohort. In younger cohorts, the transfer of education from father to son is high for primary and matric level of education. From this analysis, it could be said that if the father joins informal sector

or elementary occupation to meet his urgent expenditures then it would become hard for him to provide his children higher education.

6.3.2 Occupational Mobility

Selection into informal sector work act as an important channel through which endowments and opportunities are transmitted from one generation to next generation. Immobility in occupation is usually linked to low levels of access to higher education opportunities or to segmentation in labor markets. Transfer of occupation to the next generation also causes the transfer of poverty from one generation to next generation. Therefore studying the occupational mobility is also crucial in determining the poverty status of household.

Table 6. 5: Son's Employment Sector against Father's Employment Sector (%)

	Son's sector		
Father's sector	Formal employment	Informal employment	%(N)
Formal employment	34.0	66.0	100(799)
Informal employment	7.4	92.6	100(3799)
%(N)	12.0 (554)	88.0 (4044)	100 (4598)

Source: Author's own calculation

Compared to 83.0 % fathers[71], 88.0 % sons work in informal sector indicating that ratio of working in informal sector has increased over the time. Table 6.5 clearly shows that the probability of sons of informal father to join informal sector is higher than the probability of sons to join formal employment. That is only 7.4 % sons join the formal sector if the father was employed in informal sector.

Table 6.6 details the probability of selection of formal sector and informal sector (occupation wise) by the sons given their father's occupation, first for the aggregate rural-

[71] In fathers' generation 17.38 (799) % are found to be employed informally, whereas 82.62 (3799) is working as informal workers.

urban sample then disaggregate analysis for rural and urban regions. The informal categories of occupations are ranked in decreasing order i.e. informal clerical workers is the most preferred occupation and elementary occupation is the least preferred over the other occupations.

It is evident that most of the diagonal terms are dominating the off-diagonal terms, suggesting inequitable distribution of opportunities of occupational choices. Father's occupation remains primary determinant of son's entry to labor market. The persistence is highest in lower occupation specifically informal craft workers and elementary occupation. The probability of sons ending up joining the fathers' occupation is 52.1 and 49.0 %, respectively.

Moreover, the likelihood of sons to join the formal sector declines with the order of occupation. For example, highest chances of sons joining the formal sector (25.0 %) whose fathers are informal clerical workers and the lowest chances of sons joining the formal sector (3.3 %) whose fathers are in elementary occupation. This reflects the fact that opportunities are unequally distributed and those in lower status have low opportunities to move to high status.

Transition matrix also point towards upward mobility in two occupations (informal clerical workers and informal machine operators) and downward mobility only in informal clerical workers. Our results contradict with Javed and Irfan (2012) and Muhammad and Jamil (2017) who find high downward mobility in all occupations for Pakistan. This may be due to considering different data sets.

Table 6. 6: Son's Occupation against Father's Occupation (%)

Occupation of Fathers	Occupation of Sons						
	formal employment	informal clerical workers	informal sales workers	informal craft workers	informal machine operators	informal elementary occupation	% (N)
formal employment	33.8	7.4	24.6	16.0	6.7	11.4	100(780)
informal clerical workers	25.0	24.2	29.5	11.4	2.3	7.6	100(132)
informal sales workers	8.7	3.3	40.7	19.5	9.2	18.5	100(1198)
informal craft workers	7.0	3.0	19.6	49.0	7.7	13.7	100(810)
informal machine operators	8.1	3.7	24.8	24.4	22.2	16.7	100(616)
elementary occupation	3.3	1.0	18.6	17.8	7.3	52.1	100(1024)
Urban							
formal employment	34.49	8.1	25.0	16.3	7.2	9.1	100(657)
informal clerical workers	25.0	25.0	28.6	13.4	0.9	7.1	100(112)
informal sales workers	9.2	3.6	40.3	20.9	9.0	17	100(1027)
informal craft workers	7.2	3.2	19.2	50.7	7.4	12.3	100(691)
informal machine operators	8.5	4.1	24.1	25.5	23.0	14.9	100(518)
elementary occupation	3.7	1.0	21.2	21.2	7.5	45.4	100(731)
Rural							
formal employment	30.9	4.1	22.8	14.6	4.1	23.6	100(123)
informal clerical workers	25.0	20.0	35.0	0.0	10.0	10.0	100(20)
informal sales workers	5.8	1.8	43.3	11.1	10.5	27.5	100(171)
informal craft workers	5.9	1.7	21.8	39.5	9.2	21.8	100(119)
informal machine operators	6.1	2.0	28.6	18.4	18.4	26.5	100(98)
elementary occupation	2.4	1.0	11.9	9.2	6.8	68.6	100(293)

The diagonal probabilities are found to be larger than off-diagonal probabilities except for informal clerical workers and informal machine operators. Moreover, the fathers who are in elementary occupations, the probabilities of their sons to reach formal sector is relatively lower in rural area than in urban areas. Cohort wise analysis of son's occupation against their father's occupation is presented in Table 6.7. Intergenerational persistence is observed to be higher for the cohorts of sons with ages >25 years and smaller for the cohorts ages <25 years respectively except for informal sales workers and elementary occupations.

Table 6. 7: Son's Occupation against Father's Occupation by Cohort (%)

Occupation of Sons (Age less than 25)							
Occupation of Father	formal employment	informal clerical workers	informal sales workers	informal craft workers	informal machine operators	informal elementary occupation	% (N)
formal employment	69.0	6.4	28.8	22.8	4.8	9.6	100(250)
informal clerical workers	25.58	25.58	25.58	11.63	4.65	6.98	100(43)
informal sales workers	6.85	3.05	42.13	19.04	8.88	20.05	100(394)
informal craft workers	7.58	3.97	20.94	46.21	7.58	13.72	100(277)
informal machine operators	6.31	3.88	24.76	22.33	21.84	20.87	100(206)
elementary occupation	3.79	1.17	15.16	16.62	6.71	56.56	100(343)
Occupation of Sons (Age greater than and equal to 25)							
formal employment	47.37	9.77	18.55	9.52	7.27	7.52	100(399)
informal clerical workers	30.0	28.57	28.57	5.71	0.00	7.14	100(70)
informal sales workers	16.34	5.66	39.65	14.16	11.11	13.07	100(459)
informal craft workers	10.33	4.13	15.29	52.89	7.44	9.92	100(242)
informal machine operators	15.12	6.83	18.05	20.49	27.8	11.71	100(205)
elementary occupation	5.6	2.24	17.91	18.28	10.82	45.15	100(267)

6.3.3: Income Mobility

Individuals are divided into five quintiles on the basis of their employment income for doing the analysis of persistence in earning across generations through earnings[72]. The first quintile is for the lowest income group or poor people whereas fifth quintile stands for the richest group of people.

Table 6.8 reports the transition probabilities of the sons 'income whose parents are in informal employment. The probability of staying for the children in the same income group to that of their father is highest for lowest income quintile i.e. 37.43 %. For this income group there are only 5.75 % chances of the movement towards highest income quintile.

[72] Our regression analysis is based on only educational and occupational mobility, as it is recognized persistence in education and occupation explains the persistence in earning (Parlevliet, 2008).

The likelihood of retaining the same economic status to that of their father (if the father belongs to highest income group) is 31.64 %.

Table 6. 8: Son's Income against Father's Income if both (father and son) informal (%)

Full Sample	Quintiles of Monthly Income of Sons					
Quintiles of Monthly Income of Fathers	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	N (%)
1st Quintile	37.43	27.28	17.7	11.84	5.75	100(887)
2nd Quintile	29.19	19.95	23.83	22.01	5.02	100(877)
3rd Quintile	21.28	15.6	23.62	32.65	6.85	100(686)
4th Quintile	21.47	14.27	20.03	28.1	16.14	100(694)
5th Quintile	15.28	9.38	15.82	27.88	31.64	100(373)
			Rural			
1st Quintile	47.83	24.78	14.35	8.7	4.35	100(230)
2nd Quintile	31.48	24.69	22.84	19.75	1.23	100(162)
3rd Quintile	27.83	13.04	26.09	29.57	3.48	100(115)
4th Quintile	25.45	20	24.55	18.18	11.82	100(110)
5th Quintile	15.69	13.73	21.57	19.61	29.41	100(51)
			Urban			
1st Quintile	33.79	28.16	18.87	12.94	6.24	100(657)
2nd Quintile	28.67	18.88	24.06	22.52	5.87	100(715)
3rd Quintile	19.96	16.11	23.12	33.27	7.53	100(571)
4th Quintile	20.72	13.18	19.18	29.97	16.95	100(584)
5th Quintile	15.22	8.7	14.91	29.19	31.99	100(322)

It is also obvious from the second last column of the table if the father moves from lowest to higher income quintile, sons also moves in the same direction indicating son's economic status is positively associated with economic status of their fathers. The sons are most probably to fall in the poorest income group of their own generations if the father is also in the poorest income group. From the table, it is obvious highest persistence is in the lowest income quintile showing the poverty trap across generations.

Table 6. 9: Son's Income against Father's Income if both (father and son) formal (%)[73]

Full Sample	Quintiles of Monthly Income of Sons					
Quintiles of Monthly Income of Fathers	1*st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	N (%)
1st Quintile	21.43	21.43	7.14	28.57	21.43	100(14)
2nd Quintile	0.00	60	0.00	10.0	30.0	100(10)
3rd Quintile	11.11	0.00	0.00	55.56	33.33	100(9)
4th Quintile	11.11	5.56	11.11	27.78	44.44	100(36)
5th Quintile	7.88	3.94	3.94	10.84	73.4	100(203)

Comparing, the persistence of earnings across informal-formal employment reflects the existence of highest persistence in upper income quintile for formal employment, i.e. 73.4 % (Table 6.9) opposite to the case of informal employment where highest persistence exists both at the lower end of income distribution. The chances of sons for staying in the poorest group in case where the father is formally employed (21.43 %) is significantly lower than the likelihood if the father is in informal employment (37.43 %).

This point out positive wealth trap for the sons whose father have high earnings and the sons are most likely and comfortably to find their positions in high earning jobs (Ferreira & Veloso 2006). This also shows lower chances of sons to fall in poverty trap born with the fathers who are in formal employment compared to those whose father are in informal employment.

Low mobility in earning is observed for rural sample. The chances of reaching from the lowest to the highest income group is only 4.0 % in rural areas, while it is 6.86 % in urban areas. This shows the availability of better opportunities in urban areas. In the rural sample the probability of falling in the lowest income quintile is high as compared to urban areas (49.6 and 35.2 % respectively). Similarly, the probability of movement of sons from lower

[73] Rural-urban analysis cannot be done due to small number of observations in formal employment.

income group to upper income along with the movement of father from lower to upper quintile is high for urban areas than rural areas.

6.4 Regression Based Analysis

The regression analysis is done with the sons greater than 20 years of age reducing the observations further. At the lower bound of the age range we cannot include too young children, as they are only about to start their educational path. Therefore, the information on years of schooling is likely to be much less related to their final schooling outcome as compared to slightly older children (Wendelspiess & Jua´rez, 2015; Majumdar, 2010; Binder & Woodruff, 2002). This age limit is set to avoid the biased estimates which may arise due to consideration of individuals who have not yet completed their education.

Our regression analysis for educational mobility is based on informally employed father and sons.

6.4.1 Educational Mobility

6.4.1.1 OLS and Pearson Correlation Results

Both (IGE and IGC) approaches of measurement of intergenerational mobility rely upon the assumption of linearity, but the slope could vary with the increase in parental education, therefore, linearity assumption might become invalid (Bjorklund & Jantti, 2000; Neidhöfer et al., 2017). Hence, we have started the analysis with simple linear regression and then incorporated the non-linearity in the model.

Firstly, son's completed years of education are regressed on father's completed years of education and then sensitivity analysis is done by controlling family and individual level characteristics in the regression that may possibly affect son's educational attainment. A separate analysis for rural and urban areas is also undertaken. Table 6.11 below reports the results of both OLS and Pearson correlation. Since, schooling is measured in numbers, so,

the estimated coefficient would indicate the difference in schooling of sons brought about by one-year difference in father's schooling.

The results reveal existence of intergenerational association for all specifications. The first, third and fifth columns of the Table 6.10, represents the results of intergenerational regression coefficient when other variables that may possibly have an effect on son's education are not controlled. While, column 2, 4 and 6 of the table reports the results with control variables. Positive and significant impact of father's schooling on son's schooling is found for overall, rural and urban sample.

For instance, when overall sample is considered, and no controls are added, estimated coefficient displays a one-year difference in father's schooling is linked with 0.44 year difference in son's educational achievement or it can be said, on average the sons' education is increased by 0.44 years with a one year increase in fathers' education.

Disaggregate analysis for urban (N=2647) and rural (N=509) samples points out that on average, the estimated coefficient on father's schooling are larger in urban areas (0.442) relative to rural areas (0.412) pointing towards higher intergenerational persistence of schooling in urban areas. This could be due to higher persistence found at graduation and post-graduation level in urban areas (see Appendix Table, XVI). All of the results suggest that educational attainment of son's is determined by father's educational achievement.

Although both (Pearson correlation and intergenerational elasticity) measures only the linear statistical association between father and son's outcomes and do not reflect the true causal effect, therefore because of exclusion of the other explanatory variables the value of intergenerational coefficient could be overestimated (Hertz et al., 2007; Daude 2011; Javed & Irfan 2012). The other explanatory variables that are included in the regression are

individual and household level characteristics. Individual (child level) characteristics include the age of the son. Both, the age and the square of the age of the son is added in regression equation to consider any non-linearity in the age effect.

The number of siblings and employed, and province dummies are also added as regressors to reflect the impact of unobserved public investment that could possibly effect children's educational attainment (these variables are used by, Blezil & Hansen, 2003; Chevalier, 2004; Majumdar, 2010; Maitra & Sharma, 2009; Daude, 2011, Fessler & Schneebaum, 2012; Jua´rez, 2015).

Table 6. 10: OLS and Pearson Correlation Results

	OLS Results						Pearson Correlation Results					
	Full Sample		Rural Sample		Urban Sample		Full Sample		Rural Sample		Urban Sample	
	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Edu	0.444***	0.423***	0.412***	0.420***	0.442***	0.426***	0.433***	0.413***	0.365***	0.372***	0.439***	0.423***
	(0.0194)	(0.0197)	(0.0539)	(0.0545)	(0.0209)	(0.0211)	(0.0190)	(0.0192)	(0.0478)	(0.0482)	(0.0208)	(0.0210)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	yes
Constant	5.106***	1.312	4.563***	13.37**	5.246***	0.651	1.143***	0.294	1.045***	3.062**	1.177***	0.146
	(0.116)	(2.274)	(0.269)	(6.119)	(0.128)	(2.409)	(0.0259)	(0.509)	(0.0616)	(1.401)	(0.0287)	(0.541)
σ_s	4.4655	4.3675	4.4568									
σ_f	4.3610	4.3611	4.4342									
σ_f/σ_s	0.9766	0.8853	0.9949									
Observations	2,255	2,255	382	382	1,873	1,873	2,255	2,255	382	382	1,873	1,873
R-squared	0.188	0.209	0.133	0.162	0.193	0.212	0.188	0.209	0.133	0.162	0.193	0.212

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression is controlled for age of children, age square of children, number of siblings, number of working members, regional and provincial dummies

One can clearly note that when son's education is controlled for his own and family characteristics then a decline in intergenerational persistence is observed. For full sample, there is 2.1 percentage points decline in intergenerational regression coefficient, whereas for urban sample 1.6 percentage points decline in regression coefficient is observed. Surprisingly, in rural sample 0.8 percentage point increase in transfer of education from father to son is observed. There could be two reasons for higher decline in intergenerational persistence in urban areas than in rural areas; firstly, due to significantly higher educational achievements of parents residing in urban areas makes more room for intergenerational mobility. Secondly, availability of more educational resources and good schools in urban areas facilitate the urban people to get advantage of these facilities (Haung, 2016).

Moreover, in urban areas there is equitable excess to education and job opportunities compare to rural areas. In rural areas educational attainment of children depend upon father's socioeconomic status and other factors such as there is influence of landlord etc. Therefore, there is increase in co-efficient or other factors play important role in determining the persistence of education in next generations. Whereas, in urban areas the effect of other factors is low, so we get low persistence of occupation among the sons. The same results are reported by Azomahou, T. T., & Yitbarek, E. A. (2016).

Bottom half of the Table 6.10 reports Pearson correlation estimates. The correlation coefficient between the sons and fathers is positive and statistically significant but lower than regression coefficient for all specifications. This might be due to the fact that dispersion in educational achievement of two generations evolve differently which causes discrepancy between the two measures. This lower correlation implies that the ratio of the standard deviation (SD) of fathers' schooling attainment to that of sons' schooling attainment is lower than 1 due to which correlation coefficient is less than regression coefficient.

Furthermore, we have also measured the intergenerational persistence by applying method of indirect mode of 2SLS. For this, father's education is estimated by regressing father's education on his own date of birth and the value of property owned in past[74] and then placed it in the regression of son's education (Table, 6.11). Although, there is close association between the approach of indirect mode of 2SLS and instrumental variable, but the former operates indirectly. The β in reported education is different to that of estimated education as the latter explains the variation in the son's education adjusted for father's age, and the value of property.

Table 6. 11: Results from Indirect Mode of 2SLS

VARIABLES	Full sample		Rural sample		Urban sample	
	M-1	M-2	M-1	M-2	M-1	M-2
Estimated_Edu_F	1.105***	1.088***	0.764**	0.847***	1.142***	1.166***
	(0.135)	(0.134)	(0.297)	(0.313)	(0.157)	(0.156)
Control	No	Yes	No	Yes	No	Yes
Constant	2.435***	-3.088	3.453***	9.543	2.287***	-3.877
	(0.551)	(2.511)	(0.962)	(6.560)	(0.669)	(2.700)
Observations	2,255	2,255	1,873	1,873	382	382
R-squared	0.029	0.073	0.028	0.069	0.017	0.047

1. Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively. 2. Regression is controlled for age of children, age square of children, number of siblings, number of working members, regional and provincial dummies

The results are indicative that one-year difference in the father's estimated education is associated with 1.105 difference in son's education (whereas in case of reported education this difference was 0.444) which is suggestive that the intergenerational mobility also depends significantly on the age, and property of the fathers' generation (for full sample and without control).

[74] Date of birth of the father and the property owned in the past have direct impact on father's education, and an indirect effect on son's education.

While, intergeneration coefficient tends to be 1.088 reflecting a decline of 1.7 point in persistence across generations when controlling for sons' own age and family characteristics. Similarly, as reported in previous results (Table 6.10), intergenerational persistence is to be higher for urban sample as compared to rural sample. Whereas, almost no difference in persistence is found for urban sample (with and without controls), while for rural sample 8.3 percentage point increase is observed. This indicates sons born in rural areas inherit more from their parents and their own characteristics are much important. It is apparent from the table that with and without controls intergenerational persistence is almost same for urban areas.

The influence of age on education is found to be positive and statistically significant for full and urban sample representing that intergenerational mobility is significantly determined by age. While the statistically significant and negative sign of age-square for full and urban sample point out towards the existence of non-linear association between age and education of son. This implies an increase in educational achievement up to certain level of age and after that decline in education starts. The influence of number of siblings[75] on sons' education is found to be negative and statistically significant whereas number of working age members found to have no effect except for estimated education and for full and urban sample.

6.4.1.2 Cohort Based Regression Analysis

Table 6.12 reports the estimates for educational mobility for two cohorts of sons with age less than 25 years and the older. Results suggest that the intergenerational persistence

[75] Participation of children in schooling might be greatly affected by composition and number of siblings in a family, specifically, if the child belongs to the household which is poor, and resource constrained. Considering the number of siblings takes into account the competition for the limited resources of the household in schooling decision.

almost remained unchanged over the time. Increase in father's schooling by one year is associated with 0.443-year increase in son's schooling in the older cohorts without consideration of controls in the regression, whereas in younger cohorts a one-year increase in father's education is linked with 0.438-year increase in sons' education. The same results are observed when son's education is controlled for other factors.

Like previous analysis the value of correlation coefficient is lower than the regression coefficient for both the cohorts. This represents that dispersion in schooling attainment of fathers' generation is lower than sons' generation. Therefore, the ratio of SD across father and sons is less than one. Moreover, the SD of schooling in younger cohorts is a little bit lower than the SD of schooling in older cohorts, for both father and sons' generations.

Thus, there is decline in the ratio of SD across father and sons and consequently, correlation coefficient also declines. This decline causes the decline in intergenerational regression coefficient. However, the decline in intergenerational persistence is not too much large i.e. 0.005 (without control) and 0.016 (with control). The change is almost 1.1 and 3.7 %, alternatively. Therefore, it can be said that the society is not mobile.

Given that declining trend in intergenerational educational persistence for estimated education across the two cohorts, when father's education is controlled for his own and household characteristics (date of birth and value of property owned in the past) then declining trend in persistence is also observed (column 9, 10, 11 and 12). In younger cohorts the persistence is found to be lower as compare to older cohort e.g. 52.9 points lower persistence is observed when no controls are added, while 68.9 points lower persistence is observed after controlling for other characteristics.

Table 6. 12: Cohort Wise Analysis

	Reported Education								Estimated Education			
	OLS Results				Pearson Correlation Results				OLS Results			
	Age>=25		Age<25		Age>=25		Age<25		Age>=25		Age<25	
	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Edu	0.443***	0.430***	0.438***	0.414***	0.443***	0.429***	0.420***	0.397***	1.376***	1.493***	0.847***	0.804***
	(0.0274)	(0.0279)	(0.0276)	(0.0280)	(0.0274)	(0.0278)	(0.0265)	(0.0268)	(0.230)	(0.232)	(0.164)	(0.162)
Control	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Constant	5.334***	0.865	4.920***	14.06	1.198***	0.194	1.105***	3.157	1.306	-7.066	3.370***	10.76
	(0.170)	(5.334)	(0.158)	(32.63)	(0.0381)	(1.198)	(0.0354)	(7.327)	(1.004)	(5.879)	(0.636)	(35.20)
σ_s	4.4541		4.4536									
σ_f	4.4449		4.2688									
σ_f/σ_s	0.9979		0.9585									
Observations	1,077	1,077	1,178	1,178	1,077	1,077	1,178	1,178	1,077	1,077	1,178	1,178
R-squared	0.196	0.213	0.176	0.203	0.196	0.213	0.176	0.203	0.032	0.074	0.022	0.073

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression is controlled for age of children, age square of children, number of siblings, number of working members, regional and provincial dummies

The evidence clearly corroborates that educational attainment of the next generation is largely influence by the preferences, endowments and opportunities provided by the previous generation.

6.4.1.3 Instrumental Variable

Parents' own schooling achievements are largely influenced by observable and unobservable characteristics. Some of these characteristics are genetically inherited by the children from their parents and some others are associated with parenting skills. Hence, this creates the link between parents' and descendants schooling (Chevalier, 2004). However, genetics and other cultural factors, associated with both father's and son's education, serve as omitted variables bias (Kishan, 2018). Instrumental variable estimation offers the cure.

It is usually difficult to find a good instrument, or instruments, in datasets from developing countries. Instrumental variables often used in the developed countries, which include change in education law, distance to school, place of birth of father, or other family background[76] (Card, 1999), are generally not available in developing countries. The most popular instruments used for studies on developing countries are parents' date of birth because only that is available.

We follow (Chevalier, 2004; Maitra & Sharma, 2009; Kishan, 2018) for the choice of instruments for fathers' education. The relationship between public expenditure on education and schooling achievements of parents served as a basis for their choice of

[76] In addition to these primary enrollment rate at the birth place of father when father was 5 to 6 years old and wealth of family when father father's age was 14 is also used as an instruments. Unfortunately for Pakistan, all these information are not available. Although, information on grandfather's land is available but against father's only 42 observations were available for grandfather. Therefore, this could not become possible to use this instrument. Therefore, this study applied wealth which is acquired in the past by the family and date of birth of father as instruments.

instruments. In some regions, higher government spending on schooling would results in better educational/schooling facilities.

Therefore, persons who grew up in a specific region would get some positive spillovers. Hence, that region where father grew up can serve as an ideal instrument for his own educational outcome. Unfortunately, no such information is provided by HIICS data.

Constrained by availability of data, we use birth years of father and value of property of grandfather as instruments. It is assumed by Maitra and Sharma (2009), public spending on schooling changes over the time and the birth year of parents captures that effect. Birth year of parent have an effect on child's schooling achievements indirectly through its impact on parental parents schooling achievements.

Potential endogeneity of father schooling attainment in the sons schooling regressions is corrected by employing the methodology proposed by Rivers and Vuong (1988). The procedure used for correction is as follows; in the first stage, completed years of schooling of fathers are regressed on the instruments along with other exogenous regressors. Then, values of residuals which are obtained from first stage are added as an additional regressors in the second stage regression. Significance of the residuals implies that fathers' schooling achievement is not exogenous on the son's schooling attainment. This allow us to measure intergenerational persistence by 2SLS estimation method. The results of 2SLS are reported in Table 6.13.

Contrary to the previous results, sharp difference in the coefficients of persistence between the OLS and IV estimates is visible. The problem of endogeneity of fathers' educational achievement turns out to be fairly important. It is important to note that the influence of father schooling on the schooling of son is statistically significant and fairly different in all

specifications. The coefficient for father's education increases sharply for both the specifications (with and without controlling for the other factors).

Comparing the results of OLS, Table 6.10 and Table 6.12, with 2SLS (Table 6.13) the evidence of significant omitted variable bias is confirmed: underestimation of the impact of the father's schooling achievements. The highest persistence is found to be for older cohort (1.484) when endogeneity is tackled.

Similar to the estimates of OLS, lower persistence is estimated for the younger cohort compared to older cohorts. Results are robust after inclusion of controls. The results confirm, if complexities of intergenerational persistence are ignored then OLS estimates will be bias downward and the estimates which we will obtain reflects the lower elasticity of persistence across generation.

These finding indicate that children from poor families tend to live in similar economic conditions to that of their parents. Parents influence children outcome at different stages of life. Different outcomes (education, occupation, income, poverty) have their roots in earlier stages of life. Someone born to parents with low income faces a higher risk of less successfully transiting through these stages and of ending up in a precarious labor market situation, which in turn diminishes his or her capacity for positive parenting. This raises the odds of a generational cycle of poverty, but money is as much the result as the cause of the vicious circle.

Table 6. 13: Two Stage Least Squares (2SLS)

VARIABLES	Full Sample		Rural Sample		Urban Sample		Age>=25		Age<25	
	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2	M-1	M-2
Father's Edu	1.105***	1.065***	0.764***	0.661***	1.142***	1.151***	1.376***	1.484***	0.847***	0.794***
	(0.151)	(0.149)	(0.293)	(0.227)	(0.181)	(0.181)	(0.302)	(0.324)	(0.164)	(0.159)
Control	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Constant	2.435***	1.921	3.453***	14.46**	2.287***	-0.0172	1.306	3.875	3.370***	13.85
	(0.620)	(2.758)	(0.950)	(6.281)	(0.771)	(3.074)	(1.317)	(8.178)	(0.635)	(34.96)
Observations	2,255	2,255	382	382	1,873	1,873	1,077	1,178	1,077	1,178
R-squared	0.238	0.280	0.036	0.118	0.247	0.278	0.278	0.288	0.0221	0.0769
Hausman (χ^2)	29.979***	28.208***	1.65749	1.23653	24.96***	27.013***	20.446***	25.572***	7.6591***	6.8341***
Sargan (χ^2)	2.56306	1.56316	2.20448	0.426837	1.05047	0.865435	0.35166	0.21378	1.9719	0.23675

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression is controlled for age of children, age square of children, number of siblings, number of working members, regional and provincial dummies

6.4.2 Occupational Mobility

6.4.2.1 Occupational Mobility Regression Analysis

Findings from transition matrix analysis clearly confirm high intergenerational association between fathers' and son's occupational choices. This section extends the analysis using regressions analysis. Table 6.14 below reports the probit regression results for full, rural and urban sample respectively. Column 1, 3, 5, 7, 9 present the probabilities obtained from probit regressions, while column 2, 4, 6, 8 and 10 present the marginal impacts.

The results show that sons' employment is positively and significantly associated with fathers' employment for all the specifications. The coefficient of father employment is positive and significant indicating the intergenerational persistence in the choice of employment across the two generations. The sons whose fathers have informal employment are more probable to be employed informally than sons of fathers who have formal employment. The results are robust for rural and urban samples as well.

As in probit regression, coefficients are not depicting the variation in sons' employment brought about by variation in fathers' employment, we, therefore, calculated marginal impacts. The most important result is that sons born to the father working in informal sector significantly and positively increases the probability that son will work in informal sector. The size of the impact however decreases when we control it for age, education and other characteristics of the household.

It is evident that father being informally employed, raises the probability of son's to be employed informally by 29.7 % as compared to the sons of formally employed fathers. The probability however falls to more than half (12.4 %) when estimates are controlled for age, education, family size, number of children and poverty status of the household.

Table 6. 14: Probability and Marginal Impact (Probit Model)

	Full Sample				Urban Sample				Rural Sample			
	Coeff.	dy/dx	Coeff.	dy/dx	Coeff.	dy/dx	Coeff.	dy/dx	Coeff.	dy/dx	Coeff.	dy/dx
	M-1		M-2		M-1		M-2		M-1		M-2	
Informal Father	1.018***	0.297***	0.687***	0.124***	0.996***	0.294***	0.692***	0.127***	1.147***	0.310***	0.712***	0.111***
	(0.0630)	(0.0201)	(0.0676)	(0.0114)	(0.0652)	(0.0157)	(0.0729)	(0.0126)	(0.158)	(0.0355)	(0.186)	(0.0276)
Control	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Constant	0.259***		3.742***		0.254***		4.113***		0.291***		1.922	
	(0.0555)		(0.713)		(0.0596)		(0.748)		(0.152)		(2.097)	
Prob > chi2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Pseudo R2	0.1017		0.2749		0.0972		0.2765		0.1301		0.3004	
Observations	3,156	3156	3,156	3,156	2,647	2,647	2,647	2,647	509	509	509	509

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

Disaggregating the analysis for urban and rural sample reveals the positive and significant association between fathers and son's occupation but higher for rural sample. Following a large literature in labor economics, age of an individual is added as a human capital variable representing the work experience[77]. The coefficient of age of son is negative and statistically significant for full and urban sample.

This may be due to the fact that in early stages of life, individuals prefer formal employment as compare to informal employment. But after certain age, his preferences changes and the likelihood of working in informal sector increases. This effect is captured by square terms of the age.

The results of multinomial logit model are reported in Table 6.15. First five rows of the table provide the probabilities and marginal impacts for father occupation on son's occupation. It is evident from the table that coefficient of fathers' occupation against the same occupation of sons are positive and significant indicating the higher intergenerational occupational persistence.

The likelihood is high in occupations which require low skills and low for high skilled occupations. For example, the likelihood son to fall in the occupation of his father is highest for elementary occupation (2.857) whereas it is lowest for informal sales workers (1.386). In terms of marginal impacts, probability of son to join elementary occupation is 34 % if the father worked in elementary occupation. The probability is 13.4 % if the father worked in informal sales worker.

Alarmingly, downward mobility in documented for some occupations. In case of father being an informal clerical worker then probability of sons to be employed as informal sale

[77] The cohort effect can also be captured by age and its square

workers is 10.4 %. Similar situation is found for the sons whose father are informal sales workers. Their probability to work in elementary occupation is 3.8 %. Father being in informal machine operators and elementary occupation is associated with negative probability of sons to work as sales and clerical workers.

With the increase in age, and thus getting more experience of the job market, the likelihood of sons working as craft worker, machine operators and elementary occupation decreases as compare to the sons of fathers who are in formal employment. With the increase in age people got more experience of the labor market therefore they prefer to work formally.

The negative and statistically significant sign of age is reflecting this fact for sales, craft related and elementary workers. Muhammad and Jamil (2017) concluded the same. Similar results are found for education. Increase in education decreases the likelihood of choosing informal occupations.

Table 6. 15: Multinomial logit model results (Full Sample)[78]

	Informal Clerks_C		Informal Sales workers_C		Informal Craft workers_C		Informal Machine_C		Elementary Occupations_C	
	Coefficients	dy/dx	Coefficients	dy/dx	Coefficients	dy/dx	Coefficients	dy/dx	Coefficients	dy/dx
Informal Clerks	1.470***	0.0733***	0.583**	0.104*	-0.122	-0.0807	-0.708	-0.0584**	0.402	0.0118
	(0.297)	(0.0246)	(0.293)	(0.0613)	(0.417)	(0.0496)	(0.762)	(0.0268)	(0.446)	(0.0480)
Informal Sales workers	0.554**	-0.0131**	1.386***	0.134***	0.795***	-0.0514**	1.182***	0.0130	1.311***	0.0380*
	(0.245)	(0.00651)	(0.168)	(0.0287)	(0.197)	(0.0249)	(0.240)	(0.0176)	(0.220)	(0.0212)
Informal Craft workers	0.758**	-0.0112	0.689***	-0.126***	1.988***	0.294***	0.994***	-0.0142	1.032***	-0.0155
	(0.310)	(0.00760)	(0.222)	(0.0296)	(0.220)	(0.0309)	(0.292)	(0.0184)	(0.267)	(0.0215)
Informal Machine operators	0.827***	-0.00221	0.629***	-0.0779**	0.888***	-0.00161	1.923***	0.164***	1.089***	0.0271
	(0.306)	(0.00885)	(0.231)	(0.0326)	(0.246)	(0.0302)	(0.271)	(0.0270)	(0.273)	(0.0246)
Elementary Occupations	0.557	-0.0212***	1.064***	-0.129***	1.376***	-0.0370	1.471***	-0.00710	2.857***	0.340***
	(0.404)	(0.00737)	(0.253)	(0.0293)	(0.265)	(0.0271)	(0.309)	(0.0181)	(0.270)	(0.0277)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.880		6.854***		6.565***		3.050		8.583***	
	(2.185)		(1.455)		(1.608)		(1.892)		(1.755)	
LR chi2(60)	1974.62									
Prob > chi2	0.000									
Pseudo R2	0.1845									
Observations	3,156									

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

[78] Before marginal effects we apply number of tests for validity of MNLM as given in appendix V (table XIV and XV). Firstly, we test the assumption of "Independence of Irrelevant Alternatives" (IIA) by employing the Hausman test. On the basis of this tests it is concluded that the assumption of IIA is not violated. For three categories, "formal, clerks" and "elementary", we have negative values of the $\chi 2$ test statistics, which according to Hausman and McFadden (1984) is evidence that assumption of IIA is not violated. Wald test given in the Table XV (appendix V) states that all coefficients associated with explanatory variable(s) are equal to zero. Result of Wald test show that all independent variables have statistically significant effect on all occupational categories of sons, simultaneously. So, there is no "irrelevant variable" in our model. Finally, LR test, indicate the overall significance of the model. The value of Likelihood Ratio (LR) statistics 1974.62 with p-value of 0.00 signifies that this model performs better over a model with no explanatory variables.

We estimate equations for urban and rural regions separately and results are given in Tables 6.16 and 6.17. Strong persistence in the occupational status of father and son is observed for both the regions. Further, we document decrease in the probabilities of the sons to achieve high status occupation compared to father's occupation, except the informal clerks in urban sample. No upward trend is observed in both the regions. Overall results reveal that son generation either achieves the same occupational status as the father's generation did or on average they fall behind the status of their fathers.

Table 6. 16: Multinomial Logit Model (Urban Sample)

VARIABLES	Informal Clerks		Informal Sales workers		Informal Craft workers		Informal Machine operators		Elementary Occupations	
	coefficien	dy/dx	coefficient	dy/dx	coefficient	dy/dx	coefficient	dy/dx	coefficient	dy/dx
Informal Clerks	1.430***	0.0751***	0.567*	0.0961	0.00183	-0.0633	-1.315	-0.0749***	0.531	0.0219
	(0.315)	(0.0272)	(0.316)	(0.0657)	(0.429)	(0.0552)	(1.046)	(0.0234)	(0.510)	(0.0467)
Informal Sales workers	0.589**	-0.0147**	1.406***	0.125***	0.877***	-0.0458*	1.149***	0.00495	1.618***	0.0640***
	(0.255)	(0.00748)	(0.181)	(0.0311)	(0.211)	(0.0270)	(0.257)	(0.0186)	(0.253)	(0.0208)
Informal Craft workers	0.713**	-0.0134	0.647***	-0.139***	1.981***	0.294***	0.960***	-0.0170	1.290***	0.0128
	(0.326)	(0.00867)	(0.238)	(0.0322)	(0.236)	(0.0335)	(0.313)	(0.0197)	(0.302)	(0.0214)
Informal Machine operators	0.762**	-0.00368	0.613**	-0.0772**	0.855***	-0.00277	1.826***	0.150***	1.293***	0.0497**
	(0.321)	(0.0100)	(0.244)	(0.0354)	(0.260)	(0.0325)	(0.286)	(0.0283)	(0.304)	(0.0244)
Elementary Occupations	0.432	-0.0259***	1.163***	-0.130***	1.534***	-0.0225	1.531***	-0.00929	3.190***	0.349***
	(0.470)	(0.00843)	(0.288)	(0.0327)	(0.299)	(0.0303)	(0.346)	(0.0198)	(0.318)	(0.0296)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.054		8.167***		8.045***		4.685**		7.151***	
	(2.239)		(1.514)		(1.681)		(1.940)		(1.904)	
LR chi2(55)	1605.60									
Prob > chi2	0.0000									
Pseudo R2	0.1786									
Observations	2,647									

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

Table 6. 17: Multinomial Logit Model (Rural Sample)

VARIABLES	Informal Clerks		Informal Sales workers		Informal Craft workers		Informal Machine operators		Elementary Occupations	
	Coefficients	dy/dx	coefficients	dy/dx	coefficients	dy/dx	coefficients	dy/dx	coefficients	dy/dx
Informal Clerks	2.212**	0.0688	1.006	0.147	-24.41	-0.193***	1.460	0.0846	0.355	-0.0571
	(1.004)	(0.0667)	(0.818)	(0.168)	(209,233)	(0.0524)	(1.300)	(0.132)	(1.007)	(0.192)
Informal Sales workers	0.141	-0.00697	1.425***	0.233**	0.280	-0.0709	1.625**	0.0774*	0.152	-0.167**
	(0.954)	(0.0110)	(0.470)	(0.0739)	(0.583)	(0.0630)	(0.707)	(0.0444)	(0.537)	(0.0826)
Informal Craft workers	1.545	0.00426	1.265**	-0.00869	2.224***	0.293***	1.783**	0.0334	0.357	-0.231***
	(1.070)	(0.0171)	(0.633)	(0.0743)	(0.635)	(0.0806)	(0.862)	(0.0447)	(0.670)	(0.0809)
Informal Machine operators	1.763	0.00803	1.130	-0.0457	1.642**	0.0665	2.906***	0.203***	0.882	-0.140
	(1.110)	(0.0199)	(0.792)	(0.0812)	(0.803)	(0.0871)	(0.910)	(0.0732)	(0.803)	(0.0958)
Elementary	1.529	0.00025	1.061*	-0.0855	0.974	-0.0805	1.841**	0.0210	2.009***	0.242***
	(0.940)	(0.0132)	(0.567)	(0.0624)	(0.614)	(0.0600)	(0.771)	(0.0360)	(0.544)	(0.0824)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-7.399		0.0407		2.220		-8.987		8.705*	
	(9.100)		(4.661)		(4.992)		(6.769)		(4.839)	
LR chi2(55)	355.89									
Prob > chi2	0.000									
Pseudo R2	0.2188									
Observations	509									

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

6.4.2.2 Occupational Mobility (Cohort Analysis)

Occupational mobility analysis is also done with respect to cohorts as is done in educational mobility section. Table 6.18 reports the results of probit model for two cohorts, age>=25 and age <25).

Table 6. 18: Probit Model (Cohort Analysis)

	Age>=25				Age<25			
	coefficient	dy/dx	coefficient	dy/dx	coefficient	dy/dx	coefficient	dy/dx
informal_F	1.040***	0.339***	0.744***	0.162***	0.901***	0.208***	0.596***	0.0817***
	(0.0770)	(0.0184)	(0.0853)	(0.0170)	(0.110)	(0.0242)	(0.113)	(0.0151)
Control	No	No	Yes	Yes	No	No	Yes	Yes
Constant	0.066***		2.348		0.594***		10.93	
	(0.0627)		(1.476)		(0.101)		(14.35)	
Prob > chi2	0.0000		0.0000		0.0000		0.0000	
Pseudo R2	0.1073		0.2616		0.0784		0.2498	
Observations	1,643	1,643	1,643	1,643	1,513	1,513	1,513	1,513

1. Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.2. Regression results are controlled for age, age square, education of son, regional and provincial dummies

One can notice higher chances of older cohorts (1.040) to be in informal employment compared to younger cohorts (0.744) if father is in informal employment. In other words, occupational mobility has increased over the time. The probability of sons from older cohort to be employed in informal employment is 33.9 % if father is in informal employment compared to the sons whose fathers are in formal employment. While, in younger cohorts, the probability is 20.8 % pointing out towards declining trend in the association between father and son's employment. The mobility is 13.9 percentage point higher in younger cohorts.

Table 6. 19: Multinomial Logit Model (Cohort Analysis: Age>=25)

VARIABLES	Informal Clerks		Informal Sales workers		Informal Craft workers		Informal Machine		Elementary	
	coefficients	dy/dx	coefficients	dy/dx	coefficient	dy/dx	coefficients	dy/dx	coefficien	dy/dx
Informal Clerks	1.467***	0.0836**	1.017***	0.182**	0.119	-0.0486	-12.74	-0.106***	0.595	0.00944
	(0.368)	(0.0379)	(0.370)	(0.0765)	(0.605)	(0.0526)	(372.3)	(0.0193)	(0.569)	(0.0555)
Informal Sales workers	0.500*	-0.0197	1.481***	0.187***	0.950***	-0.00288	1.030***	0.00660	1.096***	0.0153
	(0.293)	(0.0120)	(0.212)	(0.0367)	(0.270)	(0.0284)	(0.294)	(0.0244)	(0.289)	(0.0258)
Informal Craft workers	0.651	-0.0235*	0.795**	-0.101***	2.527***	0.387***	0.914**	-0.0298	1.058***	-0.0193
	(0.424)	(0.0143)	(0.311)	(0.0386)	(0.309)	(0.0407)	(0.392)	(0.0259)	(0.373)	(0.0275)
Informal Machine	0.755**	-0.00494	0.630**	-0.0560	1.192***	0.0600	1.829***	0.175***	0.833**	-0.00227
	(0.376)	(0.0166)	(0.304)	(0.0425)	(0.331)	(0.0375)	(0.336)	(0.0389)	(0.371)	(0.0300)
Elementary	0.714	-0.0311**	1.395***	-0.0540	1.846***	0.0398	1.590***	-0.00198	2.869***	0.287***
	(0.524)	(0.0142)	(0.346)	(0.0402)	(0.373)	(0.0342)	(0.405)	(0.0270)	(0.366)	(0.0385)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-7.230		4.711		5.042		4.940		2.120	
	(4.649)		(3.003)		(3.503)		(3.783)		(4.224)	
Prob > chi2	0.0000									
Pseudo R2	0.1952									
Observations	1,643									

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

Table 6. 20: Multinomial Logit Model (Cohort Analysis: Age<25)

VARIABLES	Informal Clerks		Informal Sales workers		Informal Craft workers		Informal Machine		Elementary	
	Coefficients	dy/dx	Coefficients	dy/dx	Coefficients	dy/dx	Coefficient	dy/dx	Coefficie	dy/dx
Informal Clerks	1.495***	0.0503*	0.0848	0.0169	-0.325	-0.0966	0.315	0.0200	0.132	0.0131
	(0.520)	(0.0270)	(0.481)	(0.0997)	(0.594)	(0.0917)	(0.854)	(0.0595)	(0.719)	(0.0831)
Informal Sales workers	0.664	-0.00547	1.290***	0.0764*	0.679**	-0.110***	1.473***	0.0281	1.525***	0.0716**
	(0.455)	(0.00562)	(0.289)	(0.0442)	(0.314)	(0.0408)	(0.426)	(0.0234)	(0.355)	(0.0342)
Informal Craft workers	0.872*	-0.00174	0.517	-0.143***	1.473***	0.194***	1.191***	0.0139	0.949**	-0.00599
	(0.473)	(0.00619)	(0.326)	(0.0448)	(0.324)	(0.0469)	(0.462)	(0.0244)	(0.392)	(0.0335)
Informal Machine	1.013*	0.00125	0.640*	-0.0963**	0.672*	-0.0727	2.163***	0.153***	1.345***	0.0698*
	(0.540)	(0.00759)	(0.379)	(0.0491)	(0.394)	(0.0471)	(0.473)	(0.0354)	(0.432)	(0.0397)
Elementary	0.382	-0.00982	0.675*	-0.196***	0.882**	-0.129***	1.408***	8.53e-05	2.777***	0.403***
	(0.647)	(0.00613)	(0.376)	(0.0428)	(0.385)	(0.0418)	(0.494)	(0.0224)	(0.403)	(0.0397)
	(0.585)	(0.00613)	(0.385)	(0.0505)	(0.406)	(0.0487)	(0.558)	(0.0267)	(0.423)	(0.0437)
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	27.14		23.15		30.49		-8.200		22.38	
	(43.27)		(29.50)		(30.59)		(36.46)		(31.97)	
Prob > chi2	0.0000									
Pseudo R2	0.1660									
Observations	1,513									

Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10% respectively.
Regression results are controlled for age, age square, education of son, regional and provincial dummies

The results of multinomial logit model for two cohorts are reported in Table 6.19 and 6.20. The probability of son to join the occupation of his father is lower in younger cohorts compared to older cohorts except for informal clerks and informal machine operators. In other words, the persistence is lower for young cohort.

6.5 Conclusion

The evidence clearly suggests higher intergenerational persistence of educational and occupational choices. The persistence is higher for informal sector and elementary occupations within the sector. The burden of persistence is skewed towards rural populations. We conclude the existence of unequal opportunities between rich and poor and low social mobility in Pakistan.

Available literature suggests that widening income inequality has been accompanied by a widening achievement gap between children living in high versus low income families. Wage persistence across generations could be driven by the effect of parental background on cognitive skills acquired by children in formal and informal education (Causa & Johanson, 2010).

Recent studies show a clear connection between intergenerational wage mobility and inter-generational mobility in education, although educational mobility cannot account for all estimated persistence in incomes (Blanden & Machin, 2008). The extent to which educational mobility is responsible for wage persistence depends on how strongly educational achievement is tied to family background, i.e. the degree of persistence in education as well as the returns to education in the labor market. Moreover, sociological research showed that for people whose parents have a high occupational status, education

acts as a mean of guaranteeing high status, but for those whose parents have low status, education is the principal mechanism of upward mobility (Hout & Diprete, 2006).

The above analysis of educational, occupational and earning mobility supported the hypothesis of intergenerational persistence across generations. Results, for informal employment, reveal higher persistence at the lower end of distribution than at the upper end in all cases (education, occupation and earning). Our findings are in concurrence with Burki (2015) and Javed and Irfan (2012). Kishan (2018) also finds higher persistence in education at the lower end.

At the top end of the education distribution, sons have managed to break away from circumstances (to a lesser extent), while at the lower and middle parts of the distribution, a son is still encumbered by his background, and even his own effort coupled with external factors such as government policies (in education and elsewhere) has done little to diminish his dependency on his father.

In contrast to this Gaentzsch and Roman (2017) find evidence of high persistence at both upper and lower ends of the distribution. In terms of income mobility, Tassinari (2017) finds proof of highest amount of dependence of a given generation on the previous generation at the top end of the distribution. We find the same case when analyzing the formal employment. Tassinari (2017) attributes this stickiness at the top to the parental tendency of rich parents to pass on their respective advantages and social network effects. Higher estimates of educational and occupational persistence, consistent with the study of Parlevliet, (2008) for Mexico are found by this study. Parlevliet finds social networks an important channel in transmitting sector affiliation and persistence in earnings. It is also

proposed by many, often good jobs are found through social networks, which may result in "positive discrimination" for the richer share of the population (IDB 2007).

Negative impact of number of siblings on sons schooling is documented which is a sign of resource constraints as indicated by Akarcaygurbuz, (2016). Resource constraints within the household play an important role in determination of child's fate. This raises the competition among the siblings or creates rivalry effect. The idea is that given resource constraints within the household, siblings compete among themselves over resources, both parental time and money resources and this has implications for human capital accumulation within the household.

In conformity with previous findings of studies (Akarcaygurbuz, 2016) on the determinants of educational outcomes, the effect of residing in urban area is positive and strong. It is reasonable to assume that private returns to education remain lower in rural areas where low-skilled farming activities prevail. Furthermore, education supply might remain low and the cost of schooling could be relatively higher in terms of commuting and the relative income of rural households, which is likely to be lower.

The evidence reported in this chapter is that intergenerational linkages are still important in Pakistan. Next generation's achievements remain dependent on those of the previous generation. The transition matrices have confirmed that intergenerational persistence is higher at the lower levels of education when father is having informal employment whereas in cases where the father is formally employed, this persistence is higher at the higher levels of education.

Moreover, children of parents employed in higher paid occupations are more likely to be employed in similar occupations themselves. These individuals are therefore advantaged

in ways that children of parents who have not achieved as much in terms of their occupational status. This thus indicates that there is both a positive ‘wealth trap’ for the formally working families, and a severe poverty trap for those families where parent and child both works informally.

Chapter 7: Results and Discussion: Education and Earning

7.1 Introduction

We argued in our opening chapter that working in informal sector contributes to persistence of poverty. One of the channels in this regard, we identified that parent who are employed in informal sector do not send all their children to school and only a fraction gets education. This lowers the human capital accumulation in households working in informal sector.

This chapter provides results on another extension of the discussion. We maintained that those who go to school earn less than those who are having similar education but employed in formal sector. To conclude, access to education does not guarantee escape from poverty. Returns on education are contingent on where the children of parents working in informal sector get employed. In previous chapter we show that children born to father working in informal sector are most likely to work in informal sector. Now we show that returns are lower in informal sector. Combined these two factors, we are able to draw two lessons. Poverty pushes next generation to join informal sector and that in return further strengthens poverty.

This chapter presents the results for return on education. Firstly, the summary statistics of informal and formally employed individuals is reported at national, regional and provincial level, and then occupation wise distribution of informally employed individuals is reported. Further, the distribution of earnings among the formally and informally employed persons is reported to show in which type of employment workers earns the most.

Section 7.3 present the results based on different estimation techniques including i) ordinary least squares (OLS); and ii) two-step selection correction models (multinomial endogenous switching regression) controlling for sample selection bias from sector choice

and labor force participation. Returns on education are estimated for i) formal employment, ii) informal employment and iii) different informal occupations.

7.2 Descriptive Analysis

Table 7.1 below reports the percentage distribution of formally and informally employed individuals at national level and by region and province. It is estimated by this study that in Pakistan informal employment dominates the formal employment. The share of informal employment is almost 76.6 %. Region wise analysis shows high distribution of informal employment in rural areas than in urban areas[79].

Process of migration is considered as one of the factors which has contributed to rising informal employment[80]. This is one of the major factors that has transformed the dynamics of urban labor market. Urban labor market, where initially the supply of labor was lower now comprise of inelastic labor supply. The lack of education, skills and training of the migrants have left no choice for them except to join the informal sector on low level of wages.

Province wise distribution shows the highest informal employment in Sindh and Punjab. In Sindh 79.0 % were estimated to be in informal employment, in Punjab over 78.0 % of the workers are found to be in informal employment. In KP the distribution of informal and formal employment among the workers is estimated to be lower than other provinces

[79] In 2001-02, without considering the agriculture sector, informal employment at national level is found to be 37.4 % of total labour force. This informal employment has reached to 41.59 % in 2013-14. Similarly, in 2001-02, out of the total urban employment informal employed was 65.7 % which raised to the level of 70.6 % in 2013-14.

[80] The rural population has compelled to migrate towards urban centers due to decline in agricultural activities. These activities have gone down due to unavailability of cultivable land, water scarcity, high cost of agriculture inputs and continuous deterioration of soil quality etc.

i.e. 71.5 and 28.5 % respectively. This is because of low employment prospects in the formal sector in Sindh and Punjab whereas in KP and Baluchistan, entry in the formal sector is relatively easy (Jamal, 2014-15).

Table 7. 1: Percentage Distribution of Employment

Employment/Region		Formally Employed Persons	Informally Employed Persons	Total
Overall		23.4(7130)	76.6(23367)	(100)30497
Region wise	Urban	25.3	74.7	(100)23743
	Rural	16.8	83.2	(100)6754
Province wise	KP	28.5	71.5	(100)6189
	Punjab	22.0	78.0	(100)12921
	Sindh	21.0	79.0	(100)8083
	Balochistan	25.2	74.8	(100)3304

Informal employment is concentrated mainly in three informal occupations namely sales workers, craft workers and elementary occupations (Table 7.2). Sales workers constitutes the largest group (31.0 %).

Table 7. 2: Percentage Distribution of Informal Employment (Occupation Wise)

Occupation	Percentage
Informal clerical workers	5.2
Informal sales workers	31.0
Informal craft workers	26.7
Informal machine operators	12.7
Informal elementary occupation	24.4
Total	100 (23061)

Table 7. 3: Comparative Age and Educational Status of Population (Formal / Informal Employment)

	Formal	Informal	Clerks	Sales Workers	Craft workers	Machine Operator	elementary
Age							
age less than 25	11.04	25.62	11.92	23.46	28.53	18.63	31.74
age between 25 to 34	28.04	27.29	33.33	26.54	27.43	29.55	25.63
age between 35 to 44	25.89	22.06	23.51	22.48	21.6	25.73	19.81
age between 45 to 54	22.39	16.23	22.25	16.44	15.11	18.42	14.78
age greater than 54	12.63	8.8	8.98	11.08	7.34	7.68	8.04
Education							
no education	5.6	33.1	1.76	26.77	34.39	30.47	47.86
primary	5.3	18.3	2.6	16.09	21.41	21.94	19.37
middle	6.6	15.9	4.62	15.74	18.45	20.37	13.52
metric	16.9	19.3	22.17	23.23	18.57	20.1	13.98
graduation	35.4	11.5	51.3	16.03	6.51	6.48	4.93
post-graduation	30.2	1.9	17.55	2.14	0.68	0.65	0.36

Table 7.3 shows the inequality in age and education across the formally and informally employed persons. The age group 11 to 44 accounts for 74.97 % of the individuals who are in informal employment whereas the formal employment is 66.97 % in the same age group. This signifies that relatively higher proportion of young individuals is in the informal employment than in the formal employment. The age distribution further indicates that individuals at early age of life choose to work in informal sector and as long as they are not succeeded to obtain the jobs in formal sector, they remain there.

Investment in schooling is considered as the most important form of building up of the human capital. Human capital which is acquired through education and training plays major role in enhancement of labor productivity. Effect of schooling on labor productivity is through skills, communication, occupation specific instructions, etc. It is important to note, lack of education compels the workers to join informal sector which requires low education and training.

The proportion of illiterate workers is the highest in informal employment i.e. 33.1 %, since it is lowest in formal employment i.e. 5.6 %. As the education level goes up percentage share of workers in informal employment declines. The lowest share of illiterate individuals in formal employment depict the fact that in formal employment workers do managerial, professionals work. Among different informal occupations, elementary occupation is the one where highest percentage of workers (47.86 %) are uneducated, whereas only a negligible proportion among the elementary workers are graduate or post graduate i.e. 5 %.

Table 7.4 displays difference in earnings between formally/informally employed persons with respect to education level. The earnings of individuals are important link between employment, and poverty. It can be seen by comparing average earnings in formal and informal employment that workers who are in formal employment receive earnings that are slightly higher than the earnings of their counterparts of similar experience and education in the informal sector (Table 7.4).

The difference in earnings has more to do with the other factors than education. The most important factor due to which earnings are relatively higher in the formal sector than informal sector might be better application of labor laws in this sector. Subsequently, nonmarket forces in the formal sector may also raise wages relative to informal sector, it may also be the case that the government which dominates the formal sector pursues an equity-oriented wage policy that compresses wages.

Table 7. 4: Median Income of Individuals by Sector and Education

Education/Employment	Informal	Formal
No education	10000	15000
Primary	11000	16000
Middle	12000	18500
Matric	15000	21000
Graduation	18000	25000
Post-graduation	25000	40000

It can be seen from Table 7.5, the median earnings are higher among those working as formal worker relative to those who works informally. The difference in the median income between the individuals who are in formal and informal employment comes to more than double. The existence of qualitatively different sectors if not completely but to some extent is the evidence that skills are rewarded differently in different sectors. Therefore, this differential in the median income has more to do with low level of remuneration paid to those who are in informal employment.

Within the informal occupations, incomes in high skilled occupations are expected to be higher than in the occupations where low skill is required. In skilled occupations the labor productivity is expected to be higher. This fact is also illustrated in the table below. Clerical occupation requires high skill, therefore among all the informal occupations median income is high for those who performs clerical duties.

Table 7. 5: Median Income of Individuals occupation wise

Occupation	**Median Income**
Formal	25000
Informal	12000
Informal Clerks	23000
Informal Sales Workers	14000
Informal Craft workers	10500
Informal Machine operators	14000
Informal elementary occupation	10000

7.3 Regression Analysis

This section presents the results of the estimation of returns to schooling. Multinomial endogenous switching regression is used to control for sample selection bias from employment choice. Firstly, OLS estimation is conducted by adding the formal/informal employment dummy as an independent variable and then regression is estimated with disaggregating the informal employment into different occupations (Table 7.6).

Subsequently, in Table 7.7 the impact of completed years of education on employment earnings in different informal occupations is checked. After this, an analysis with multinomial endogenous switching regression is carried out. Although the results are presented for both the regression techniques but we mainly focus on the later as it provides us counterfactual estimates.

7.3.1 OLS Results

Though we depart later, but begin the analysis with the classic "Mincer equation" to show inefficacy of the equation. Mincer equation is just a simple linear regression of earnings on schooling. The equation can easily be estimated via ordinary least squares (OLS) regression with observed data. The results of the estimation of Mincerian wage equation with eight different specification are reported in Table 7.6.

The dependent variable is earnings received from employment. Educational achievement is treated as continuous variables in the first panel (column 1 to 4) and as categorical variable in second panel (column 5 to 8). Column 1 reports the results without controlling for individual characteristics, whereas column 2 and 3 displays the results with control variables and informal/formal employment dummy respectively. In column 4 the results

are reported with disaggregation of the informal employment into different occupations to assess the differences in earnings across different occupations.

The impact of completed years of schooling is found to be positive and statistically significant on employment earnings for all the specifications. Following, Comola and Mello (2011) we added age, age square, marital status of person, occupation dummies in earning equation. It is evident from the results that coefficient of schooling change significantly when the impact is controlled for other factors.

Our estimates for returns to education ranges from Rs.1543 to Rs.1036 for first panel. Moreover, all else equal, worker in informal employment (column 3) earns Rs. 10444 less than those employed in formal sector. When informal employment is divided into different occupations (column 4) for comparing the earning across these occupations, it is evident that earnings in elementary occupations are the lowest (Rs. 11683) as compared to formal employment. Since, the earnings of informal sales worker are Rs. 9564 lower than worker who have formal employment. This points out that informal sales workers are comparatively in better position when comparing with the workers who are in elementary occupations.

The second panel of the table also reports the positive and statistically significant association between employment earnings and different levels of education. As person moves from lower to higher level of education, his earnings increase significantly. Highest earnings are for those workers who have education at post-graduation level for all specifications. Since, there is substantial difference in earnings of individuals with post-graduation level (with and without controlling for the other characteristics).

When no controls are added individuals with post- graduation degree earns Rs. 33,318 higher than with the individuals who have education up to primary. However, when education is controlled for occupational dummies then individuals' earnings are only Rs. 24,971 higher than individuals with primary levels of education. This shows a decline of almost 25 %. Again, as before, the individuals who are in elementary occupations have the lowest income (Rs. 9,859) than the individuals who are in formal employment.

Table 7.7 below reports the OLS estimates of the effect of schooling on the earnings of individuals by informal, formal employment (Column 1, 2, 3 and 4), whereas column five and onward shows the impact of schooling on earnings of individuals who are in different informal occupations. Education is affecting positively and significantly on the employment earnings in all cases. Without controlling completed years of education, results point out a one-year increase in schooling raises the earnings of formally employed persons by Rs. 1,903, while in case of informal employment this increase is only Rs. 837. The results suggest that although returns to schooling are positive in both types of employment but marginal returns, returns to schooling in formal employment minus the one in the informal employment, to schooling are Rs.1,066 lower for informally employed individuals. Results for informal employment by occupations show highest returns (Rs. 1180) to schooling for informal clerks and the lowest one (Rs. 310) for elementary occupations. This indicates almost 280 % lower returns for individuals working in elementary occupations.

It is clear from the Table 7.7 that movement from lowest to highest informal occupations raises marginal returns to schooling significantly. The movement of workers from informal to formal employment raises the marginal returns to schooling almost by 127 % (Rs.837 to

Rs.1903). Furthermore, the individuals who are in elementary occupations if moves towards formal employment, then increase in marginal returns to schooling is almost 513 %. This is the highest observed increase in marginal returns to schooling of the movement from elementary occupations towards formal employment.

The lowest increase in marginal returns to schooling (almost 61 %) is observed for informal clerical workers. Most importantly, controlling the estimates for other socioeconomic characteristics do not affect the sign of the coefficients of years of schooling. There is however slight cut in in the size of impact.

Table 7. 6: OLS Estimation of the Effect of Schooling on Employment Earning

Dependent variable (earnings)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)	Coefficients (std. error)
schooling	1,543***	1,478***	1,084***	1,036***	---	---	---	---
	(24.50)	(24.17)	(27.18)	(28.82)	---	---	---	---
primary	---	---	---	---	2,074***	3,593***	3,212***	3,039***
	---	---	---	---	(416.9)	(402.8)	(399.6)	(400.7)
middle	---	---	---	---	4,309***	5,515***	4,898***	4,609***
	---	---	---	---	(431.7)	(420.4)	(417.6)	(420.1)
matric	---	---	---	---	7,519***	7,751***	6,381***	5,917***
	---	---	---	---	(392.5)	(381.1)	(382.4)	(389.4)
graduation	---	---	---	---	15,581***	15,435***	11,814***	11,132***
	---	---	---	---	(405.2)	(396.2)	(423.0)	(447.3)
Post-graduation	---	---	---	---	33,318***	31,949***	25,574***	24,971***
	---	---	---	---	(516.6)	(503.9)	(571.0)	(589.3)
Informal emp	---	---	-10,444***	---	---	---	-8,302***	---
			(347.8)		---	---	(360.3)	
Clerical Workers	---	---	---	-9,374***	---	---	---	-7,918***
	---	---	---	(679.7)	---	---	---	(677.8)
Sales Workers	---	---	---	-9,564***	---	---	---	-7,161***
	---	---	---	(400.4)	---	---	---	(413.3)
Craft workers	---	---	---	-11,929***	---	---	---	-9,691***
	---	---	---	(435.5)	---	---	---	(448.8)
Machine Operators	---	---	---	-10,286***	---	---	---	-7,889***
	---	---	---	(516.4)	---	---	---	(528.7)
Elementary	---	---	---	-11,683***	---	---	---	-9,859***
	---	---	---	(460.8)	---	---	---	(466.8)
Controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Constant	8,233***	-14,284***	-1,859	-776.8	11,449***	-11,486***	-2,524**	-1,400
	(218.6)	(1,172)	(1,226)	(1,245)	(251.6)	(1,173)	(1,226)	(1,243)
Observations	29,862	29,862	29,862	29,862	29,862	29,862	29,862	29,862
R-squared	0.117	0.191	0.215	0.216	0.147	0.214	0.228	0.230

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.
Regression results are controlled for age, age square and marital status of individuals and also for regional and provincial dummies

Table 7. 7: OLS Estimates of the Effect of Schooling on Informal/Formal Employment Earning

Dependent variable	Formal emp		Informal emp		Informal Clerks		Informal Sales workers		Informal Craft workers		Informal Machine		Elementary	
(earnings)	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.	Coff.
Schooling	1,903***	2,203***	837.0***	819.4***	1,180***	1,227***	899.9***	913.4***	714.5***	692.5***	428.0***	460.5***	310.5***	333.1***
	(113.9)	(111.4)	(15.83)	(15.00)	(106.2)	(94.71)	(37.59)	(35.86)	(29.73)	(27.36)	(41.63)	(39.62)	(16.85)	(15.92)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Constant	11,559***	-58,583***	9,978***	-8,571***	10,295***	-28,733***	11,599***	-14,015***	8,846***	-8,158***	13,440***	-3,052*	9,737***	45.26
	(1,454)	(5,636)	(117.5)	(627.8)	(1,336)	(4,001)	(307.1)	(1,517)	(198.9)	(1,047)	(287.6)	(1,788)	(97.34)	(564.5)
Observations	6,801	6,801	23,061	23,061	1,191	1,191	7,154	7,154	6,162	6,162	2,931	2,931	5,623	5,623
R-squared	0.039	0.132	0.108	0.240	0.094	0.308	0.074	0.201	0.086	0.266	0.035	0.170	0.057	0.202

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.
Regression results are controlled for age, age square and marital status of individuals and also for regional and provincial dummies

7.3.2 Results of Multinomial Endogenous Switching Regression Model

In presence of sectoral selection bias, OLS may produce biased estimates. The structural differences between characteristics of informally and formally employed individuals can cause selection bias. In case when the decision of choosing informal employment is random then OLS will be suitable estimation procedure but it is not a random decision, as it is influenced by many factors.

The issue of selection bias, in Mincerian wage model is firstly discussed by (Gronau, 1974) suggesting that OLS estimates get biased due to differences in characteristics of the workers were in labor force from those who were not. Therefore, inferences about the factors which influence the wages in labor market might be incorrect (Bagheri & Kara, 2005).

As discussed at length already, Heckman (1976 and 1979) proposed two step correction procedure and by employing this procedure Funkhouser (1997) and Arias and Khamis (2008) controlled the selection bias in the formal and informal sector. Since Heckman procedure considers only univariate selectivity, Huesca and Llamas (2018) employed multinomial endogenous switching regression model to control selection bias while analyzing the impact of different types of employment status on wage. Following him, we have also estimated impact of employment on different informal occupations on returns to schooling.

a) Test for the validity of the exclusion restriction

Based on different studies (Di Falco *et al*., 2011); Di Falco and Veronesi, 2012; Belayneh, 2012, Yamasaki, 2012; Shiferaw et al., 2014; Parvathi & Waibel, 2015; and Tesfaye & Tirivayi, 2018), falsification test is applied for the admissibility of instruments.

Table 7. 8: Parameter Estimates (Test on the Validity of the Selection Instruments)

Independent variables	Informal/Formal Probit (1/0)	Earnings (OLS)
Schooling	-0.159***	2,207***
	(0.00213)	(111.6)
Age	-0.0466***	1,365***
	(0.00513)	(280.5)
Age square	0.000279***	-5.950*
	(6.01e-05)	(3.217)
Marital Status	0.163***	6,032***
	(0.0286)	(1,467)
No of Employed	0.0312***	-758.0
	(0.00908)	(493.7)
Family Size	-0.00615*	281.3*
	(0.00316)	(155.5)
Urban	0.0278	9,869***
	(0.0247)	(1,345)
Punjab	0.189***	-764.7
	(0.0252)	(1,261)
Sindh	0.295***	-471.3
	(0.0281)	(1,403)
Balochistan	0.0583*	-2,662
	(0.0347)	(1,721)
Constant	3.064***	-57,963***
	(0.107)	(6,078)
Wald test on selection instruments (χ^2)		1.84
Observations	29862	6,801
Pseudo R-squared/R-squared	0.2784	0.132
Log likelihood	-11561.35	

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.

These instruments should have direct effect on the employment choices but not on the earnings. Table 7.8 shows that number of employed people in the family is not affecting the earnings of formally employed persons, therefore, this can be considered as instruments. Other individual-level instruments that is having the spouse or other relatives employed in the formal sector, as suggested by Pratap and Quintin (2006) affect sector participation and is uncorrelated with wage outcomes. The reason for choosing this selection variables is motivated by the fact that these variables should contain household-

specific characteristics that influence an individual's choice regarding formal or informal employment, but at the same time have no direct impact on the earning potentials of individuals. Household size, is a measure of the need for job security.

b) Results: Multinomial Logit Model (Selection Equation)

After applying the test of exclusion restriction, multinomial logit model is estimated by keeping formal employment as base category. We obtained predicted probabilities for each informal occupation to incorporate them in second stage regression. Table 7.9, reports the coefficients of multinomial logit model.

The coefficient of schooling reported is negative and significant for all the choices of informal occupations except informal clerks. It means that more schooling is associated with lower probability of individuals to work informally as compare to work formally. The coefficient of schooling for elementary workers (0.409) is highest among all the coefficients predicting the lowest likelihood of working as elementary workers as compare to formal occupations.

The lowest probability (0.284) of working informally is observed for informal sales workers among all the occupations. Since the results of multinomial logit model only provides the estimates of coefficients. These estimates only inform about the direction of change in the dependent variable and not about the magnitude of change brought about by a unit change in explanatory variable. So, for knowing about the magnitude of change, it is necessary to further calculate marginal impacts. These marginal impacts are provided in Table 7.10.

Table 7. 9: Parameters Estimates of Informal Sector Employment – Multinomial Logit Model (First Stage Equation)

Dependent variable (Occupations)	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupations
Schooling	0.00863	-0.284***	-0.354***	-0.340***	-0.409***
	(0.00898)	(0.00498)	(0.00535)	(0.00601)	(0.00567)
Age	0.000196	-0.106***	-0.0760***	-0.0162	-0.0951***
	(0.0200)	(0.0105)	(0.0114)	(0.0140)	(0.0116)
Age square	-0.000214	0.000872***	0.000292**	-0.000400**	0.000503***
	(0.000236)	(0.000122)	(0.000136)	(0.000170)	(0.000139)
Marital Status	0.171*	0.299***	0.329***	0.527***	0.204***
	(0.0982)	(0.0584)	(0.0621)	(0.0762)	(0.0652)
No of Employed	-0.0743**	0.0103	0.176***	0.00328	0.0603***
	(0.0338)	(0.0187)	(0.0193)	(0.0232)	(0.0204)
Family Size	0.0128	0.00654	-0.0423***	0.00679	-0.0257***
	(0.0108)	(0.00650)	(0.00725)	(0.00818)	(0.00755)
Urban	0.324***	0.252***	0.171***	-0.0272	-0.434***
	(0.0975)	(0.0513)	(0.0536)	(0.0609)	(0.0530)
Punjab	0.191**	0.361***	0.287***	0.350***	0.184***
	(0.0898)	(0.0523)	(0.0570)	(0.0658)	(0.0586)
Sindh	0.517***	0.512***	0.667***	0.274***	0.374***
	(0.0935)	(0.0579)	(0.0620)	(0.0750)	(0.0649)
Balochistan	0.420***	0.245***	-0.175**	-0.102	-0.223***
	(0.111)	(0.0702)	(0.0804)	(0.0919)	(0.0823)
Constant	-2.449***	4.314***	4.406***	2.803***	6.366***
	(0.425)	(0.220)	(0.233)	(0.279)	(0.237)
Observations	29,862	29,862	29,862	29,862	29,862
Wald test on selection instruments (χ^2)	4.83**	0.31	83.03***	0.02	8.75***
Log likelihood	-43100.013				

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 show significance at 1%, 5% and 10%.

Looking at the marginal impacts (Table, 7.10), it can be seen that all marginal impacts associated with completed years of education are negative except craft workers, reflecting that each additional year of schooling decreases the probability of working informally as compare to formally. The individuals working as machine operators have 0.64 % lower chances to work informally with each additional year of schooling when comparing them with the individuals who are in formal occupations. This is the lowest probability of working in informal occupation attached with each additional years of schooling among all

the occupations. Subsequently, each additional year of schooling is attached with lower chances of working as informal craft workers, elementary worker.

The results of second stage equation (multinomial endogenous switching regression) are reported in Table 7.11. The dependent variable, as usual in the earning equation is income earned through employment. Six equations are estimated including six selection terms representing different formal/informal occupations. The coefficient of schooling is positive and significant for formally employed persons, but insignificant for all informal occupations.

Table 7. 10: Parameter Estimates of Informal Sector Employment-Multinomial Logit Model; Marginal Effects (Selection Equation)

Dependent variable (Occupations)	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupations
Schooling years	0.00654***	2.89e-05	-0.0164***	-0.00646***	-0.0227***
	(0.000229)	(0.000634)	(0.000553)	(0.000415)	(0.000467)
Age	0.00156***	-0.0113***	-0.00146	0.00621***	-0.00461***
	(0.000427)	(0.00145)	(0.00135)	(0.00114)	(0.00114)
Age square	-1.32e-05***	0.000152***	-1.99e-05	-9.01e-05***	2.29e-05
	(5.06e-06)	(1.74e-05)	(1.67e-05)	(1.40e-05)	(1.40e-05)
Marital Status	-0.00224	0.00862	0.0135*	0.0296***	-0.0123*
	(0.00210)	(0.00892)	(0.00789)	(0.00637)	(0.00692)
No of Employed	-0.00287***	-0.0135***	0.0286***	-0.00591***	0.00110
	(0.000719)	(0.00268)	(0.00227)	(0.00184)	(0.00204)
Family Size	0.000545**	0.00556***	-0.00723***	0.00212***	-0.00258***
	(0.000231)	(0.000997)	(0.000954)	(0.000669)	(0.000823)
Urban	0.00628***	0.0643***	0.0302***	-0.00816*	-0.0867***
	(0.00208)	(0.00749)	(0.00654)	(0.00479)	(0.00513)
Punjab	-0.00125	0.0321***	0.00782	0.0120**	-0.0128*
	(0.00182)	(0.00803)	(0.00736)	(0.00570)	(0.00666)
Sindh	0.00199	0.0244***	0.0597***	-0.0166***	-0.0102
	(0.00199)	(0.00885)	(0.00833)	(0.00602)	(0.00729)
Balochistan	0.0110***	0.0762***	-0.0360***	-0.0116	-0.0391***
	(0.00304)	(0.0113)	(0.00957)	(0.00733)	(0.00853)
Observations	29,862	29,862	29,862	29,862	29,862

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 show significance at 1%, 5% and 10%.

Coefficients, measuring the self-selection (m1 to m6) are statistically significant pointing towards the existence of selection bias due to non-observable characteristics in the process

of wage determination is a problem. The negative sign of selection coefficient (of other sectors) means that workers in this category would receive lower wages if the workers have decided to join other than this category of occupation. The positive sign of m1 in case of formal employment represent that being a formal worker be the best choice in order to obtain higher earnings. The negative sign of m6 in case of formal worker imply lower earnings if that individuals would be in elementary occupation. In order to test that in occupational choice process, are there some unobservables factors effecting the choice of employment, a joint significance test on the selection was carried out to confirm that all selection correction terms are zero. The results are reported in Table 7.12. In all segments of occupations, the null hypothesis of no selection bias is rejected.

Table 7. 11: Multinomial Endogenous Switching Regression – Employment Earnings (Estimates Corrected by BFG Technique: Second Stage)

Dependent variable (Earnings)	Formal	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupation	Formal	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupation
	DMF1						**DMF2**					
Schooling	6,176***	392.2	40.10	258.5	883.8	135.2	6,009***	593.9	-124.2	342.2	509.2	155.9
	(1,975)	(2,383)	(671.0)	(311.2)	(850.8)	(235.0)	(1,208)	(1,633)	(697.8)	(287.7)	(587.6)	(203.3)
Age	1,939*	2,461**	1,440**	721.9*	224.5	494.0**	1,896**	2,403***	1,234**	685.7**	633.4	426.3**
	(1,083)	(1,086)	(618.9)	(374.4)	(1,509)	(229.4)	(824.1)	(839.2)	(595.5)	(319.6)	(1,068)	(184.9)
Age square	-13.31	-27.78**	-18.59**	-8.327*	-0.375	-6.256**	-12.59	-26.93***	-16.00**	-7.715*	-6.233	-5.315**
	(11.88)	(11.96)	(8.008)	(5.031)	(20.91)	(3.091)	(9.799)	(9.751)	(7.722)	(4.278)	(14.66)	(2.490)
Marital Status	5,655	2,324	2,287	1,407	763.6	1,057	5,439	2,003	2,295	1,059	1,886	923.2
	(4,304)	(2,188)	(2,706)	(1,324)	(3,916)	(755.1)	(3,444)	(1,889)	(2,422)	(1,177)	(2,589)	(647.9)
_m1	8,389	25,425	53,833**	5,448	20,694*	9,122***	22,506*	35,055	83,123***	21,377*	34,906**	15,945***
	(8,271)	(19,975)	(22,685)	(8,112)	(12,557)	(3,379)	(12,186)	(27,121)	(30,586)	(11,109)	(16,457)	(4,481)
_m2	160,769***	835.1	72,465***	14,092	39,072**	15,076	210,769***	5,801	102,949***	30,455	54,429**	24,518
	(47,530)	(8,164)	(22,412)	(14,947)	(18,346)	(12,473)	(58,476)	(15,374)	(31,322)	(21,359)	(26,302)	(17,619)
_m3	10,586	-41,558	-1,530	-19,253	31,189	-5,779	26,730	-38,442	11,715*	-6,841	27,973	2,220
	(41,000)	(40,849)	(4,468)	(12,906)	(58,508)	(8,309)	(32,174)	(34,014)	(6,664)	(12,556)	(44,432)	(7,592)
_m4	147,973***	67,535***	117,972***	15,063***	52,173***	34,380***	182,035***	90,429***	156,734***	29,392***	68,842***	43,914***
	(28,549)	(17,812)	(17,764)	(1,814)	(12,784)	(6,087)	(29,525)	(22,107)	(26,674)	(3,677)	(15,195)	(6,095)
_m5	-59,319	101,997***	36,900	-6,046	-2,879	5,975	-68,568	128,575***	56,905	-3,427	5,982	7,097
	(50,880)	(33,507)	(40,522)	(21,770)	(15,378)	(14,256)	(57,386)	(39,562)	(52,967)	(24,524)	(20,898)	(15,167)
_m6	-85,274***	-19,415	74,836	-5,490	17,935	2,423	-82,286**	-14,195	107,954*	11,233	32,220	6,267*
	(28,648)	(30,811)	(50,284)	(14,478)	(22,000)	(1,882)	(34,221)	(36,253)	(59,541)	(15,943)	(20,408)	(3,302)
Constant	-108,854*	-4,801	105,368**	-42,141***	54,690	12,414***	-109,271***	-11,200	95,595**	-34,062***	34,769	12,631***
	(62,288)	(95,660)	(50,958)	(14,872)	(85,362)	(3,877)	(35,914)	(81,602)	(47,251)	(12,524)	(59,836)	(2,882)
Observations	6,801	1,191	7,154	6,162	2,931	5,623	6,801	1,191	7,154	6,162	2,931	5,623

1. Bootstrapped Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.
2. Regional and Provincial dummies are also added in the regression

Table 7. 12: Coefficient of Selectivity Variables in Earning Equations (Proportionality Hypothesis between formal/informal occupations)

	formal	Clerks	Sales Workers	Craft related workers	Machine Operators	Elementary
	DMF1					
m1 =m2=m3= m4 =m5 =m6=0	85.25*** (F6,6801)	63.07*** (F6,1191)	244.75*** (F6,7154)	130.24*** (F6,6162)	32.17*** (F6,2931)	123.05*** (F6,5623)
	DMF2					
m1 =m2=m3= m4 =m5 =m6=0	93.45*** (F6, 6801)	65.2*** (F6, 1191)	235.03*** (F6, 7154)	134.6*** (F6, 6162)	33.88*** (F6, 2931)	139.09*** (F6, 5623)

*** p<0.01, ** p<0.05, * p<0.1 show significance at 1%, 5% and 10%.

c) Treatment Effects/Counterfactual Estimates: Evaluating Formal employment Impacts

In this section, we use treatment effect model to evaluate the implication of choosing formal employment on employment earnings for each informal occupation. Table 7.13 provides results of expected gains in employment-based earnings of the movement form informal employment (for each of the five informal occupations) towards formal employment.

Column (1) and (2) of the table shows the actual earnings when individuals are in specific informal occupation and counterfactual estimates if they would have been in formal employment, respectively. In 3rd column of the table, treatment effects on employment earnings, as the difference between columns (1) and (2), of each informal occupation are presented.

This counterfactual analysis allows us to identify the highest and lowest expected gains in terms of increased employment earnings if informally employed persons in theses occupations have the opportunities of working formally. It is evident from this analysis, the movement from informality to formality is associated with increased employment earnings for all occupations.

By comparing the actual employment earnings for informal employment in different occupations it can be concluded that households' head who are in elementary occupation are those with lowest earnings. They would gain Rs. 9851 if they would have been employed in formal employment. The gain is 74.0 % of their earnings form present occupation.

As we move to higher grade informal sector occupation, the expected gain declines. The difference between actual and expected gain is lowest (Rs. 2288) for informal clerical workers which is 13.71 % up from earning from present job. These results are implying either the expected gains may differ across the occupations but the movement from informality to formality is associated with significant and high returns to schooling.

Table 7. 13: Counterfactual Estimates of Earnings

Occupation	Expected/Actual earnings	Counterfactual expected earnings	Treatment Effect	% increase
		DMF1		
Informal clerks	16694.41	18983.03	2288.61***	13.71
Informal sales workers	18805.72	22784.6	3978.88***	21.16
Informal craft workers	15610.04	22784.53	7174.48***	45.96
Informal machine operators	17095.56	22872.73	5777.16***	33.79
elementary occupation	13299.31	23151.04	9851.73***	74.08
		DMF2		
Informal clerks	16829.8	18923.36	2093.56***	12.44
Informal sales workers	18754.95	22504.57	3749.62***	19.99
Informal craft workers	15545.66	22389.95	6844.29***	44.03
Informal machine operators	17031.03	22270.82	5239.79***	30.77
Elementary occupation	13235.65	22502.72	9267.07***	70.02

*** p<0.01, ** p<0.05, * p<0.1 show significance at 1%, 5% and 10%.

Substantial difference in the average earnings of formal and informal workers confirms the existence of segmentation in the labor market. Guisinger and Irfan, (2007) found that

formal sector employees in Pakistan earn roughly 50 per cent more than their counterparts in the informal sector. Merrick (1976) found formal sector wages to be more than 85 per cent higher than informal sector earnings in Belo Horizante, Brazil, even after the effects of experience and education were allowed for.

Lindauer and Sabot (1983) found a substantial wage premium for government employees in Tanzania, while Corbo and Stelcner (1983) found wages slightly higher in the private sector in Chile. Marcouiller, Ruiz and Woodruff (1997) found higher mean earnings in the Mexican informal sector than in the formal sector while the mean earnings in formal sector were higher than in the informal sector in El Salvador and Peru.

For individuals, at all levels of education, the difference in expected wages between the formally employed and the informally employed is positive. Gindling, (1991) also found the positive difference between the expected wages of private formal and informal sector for all levels of education. Many studies are available which have estimated the earning function for different sectors like ours.

Some (Ewoudou & Vencatachellum, 2006; Pisani & Pagan, 2004; Chong, 1999; Gindling 1991), have controlled the sectoral allocation, while some other (Yamasaki, 2012; Kuepie et al., 2009; Tegoum, 2009) have corrected for endogeneity of both sectoral allocation and education. After tackling the issues of endogenous sector allocation, we find that the movement from informal to formal sector and from low elementary occupation to informal clerical, within informal sector, significantly increases the returns to schooling.

Existence of difference in returns to schooling between informality and formality might be due to underlying three possible reasons. First, the difference in quality of education that both type of workers receive. There are chances that individuals who are in informal

employment possess lower quality of education than their formal counterpart. However, the provision of on the job training and non-formal schooling by the government may complement low quality of education and improve the productivity of workers. However, investigating the quality of education and possession of skill is crucial for finding out the differences in returns to education in both type of employment.

The second possible reason for difference in rewards might be under consideration of education (because of discrimination) or lower productivity of education in informal employment.

If true, then it is an evidence of dual labor market theory. However, if informal sector firms become formal then productivity can be increased due to accessing public infrastructure and programs and gradation of technology. For this, removal of complex regulatory process from the labor market by the government is required. Hence, policies related to labor market reforms and regulation should be considered by policymakers.

Third, return to schooling in the informal sector is lower because workers do not have to pay tax when employed informally.

7.4 Conclusion

In this chapter, firstly the descriptive analysis regarding age, education, median income of formally and informally employed persons is presented. Then regression analysis is conducted to see the effect of education on earnings and the likelihood of working in formal and informal occupations. The regression analysis is controlled for sectoral selection bias by employing multinomial endogenous switching regression model and counterfactual earnings are estimated.

Findings of this chapter reveal that percentage distribution of informally employed persons is higher in Pakistan. We document evidence for statistically significant earning difference between informally and formally employed workers. Informally employed workers are rewarded less than formal workers. The difference is significant even when workers have same level of education.

In other words, returns on education/schooling are dependent on type of sector and occupation within each sector. Findings from counterfactual analysis suggest significant gains in earnings when workers move from i) informal to formal sector and ii) bottom (elementary) occupation to top (informal clerics) occupation within informal sector.

Chapter 8: Conclusion and Policy Lessons

1. Major Conclusions

We assessed the impact of informal sector employment on poverty in Pakistan using data from HIICS. We maintain that working in informal sector produces poverty which transfers across generations. And that informal sector is associated with low earnings and lower human capital accumulation in present and future generations. We use intergenerational immobility of education and occupational choices, from fathers to sons, to show how working in informal leads to persistence of poverty across the generations. We also show significantly lower return on education in informal sector compared to formal sector.

Both descriptive and regression analysis confirms that incidence of poverty is higher among the informally employed persons than formally employed persons and this difference is sizeable. Considering different occupations among those who are informally employed, highest incidence of poverty is observed for those who are in elementary occupations. Overall we conclude statistically significant and positive effect of informal employment on poverty. Household heads having an informal employment, are more likely to be poor than formally employed persons. The highest association is observed between elementary informal occupation and poverty.

We conclude that formalization of the economy, and moving toward higher informal occupations, increases the welfare gains in terms of increased consumption expenditures. Comparison of actual mean per adult equivalent consumption expenditures for informal employment in different occupations has led to conclude that workers with elementary occupation are most vulnerable group of working population and have the lowest per adult equivalent consumption expenditure. If these workers are provided with formal

employment opportunities then they can get higher welfare in terms of increased consumption expenditures.

Individual and household level characteristics also have an influence on the poverty. Lack of education is one of the significant factors contributing to informal employment and poverty. A consistent reduction in incidence of poverty with the movement from no education to post-graduation can be achieved. So, it can be said education not only decreases the chances of being poor but also increases the chances of to be employed in formally. Furthermore, counterfactual estimates obtained from multinomial endogenous switching regression analysis predicts that those who are in informal employment can make better off if they are provided with formal jobs.

The evidence clearly suggests higher intergenerational persistence of educational and occupational choices. We document higher persistence at the lower at lower levels of education, occupation and earning than at the upper levels. At the upper levels of education, sons have been succeeded, but to a lesser extent to break away from circumstances, while they have been still burdened by their background at the lower levels. Their own efforts together with external factors for example government policies (in education and elsewhere) has done little to decrease their dependency on their fathers.

Father's occupation remains primary determinant of son's entry to labor market. High persistence is confirmed in low skilled informal occupations, specifically elementary occupations and lower persistence is found in high skilled occupations. The highest chances of sons joining the formal sector whose fathers are in upper informal occupations and the lowest chances of sons joining the formal sector whose fathers are in elementary occupation.

We have not only found the strong persistence in different informal occupation but also movement from higher to lower informal occupation is established. This denote informalization of labor market in Pakistan over the time. Further, it may also reflect lower lack of access to opportunities in formal sector. Most importantly, it shows the transfer of informality from one generation to other generation.

Moreover, the fathers who are in elementary occupations, the probabilities of their sons to reach formal sector is relatively lower in rural area than in urban areas. Intergenerational persistence is observed to be higher in older cohorts and smaller for the younger cohorts.

This sector affiliation leads towards earning persistence too. The analysis of income mobility/earning mobility across generation for formal and informal employment shows if father is working informally then earning persistence is more prevalent. It is confirmed that at the lower income quintile earning persistence is high than at the higher income quintile when father is in informal employment. While, son born with formally employed father experience higher persistence at the high end of income distribution. The situation of immobility may arise due to lower investment in education by the father on their sons. Moreover, it could become not possible for informal and poor father to provide quality and higher education, which can easily be provided if father is formal and rich. This confirms the existence of unequal opportunities between rich and poor and low social mobility in Pakistan.

The probability of staying for the children in the same income group to that of their father is highest for lowest income quintile. In contrast to this, the existence of highest persistence in upper income quintile for formal employment is documented. This points out positive wealth trap for the sons whose father have high earnings and the sons are most likely and

comfortably to find their positions in high earning jobs. If the father moves from lowest to higher income quintile, sons also moves in the same direction indicating son's economic status is positively associated with economic status of their fathers. Low mobility in earning is observed for rural sample compared to urban sample.

Workers who are in formal employment receive earnings that are higher than the earnings of their counterparts with similar education and experience in the informal sector. Moreover, the median earnings are higher among those working as formal worker relative to those who works informally. The difference in the median income of formally and informally employed individuals is more than double. The households' head who are in elementary occupation are those with lowest earnings.

We document evidence for statistically significant earning difference between informally and formally employed workers. Informally employed workers are rewarded less than formal workers. The difference is significant even when workers have same level of education. In other words, returns on education/schooling are dependent on type of sector and occupation within each sector. Findings from counterfactual analysis suggest significant gains in earnings when workers move from i) informal to formal sector and ii) bottom (elementary) occupation to top (informal clerics) occupation within informal sector.

2. Policy Implications

The findings of study lead to some interesting policy implications. However, we would like to note on the very onset that conclusion of the study needs to be carefully interpreted. We, in no way, are recommending complete abolition of informal sector. This is neither suggested nor do able. We recommend that the opportunities in formal sector must be

increased and distribution thereof to be more equitable. And that informal sector needs to be mainstreamed and better regularized.

Government needs to take step to promote social mobility particularly in labor market where the children born to parent of informal sector remain informal. The children who fulfil the criteria for formal jobs must be provided the opportunities. Within the informal sector government must focus on providing or expanding opportunities on the higher side of the ladder, the higher informal occupation which include informal sales and clerical works.

Education is one of the crucial factors that affect both informal employment and poverty. A high proportion of individuals is found to be involved in informal activities mainly in occupations requiring low levels of skills. In formal sector, mostly high qualified individuals succeed in obtaining the opportunities offering high wages. In completely rigid society parent's education determine their children's education. It means, the growth is not equitably benefitting all the members of societies as a major proportion of the population is not able to acquire human capital.

In formulating/designing policies, interlink between opportunities, endowments and family background should be considered. Despite controlling all the other factors that can possibly effect children's achievement, parental background is the most crucial factor. Education, occupation and income are the factors which are involved in determining the fate of next generations. Further, it is also suggested by Becker and Tomes that due to imperfections in human capital market, the propensity of investment in children's human capital lowers down by the poorer families that in turn impede the mobility. This implies that intergenerational mobility can be increased if inequalities are reduced in accessing the

education. It means, imperfections in human capital market are necessary to be considered if we want to encourage investment in human capital.

Although not completely but to a little extent education can mediate the parental effect on their children's life chances. Investment in early period of children's life is recognized as important transmission channel. If parents are educated and well-off then they can better invest in human capital of their next generation in terms of time allocation and resources (d'Addio 2007; Esping-Andersen 2008).

Among the policies, conditional cash transfer programs may stimulate the investment in early childhood. Later on, improvement in schooling achievement, development in non-cognitive and cognitive abilities could be achieved through these programs and selection into decent job could become possible afterwards (IDB 2007; World Bank 2007). Therefore, as a result unequal distribution of human capital could be neutralized.

It is evident from the experience of OECD member countries that association between parent and offspring can be weaken if public spending on pre-school education is increased and high enrolment rate is achieved. If early childhood development program cover a significant proportion of population then it could prove to be beneficial. Surely, it could not be possible that ECD by itself ensure equal opportunities but along with this subsequent investment in skill is a precondition and an area where public policy action could be extremely powerful.

Government should implement and enforce the minimum education laws. For example, in US, there is a policy that individuals with age between 5 to 17 years must be in an educational institute. This change in educational level have transmissible consequences. This will help in improving skills and human capital of individuals and will increase their

socioeconomic status. It is evident from OECD countries, the extension in compulsory education to secondary level caused an increase in parental education, that in turn effect positively and significantly on the educational achievement of their offspring. The highest impact of such extension in compulsory education is observed for the middle class. As far as the poor class is concerned, along with such compulsion, other material incentives are also required.

To do so, first and foremost, access to education should be a prime priority. In this light, programs like that stimulate children to go to school are extremely valuable. Further, government should finance or subsidize the tertiary education to remove financial constraints of the poor to educate their children. In addition, well-targeted policy intervention (such as promoting the diffusion of student loans to mitigate family financial constraints) for improving tertiary education for poor students can lead to positive spillovers for successive generations (IDB 2007; World Bank 2007).

It is also argued that mobility to a greater extent may not automatically be achieved if more educational opportunities are offered. For reducing inequalities in educational achievement and promoting mobility, targeting and enforcement of policies is mandatory to bring out positive outcomes. So, in case if access to educational attainment to everyone is achieved this could further facilitate the children to climb up in occupational ladder. This will also facilitate upward intergenerational income mobility.

Our results show that opportunities for the children are based in and transmitted from the home, so reliance upon the education system or job market to increase mobility may be an overly optimistic strategy. There is a need for institutional reforms and behavioral changes to improve the socio-economic status of the current generation. Finally, government should

ensure the policy of merit in order to equalize the opportunities for every talented person and eliminate nepotism from the job market.

Existence of difference in returns to schooling between informality and formality might be due to underlying three possible reasons. First, the difference in quality of education that both type of workers received. There are chances that individuals who are in informal employment possess lower quality of education than their formal counterpart. However, the provision of on the job training and non-formal schooling by the government may complement low quality of education and improve the productivity of workers. However, investigating the quality of education and possession of skill is crucial for finding out the differences in returns to education in both type of employment.

The second possible reason for difference in rewards might be under consideration of education (because of discrimination) or lower productivity of education in informal employment. If true, then it is an evidence of dual labor market theory. However, if informal sector firms become formal then productivity can be increased due to accessing public infrastructure and programs and gradation of technology. For this, removal of complex regulatory process from the labor market by the government is required. Hence, policies related to labor market reforms and regulation should be considered by policymakers.

The possible policy implications drawn from the analysis are; 1) to improve the quality of schools from which informal sector workers graduate, 2) to provide training and non-formal schooling for workers in the informal sector and 3) to remove complicated regulations in the labor market and seeking to provide incentives for informal sector firms

to become formal. Hence, policies related to labor market reforms and regulation should be considered by policymakers.

Informality is not caused by a single factor, rather it is complicated and multifaceted segment of the economy of Pakistan. At micro level, there are regional, socioeconomic and demographic factors (i.e. rural populations, lack of human and physical capital, high percentage of young) associated with informality and in turn lower productivity and income. At macro levels, lack of economic development and poor governance are among the major factors causing the informality to grow fast. Bad governance in terms of imposition of an excessive regulatory and tax burden creates informality. This is because when the cost of fulfilling these regulations exceeds the benefits provided to formal enterprises, firms prefer to operate informally. Informality, however, exists because it offers the advantages of flexibility.

A first policy option could be deregulation of formal economy. The logic behind this option is that as informal economy is considered to emerge due to over-regulations. This will relax those in the formal economy from the constraints that force up labour costs and prevent flexibility. This will lower the distinction between formal and informal economy.

However, there are some problems with this policy option. The view behind de-regulation is that this will reduce the informality. However, evidence suggests even if the degree of regulation is reduced, it could not encourage the informal entrepreneurs to become formal. Even, if high level of formalization is achieved, this result in poor working conditions rather improved working conditions and output (Williams, 2006, 2014a).

Another policy option is eradication of informal economy, but in reality this is not doable. In pursuing this, there may arise different problems. If in one hand it become costly for

government then on the other hand entrepreneurial activities will be destroyed that are seeking support for nourishment. So, this approach is not applicable because it can take away the existing opportunities from the poor, while without taking into account other measures of provision of livelihood. Therefore, a great challenge faced by the government is to join up its policies of informal economy with the policies of entrepreneurship. It is also required by the government to join up its policies of informal economy with the policies of social cohesion and employment creation.

The labor cost and ease of hiring and firing of the workers not only determine the demand for formal workers but also labor and firms' productivity is crucial in determination of labor demand. At individual level, labor productivity is determined by technical and social skills obtained at home and school. Educational reforms, in the form of better school infrastructure, more suitable curriculum and teacher's incentives are needed for transforming the schooling into learning. For retaining their position in the labor market in regard to changing market conditions, the worker who are already in the labor force need to improve their productivity.

In order to control the harmful effects of prolonged unemployment of the workers who have lost their jobs, labor reinsertion systems, including orientation and retraining is required. At the firm level, management quality, better use of capital investment, and the capacity of adopting and developing new technologies, processes, and products determine the labor productivity. Finally, at the national level, productivity of workers depends upon the provision of government institutions and quality of public infrastructure. Furthermore, competition in and access to global markets also play crucial role in determining the

productivity. It is not surprising, gradual formalization of the economy is associated with sustained economic growth.

Moreover, there are limited opportunities of high-status occupations in rural regions that is why, people are engaged in the lower status occupations. Government should create high status occupations in the rural regions. Developing rural areas and access to capital market are other factors that should be taken into account while considering poverty and informality in Pakistan. The central administration may also organize targeted vocational training for rural farmers for the use of new agricultural technologies.

Strong efforts have to be made to address decent work deficits among rural workers. This implies protection by labor legislation, which in many countries excludes agricultural workers and home-based workers, strengthening the labor inspectorate system in rural areas, improving occupational health and safety, supporting farmers' unions and workers' organizations, extending social security and insurance systems, and access to land tenure.

The essential feature of a viable smallholder agriculture is the development of a smallholder farming system that is productive and remunerative; integrated into dynamic markets; and sustainable and resilient to risks and shocks. Link producers to new markets opportunities, provide training on marketable skills and production technology, establish policies that allow group formation and joint direct marketing, and build capacity in negotiating better contracts. This combined approach would ensure better value capture and improved terms of trade, especially in the lower parts of the supply chain where informality is most pervasive.

Finally, informality should not be ignored while formulating policies of poverty eradication and inequality because of its association with poverty. Significant progress has been made

in the past many decades for reducing poverty, but the main focus of these efforts was on education and skill development programs. The societies, like Pakistan where educational and occupational persistence is high and the labor market is segmented into formal and informal sector, focusing only on provision of education will not reduce the poverty because in segmented labor market, equal level of education may bring different returns both in formal and informal sector with the lower in informal sector. Therefore, in such situations a set of labor, education and social policies is required which minimizes the burden of inheritance wherein poor are poor because they were born poor is needed.

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Appendices:

Appendix I

- **Background of Informality**
    - **Evolution of Definition**

The concept of informal sector was first recognized in 1970s for describing the economic activities taking place outside the corporate public and private sector establishments but it

is associated with efforts of the 1950s and 1960s of economic development.[81] The term informal sector was first coined by a British Anthropologist, Keith Hart (1971) in his study "*low-income activities among unskilled migrants from Northern Ghana to the capital city, Accra*", who could not searched for wage employment. After this, International Labor Organization (ILO) while researching into the Kenyan labor market used the word of informal employment for describing the self-employment and microbusinesses carried out in urban areas that lack regulations, have low productivity and informal learning, use ownership of families as means of production (ILO 1972, p. 6).

During 1980s the concept of informal sector spread and it incorporated all the changes that were taking place in advanced capitalist economies. These changes were associated with informalization of employment relation. During economic crisis, employment in informal sector increases along with increase in open-unemployment in Latin America (Tokman, 1984). In Indonesia and Malaysia, millions of people who became unemployed during Asian Financial Crisis move into informal sector (Lee, 1998). Employment in informal sector also expanded in Central and Eastern Europe as a result of economic transition. During the 1990s, many countries and industries have experienced informalization due to globalization of the economies (Standing, 1999).

Therefore, during the decade of the 1990s concept of the informal sector realized international acknowledgement and was incorporated into the official international schema. As a result of this realization ILO redefined the informal sector in the 15th ICLS

[81] Lewis (1954) provided model of dualism, between a capitalist sector (with profit maximization and market orientation), and a subsistence sector (in rural and urban areas) following different, non-market, rules, and acting as a reserve pool of labor for the modern sector. An influential variant of this approach was put forward by Harris and Todaro (1968).

(1993)[82] as "*consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. These activities operate within a small sector, with little division if any between labor and capital as factors of production. Labor relations in these activities are socially determined as opposed to being contractually set with formal guarantees*".

Despite, the use of informal sector at a wider level, there is no consensus on defining and measuring it except this recognition that informal sector consists of the activities that take place outside the legal and regulatory frame work. Heterogeneity of the informal sector could be the possible reason of this disagreement. There was a sharp rise in many forms of non-standard employment during 90s.[83] It was realized that this increase in employment has close association with informal sector and the two (informal sector and informal employment) should be analyzed together (Hussmanns, 2001).

Perry et al., (2007) argued that informal sector is heterogeneous, consisting of the firms and workers excluded from the formal economy on the basis of cost benefit analysis. Reis et al., (2009) established that informal sector is indeed a heterogeneous in nature consisting of "*unregistered small firm, the street vendor and the large, registered formal firm that employs a share of its workers without offering them written contracts with access to benefits and unemployment protection*". This heterogeneity became the reason of the failure of the enterprise-based definition provide by 15th ICLS which was unable to explain all the aspects of an increasing informalization of employment within the formal sector itself.

[82] International Conference of Labor Statisticians

[83] Non-standard form of employment includes small jobs, casual work, contributing family workers, unwarranted employment and outwork.

As a result of this, two different concepts emerged i.e. informal sector and informal employment. Informal employment, a job based concept is defined as "*total number of informal jobs, whether carried out in formal sector enterprises, informal sector enterprises, or households (unpaid family workers in formal and formal enterprises), or the total number of persons engaged in informal jobs during a given reference period*".[84] Whereas informal sector, an enterprise-based concept is considered to include employers, employees, self-employed who work independently or run family business and individuals working in small-unregistered enterprises.

Table I: Conceptual Framework of Informal Employment

Production units by type	**Jobs by status in employment**								
	Own-account workers		Employers		Contributing Family workers	Employees		Members of producers' cooperatives	
	Informal	Formal	Informal	Formal	Informal	Informal	Formal	Informal	Formal
Formal Sector Enterprises					1	2			
Informal sector enterprises [a]	3		4		5	6	7	8	
Households[b]	9					10			

Source: Seventeenth International Conference of Labor Statisticians, Geneva, 24 November-3 December 2003. (a) As defined by the Fifteenth International Conference of Labor Statisticians (Excluding households employing paid domestic workers); (b) Households producing goods exclusively for their own final use and households employing paid domestic workers.

ILO divides the production units in an economy into three sectors i.e. formal sector enterprises, informal sector enterprises and households (Table I). In the same way, jobs are classified into five groups such as own-account workers; employers; contributing family workers; employees; and members of producers' cooperatives, with respect to status in

[84] ILO Report, Decent work and the informal economy (2002b) presented in 17th ICLS.

employment.[85] The jobs, not existing in the type of production in question are represented by dark grey cells whereas the light grey cells represent the jobs that are there in the type of production units concerned but these are irrelevant to informal employment. Informal employment is represented by unshaded cells in different production units. Cells 3 and 4 indicate own-account workers and employers having their own informal sector enterprises whereas cells 1 and 5 represent contributing family workers, regardless of the work in informal or formal sector enterprises. Employees with informal jobs, whether employed by formal sector enterprises, informal sector enterprises, or as paid domestic workers by households (cells 2, 6 and 10) and finally, the members of informal producers' cooperatives (cell 8).

- **Supply Led and Demand Led Views of Informal Employment**

During the past decades' tremendous growth of the informal sector attracted the attention of researchers and policy makers and a debate started regarding its features, size and influence on economy. This debate headed towards different school of thoughts[86] who sees informal employment from different perspectives. Under one perspective informal sector arises because of surplus labor, composed of marginal activities, has no link with the formal sector and provides income to poor in times of economic crises (Tokman 1978; Sethuraman 1976; Fields 1975; Hart 1973). Under second perspective, people join the informal economy to avoid cost, time and effort of formal registration (Pery et al., 2007; Maloney 2004; De Soto 1989). Behind these perspectives, there are two different hypotheses concerning informal economy (Harati, 2013).

[85] These groups are taken from International Classification of Status in Employment (ISCE-93).
[86] Dualistic, Structuralist and Legalist, for detail analysis see Chen (2012).

Supply Led View

First hypothesis identifies employment in informal sector a supply-led and voluntary phenomenon. That is, working choice by the people between formal and informal sector is voluntary, depending upon their preferences and the value of marginal productivity in each sector. In this context, informal employment can be seen as strategy that minimizes the cost of the entrepreneurs who try to reduce the costs of labor regulations. Eventually, government-induced distortions like minimum wages and excessive taxes cause informal sector to emerge. Empirical evidences, supporting the supply-led and voluntary choice of employment in the informal sector associated with reasonable financial benefits are provide by Heckman and Sedlacek (1985), Melony (2004) and Packard (2007). According to this view the link between informality and poverty is not obviously manifested.

Demand Led View

In contrast to above hypothesis, accepting job in informal sector is a consequence of lack of opportunities for accessing jobs to formal sector due to institutional barriers, personal characteristics and labor market regulations. It means to get rid of unemployment, informal employment is a last resort option for low skilled workers. Lower wages, inferior working conditions and fewer career opportunities for progress are the characteristics of informal sector (Fields, 1975). For that reason, the second hypothesis sees the informal employment as demand-led and {Amuedo-Dorantes, 2004 #5}. In this perspective, firms demand for cheaper labor along with worker's requirement of job and not their preferences determine the employment in informal sector. So, in contrast to supply-led view, demand-led view stresses upon involuntary nature of employment. In this perspective, incapability of the household in fulfilling their basic needs such as food, clothing, shelter and fuel along with problems in attaining the job in formal sector describes the household's choice of informal

sector (Dorantes, 2004). Therefore, involuntary view of employment identifies poverty not only a consequence of informality but also one of its determinants (Dorantes 2004). Here, a clear association between poverty and informality can be seen.

Appendix II

- **Informal Sector: Pakistan**

Like other developing countries, Pakistan has a huge informal sector side by side with the formal sector. In this economy workers have limited access to labor welfare services. From the previous many years, employment in the informal sector is increased. In almost all sectors[87] of Pakistan economy Informal activities are present.

- **Composition of Informal Sector**

Informal sector in Pakistan is determined by the size of employment in a firm and household enterprise. For computational purpose, the division of employment in informal sector is described as follows: "*All household enterprises owned and operated by own-account workers, irrespective of the size of the enterprise (informal own-account enterprises),*[88] *enterprises owned and operated by employers with less than 10 persons engaged. It includes the owner (s) of the enterprise, the contributing family workers,*[89] *the employees, whether employed on an occasional or a continuous basis, or as an apprentice, and excluded are all enterprises engaged in agricultural activities or wholly engaged in non-market production*".

[87] agriculture, manufacturing, construction, finance, transport or services.

[88] "a person working during the reference period, on own-account or with one or more partners at a self-employment job, without any employee engaged on a continuous basis; but, possibly, with one or more contributing family workers or employees engaged on an occasional basis. It includes owner cultivator, share cropper and contract cultivator".

[89] a person working without an payment in an enterprise that is run by a member of his/her household or other related persons.

- **Classification of Occupation**

Table II. Major Occupational Groups Identified by Pakistan Bureau of Statistics (2015)

S.NO.	Major Groups	Sub-Major Groups[90]
Group 1	Mangers	4
Group2	Professionals	6
Group3	Technicians & Associate Professionals	5
Group4	Clerical Support Workers	4
Group5	Services & Sales Workers	4
Group6	Skilled Agriculture, Forestry & Fishery Workers	3
Group7	Craft and Related Trades Workers	5
Group8	Plant & Machine Operator & Assemblers	3
Group9	Elementary Occupations	6
Group10	Armed Forces Occupation	3

- **Statistics of Informal sector**

According to Labor Force Survey (2014-15), informal sector provides almost 72.6 % non-agricultural labor force to earn their livelihood from this sector. The rural share in informal activities is 76.1 % whereas urban areas accounts for 69.2 %. In contrast to this, the concentration of formal activities in urban areas is more than in rural areas *i.e.*, 30.8 % and 23.9 %, respectively.

Industry wise share of the informal sector is as follows; wholesale and retail trade 34.1 %, manufacturing 23.2 %, construction 16.4 %, community, social & personal services 14.5 % and transport 10.9 %. With respect to occupation, service and sales workers has 33.1 % contribution, while craft & related trades workers have 28.5 % and elementary occupations have 18.5 % shares in informal activities. While the share of other occupation is very low

[90] These are further divided into minor groups and unit groups, for detail see Pakistan's Standard Classification of Occupation (2015).

in informal sector activities. The share of employees and own account workers which represents the employment with respect to employment status is 44.5 % and 44.0 %.

The reasons of the existence of this huge informal sector may be high population growth rates and migration of people from rural to urban areas. In addition to this government's inability to create sufficient numbers of quality jobs to absorb excessive labor force. Overall growth of informal employment as reported by Jamal (2016) was 3.36 % per annum which was substantially higher than the formal employment 0.27 % per annum from 2001-02 to 2013-14.

Appendix III

- **Theoretical foundations of formal-informal sector**

Roy (1951) model of self-selection provides the theoretical foundations for occupational choice. Occupational choice based on endowments of occupation specific skills have important implications for the distribution of earnings. Inferences drawn from the theory proved to be helpful in doing empirical analysis regarding impact of education on wages and choice of employment in different sectors. Therefore, it is crucial to review the Roy model of self-selection for occupational choices and to see the impact of education in different sectors.

The importance of Roy's work was first recognized after the empirical work done by Quandt (1972), Gronau (1974), and Heckman (1974). Mathematical formulation of the Roy model can be found in Dahl (2002), Arias and Khamis (2008), and Rankin et al., (2010) for two and more than two sectors. The model developed below is for general case (more than two sectors) and describes how individuals decide to join a sector/occupation based on the Roy model depending upon occupation specific skill. The self-selection of

workers into different sectors of the economy plays an important role in explaining the economic outcomes observed in different sectors of the economy i.e. the distribution of worker types in a sector represents the distribution of productivity and wages in that sector. Suppose different occupations available to individual are denoted by s. The choice of occupation by the workers depend upon utility u_s that they derive from each occupation. This utility is given by the sum of income y_s and non-pecuniary benefits ω_s in the sector net of costs (pecuniary and non-pecuniary) c_s of sector participation. Adopting a latent index formulation, we have:

$$u_{si}^{*} = y_{si} + \omega_{si} - c_{si} = z_i'\gamma_s + \eta_{si}$$

Where

u_{si}^{*} is utility derived from choosing a particular profession s by individual *i*

z_i' is vector of observed characteristics (human capital and demographics) of individual *i*

η_{si} consists of unobserved characteristics e.g. preferences for work and innate abilities

y_{si} is observed in sector s only when

$$u_{si}^{*} > \max_{j \neq s}(u_{ji})$$

This condition states that an individual will adopt that occupation where the net benefits of choosing that occupation are positive. If we define;

$$\varepsilon_s = max_{j \neq s}(u_{ji} - u_{si}) = max_{j \neq s}[y_{ji} + e_{ji} - c_{ji} - (y_{si} + e_{si} - c_{si})]$$
$$= max_{j \neq s}(Z\gamma_{ji} + \eta_{ji} - Z\lambda_{si} - \eta_{si})$$

Then under this definition $\varepsilon_s < 0$ stating that no earnings will be yielded for unemployed. Potential outcome for any worker in sector s is given by;

$$y_s = x\beta_s + \mu_s$$

Where s is the sector which the individual chooses.

$$E(y_s \mid x, s = 1) = x_i\beta + E(u \mid x_i, s_i = 1)$$

$$E(y_s \mid x, s = 1) = x_i\beta + E(u_i \mid x_i, \varepsilon_i < 0)$$

Considering only two sectors, formal and informal, potential earnings for workers are given by;

$$y_1 = x\beta_1 + \mu_1$$

$$y_2 = x\beta_2 + \mu_2$$

Where

x is subset of z, error terms $\mu_1$and μ_2 are correlated, but independent of z's instruments.

- **Mobility Matrix**

There are two ways of capturing mobility, one is transition matrix and the other is regression analysis. Transition matrix tells about the relative position of the child as compared to the father whereas regression analysis provides the extent of persistence.

In discussing the mobility/immobility[91] across generation the mobility matrix can be constructed in the following manner.[92] Suppose individual's life time utility U_i depends upon his occupational choice i.e. informal or formal employment;

$$U_i = \begin{cases} infoe_i, & if\ an\ individual\ chooses\ informal\ employment \\ fore_i, & or\quad if\ an\ individual\ chooses\ formal\ employment \end{cases}$$

Utility for each employment is distributed normally;

$$infe_i \sim N\left(\mu_{infe}, \sigma^2_{infe}\right)$$

$$fore_i \sim N\left(2\theta_i\mu_{fore}, \sigma^2_{fore}\right)$$

[91] Here only the construction of occupational mobility matrix is given. Educational mobility matrix can be constructed in the similar manner.

[92] See Brunetti and Fiaschi (2015).

Where N(.) is Gaussian distribution with $0 < \mu_{ife} < u_{fore}$ and $\sigma^2_{infe} \leq \sigma^2_{fore}$ and $\theta_i \in [0,1]$. θ_i is a random variable representing individual's skills and his family background including social connections.

An individual will decide to choose formal employment if and only if;

$$E[fore] \geq E[infe] + \sigma^{RP}$$

Here σ^{RP} represents risk premium showing the attitude of individuals towards risk. This risk premium is positive and non-decreasing in $\frac{\sigma^2_{fore}}{\sigma^2_{infe}}$ for risk averse and risk neutral individuals. Above Condition can be written as;

$$2\theta_i \mu_{fore} \geq \mu_{infe} + \sigma^{RP}(\frac{\sigma^2_{fore}}{\sigma^2_{infe}})$$

$$\theta_i \geq \frac{\mu_{infe} + \sigma^{RP}(\frac{\sigma^2_{fore}}{\sigma^2_{infe}})}{2\mu_{fore}} \equiv \lambda$$

Probability mass of individuals choosing the employment based on income incentives is capture by the value of λ. The higher the value of λ the lower is the probability of moving towards formal employment.

Regarding the opportunities associated with family background and social environment of individual *i*, it is assumed that if his/her parents are informally employed, the probability distribution of θ_i is giving by:

$$f(\theta_i|infe) \sim U(0, \theta^{max})$$

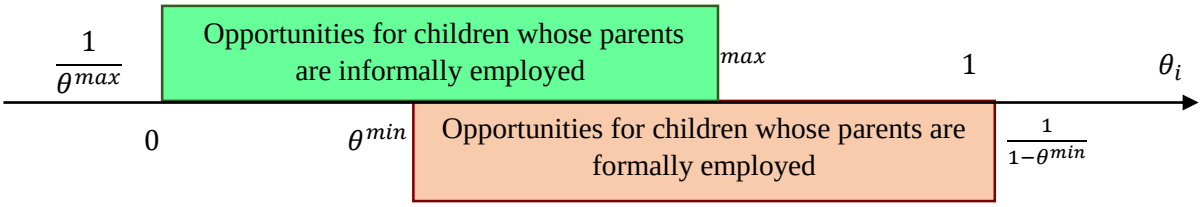
On the other hand, if his/her parents belong to formal employment, then probability distribution of θ_i is giving by:

$$f(\theta_i|fore) \sim U(\theta^{min}, 1)$$

Here $\theta^{max} \leq 1$ and $\theta^{min} \geq 0$

This condition is plotted in the following figure which shows the opportunities for the children whose parents belong to different sectors.

Figure: comparison of opportunities for children with parents having formal and informal employment



The change from informal to formal employment takes place under the following conditions; $\theta^{max} > \lambda$ and $\theta^{min} < \lambda$. These condition states that for movement from informal to formal employment λ should be lower than θ^{max} and λ should be greater than θ^{min} for movement from formal to informal employment.

Markov matrix describing occupational mobility is given by;

father/children	Informal Employment	Formal Employment
Informal Employment	$\frac{\lambda}{\theta^{max}}$	$\frac{\theta^{max}-\lambda}{\theta^{max}}$
Formal Employment	$\frac{\lambda-\theta^{min}}{1-\theta^{min}}$	$\frac{1-\lambda}{1-\theta^{min}}$

The first element of the diagonal, in this matrix represents the probability of a child to follow his father occupational class (informal employment) given the probability distribution of θ and his incentives λ. In the same way second element of the diagonal measures the probability of a child with a father in formal employment to choose formal employment.

- **Model of Optimal Schooling**

Informality also put the limits on the returns to schooling,[93] which in turn reduce the incentive to acquire human capital. Theoretical and empirical explanation of the relationship between education/human capital and earnings is provided by Becker (1964) and Mincer (1974) and the model of optimal schooling investment is provided by Card (1995, 1999, 2001). The model given below assumes that an individual derived his utility from average earnings per year (y) and years of schooling (s).

$$U\,(y,S) = ln\,(y) - h\,(S)$$

Earning that an individual earns depend upon each level of education, therefore we can write earning as a function of schooling; $y = f\,(\mathrm{S})$

$$U\,(\mathrm{y,S}) = ln\,[\,f\,(\mathrm{S})\,] - h\,(S)$$

Here $ln\,[f\,(\mathrm{S})]$ and $h(S)$ represents the benefit and cost of schooling simultaneously and are increasing convex function of *S.* Optimal level of schooling which maximizes the utility of individual is obtained by equating the marginal benefit and marginal cost of schooling. Marginal benefit of schooling is given by $f'(S)/f\,(S)$ whereas marginal cost of schooling is given by $h'(S)$.

If we assume that both marginal benefit and marginal cost of schooling are linear function of person specific characteristics and slope, then;

$$\frac{f\,\acute{(}S)}{f\,(S)} = g_i - k_1 S_i = \beta(S_i) \qquad k_1 > 0$$

$$h\,\acute{(}S) = j_i - k_2 S_i \qquad k_2 > 0$$

$$g_i - k_1 S_i = j_i - k_2 S_i$$

[93] Theoretical foundations for returns to education in formal-informal sector is provided in appendix III.

$$S^* = \frac{g_i - j_i}{k} \qquad k = k_1 + k_2$$

g_i represents the variation arises due to variation in ability and j_i represents the variation arises due to family wealth *i.e.* heterogeneity arising from two sources (1) differences in marginal returns/benefit to schooling and (2) differences in marginal cost of schooling. We will obtain the following equation by integration of marginal benefit equation;

$$\ln(yi) = \alpha_i + j_i S_i - \frac{1}{2} k_1 S_i^2$$

If there exist linear relationship between education and earnings, then k_1 must be equal to zero.

Appendix IV (Informality and Poverty)

Table III: Poverty and Informality Definition Employed by Studies in Empirical Analysis

S.No.	Studies	Poverty measurement approach	Poverty Variable	Informality
1.	Albania (2016)	Income Poverty	Binary dependent variable	Employment without social security and payment of tax
2.	Argentina (2009)	Income Poverty	Binary dependent variable	1. Non-wage earners in small firms (firms with less than five workers), 2. non-registered wage earners those who evading taxes and domestic workers
3.	Chile (2004)	Income Poverty	Binary dependent variable	Employment without any contract
4.	Ecuador (2015)	Unsatisfied basic needs (UBN) index as a proxy for income	Binary dependent variable	Employment without contract and social security.
5.	Egypt (2014)	Per capita expenditure per month of the household head	Binary dependent variable	Employment without contract and social security.

Table IV: Descriptive statistics for all variables (poor/non poor)

	Over All		Formal		Informal	
	Poor	**Non Poor**	**Poor**	**Non Poor**	**Poor**	**Non Poor**
Head of Household Characteristics						
Mean Age	42.29	43.48	44.68	45.38	41.94	42.62
Mean Age Squared	1907.51	2005.50	2108.31	2167.11	1877.92	1932.8392
Mean number of years in school	4.41	8.20	8.15	11.57	3.86	6.66
age between 15 to 34	23.84	20.90	16.45	14.97	24.92	23.56
age between 35 to 44	32.74	31.52	30.35	30.83	33.02	32.04
age between 45 to 54	27.88	30.45	34.05	32.75	27.16	28.83
age greater than 54	15.55	17.14	20.63	19.97	14.90	15.57
Male	98.38	98.82	99.04	98.14	98.28	99.13
Female	1.62	1.18	1.86	0.96	0.87	1.72
Education (%)						
No formal Education	44.39	20.13	20.61	7.21	1.72	25.94
Primary	19.02	13.48	12.78	5.75	19.93	16.96
Middle	13.6	12.9	11.98	6.96	13.86	15.52
Matriculation	14.6	21.7	23.96	17.86	13.20	23.38
Graduation	6.73	21.10	20.45	33.77	4.71	15.41
Post-Graduation	1.66	10.76	10.22	28.46	0.40	2.81
Marital Status (%)						
Married	94.42	94.35	94.57	93.94	94.40	94.54
Otherwise	5.58	5.65	5.43	6.06	5.60	5.46
Household Composition (Mean)						
Family Size	7.24	6.00	8.35	6.13	7.07	5.93
Female to Male Ratio	1.24	1.21	1.22	1.22	1.23	1.19
Employment Ratio	0.30	0.31	0.26	0.29	0.30	0.32
Dependency Ratio	0.44	0.36	0.41	0.34	0.44	0.36
Regional Categories (%)						
Punjab	49.56	40.03	39.46	39.05	14.90	20.29
Sindh	20.74	29.14	16.13	26.78	51.05	40.47
Baluchistan	13.62	9.25	20.29	9.72	21.42	30.20
KP	16.08	21.58	24.12	24.45	12.64	9.04
Urban	63.61	85.61	61.66	88.16	84.46	63.90
Rural	36.39	21.58	38.34	11.84	15.54	36.10
N	4,875	10,379	626	3219	4,249	7,160

Table V: Definition of Variables

Variable Name	Definition
Dependent variables	
Poverty	Poverty status of Informally employed workers
Informal Employment	
Formal Employment	Dummy=1 if formally employed workers, 0 otherwise
Clerical Support Workers	Dummy=1 if Clerical Support Workers, 0 otherwise
Sales workers	Dummy=1 if Sales Workers, 0 otherwise
Craft and Related Trade workers	Dummy=1 if Craft and Related Trade workers, 0 otherwise
Plant & Machine Operator & Assemblers	Dummy=1 if Plant & Machine Operator & Assemblers, 0 otherwise
Elementary Occupations	Dummy=1 if Elementary Occupations, 0 otherwise
Explanatory Variables	
Age	Age of employed person
Education	Education of employed persons
Dependency ratio	Number of Dependents to the total member of
Marital Status	dummy =1 if married, 0 otherwise
Family Size	Total number of members in a family
Employment Ratio	Number of other working members with respect to
Female to male ratio	Total number of females with respect to males

Table VI: Parameter Estimates-Test on the Validity of the Selection Instruments

Independent variables	Informal/Formal (1/0) (Probit)	Per adult equivalent expenditures formal employment (OLS)
Schooling	-0.251***	579.2***
Age	-0.0258**	20.73
Age square	7.91e-05	0.244
Marital status	0.347***	1,087**
Family Size	-0.00216	-362.3***
Gender ratio	-0.0114	-162.4
Employment Ratio	0.305**	4,767***
Dependency	0.0769	-136.2
Urban	0.223***	2,441***
Punjab	0.0596	-439.9*
Sindh	0.254***	1,672***
Balochistan	0.0252	-1,142***
Constant	3.238***	-5,465***
Observations	6,377	2,875
R/Pseudo squared	0.1597	0.229

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1% 5% and 10%

Table VII: Parameter Estimates of Informal Sector Employment-Multinomial Logit Model (Selection Equation, First Stage)

	Estimated Coefficients					Marginal Impacts				
Base Category-Formal Employment	Informal clerical workers	Informal Sales Workers	Informal Craft Workers	Informal Machine Operators	Informal Elementary Occupation	Informal clerical workers	Informal Sales Workers	Informal Craft Workers	Informal Machine Operators	Informal Elementary Occupation
Schooling	-0.148***	-0.409***	-0.583***	-0.660***	-0.682***	0.108***	0.00850***	-0.0435***	-0.0320***	-0.0218***
	(0.0200)	(0.0171)	(0.0276)	(0.0366)	(0.0402)	(0.00332)	(0.00180)	(0.00277)	(0.00174)	(0.00127)
Age	0.0968**	-0.0975***	-0.0492	0.0246	-0.103***	0.00978*	0.0124***	-0.0185***	-0.00257	0.00229
	(0.0385)	(0.0238)	(0.0330)	(0.0441)	(0.0394)	(0.00510)	(0.00346)	(0.00390)	(0.00250)	(0.00201)
Age square	-0.00131***	0.000729***	0.000201	-0.000722	0.000626	-2.10e-05	-0.00014***	0.000165***	1.42e-05	-3.87e-05*
	(0.000437)	(0.000266)	(0.000373)	(0.000511)	(0.000454)	(5.68e-05)	(3.93e-05)	(4.40e-05)	(2.85e-05)	(2.34e-05)
Marital status	0.641***	0.567***	0.582***	0.717**	0.560**	-0.149***	0.0344	0.0603**	0.0240	0.0202
	(0.247)	(0.165)	(0.225)	(0.293)	(0.260)	(0.0338)	(0.0226)	(0.0274)	(0.0173)	(0.0135)
Family size	-0.0309	0.0141	-0.0110	-0.0348	0.0127	0.000983	-0.00305*	0.00391*	-0.000809	-0.00165
	(0.0195)	(0.0134)	(0.0188)	(0.0241)	(0.0227)	(0.00279)	(0.00176)	(0.00221)	(0.00144)	(0.00110)
Gender ratio	-0.000785	-0.0368	-0.0808	0.0221	0.0588	0.00598	0.00126	-0.00581	-0.00615	0.00176
	(0.0480)	(0.0378)	(0.0515)	(0.0557)	(0.0580)	(0.00755)	(0.00433)	(0.00623)	(0.00393)	(0.00250)
emp_ratio	-0.309	0.785***	0.377	0.167	1.793***	-0.129**	-0.0617*	0.123***	0.00929	-0.00539
	(0.356)	(0.265)	(0.360)	(0.451)	(0.420)	(0.0543)	(0.0321)	(0.0433)	(0.0273)	(0.0205)
dependency	-0.656***	0.316*	0.216	0.437	0.765**	-0.0377	-0.0779***	0.0569*	0.0123	0.0180
	(0.250)	(0.190)	(0.256)	(0.314)	(0.327)	(0.0383)	(0.0225)	(0.0314)	(0.0196)	(0.0143)
Constant	-2.236**	5.147***	5.549***	4.865***	7.757***					
	(0.934)	(0.607)	(0.840)	(1.077)	(0.996)					
Observations	6,377	6,377	6,377	6,377	6,377	6,377	6,377	6,377	6,377	6,377
Wald test on selection instruments (χ^2)	6.33**	16.73**	2.22	0.31	6.92**					
Log likelihood	-8592.7599									
Pseudo R2	0.1015									

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%

Table VIII: Multinomial Endogenous Switching Regression – Per Adult Equivalent Consumption Expenditure (Corrected Estimates: Second Stage)

Dependent variable (consumption expenditures)	DMF1						DMF2					
	Formal	Clerks	Sales Workers	Craft Workers	Machine Operators	Elementary Workers	Formal	Clerks	Sales Workers	Craft Workers	Machine Operators	Elementary Workers
Schooling	29.21	-180.5	-793.0	-1,053	-1,121	419.9	97.95	-85.68	-791.1*	-834.3	-1,065	568.2
	(401.1)	(372.8)	(486.3)	(1,190)	(873.1)	(959.9)	(366.6)	(351.0)	(458.5)	(776.6)	(712.1)	(764.8)
Family size	-355.4***	-164.1**	-222.7***	-299.7	-274.4*	-143.8	-353.4***	-165.4**	-218.3***	-281.7**	-271.8**	-137.8
	(66.24)	(67.94)	(81.99)	(183.2)	(155.9)	(156.8)	(60.42)	(65.22)	(78.81)	(140.1)	(123.5)	(132.2)
Gender ratio	-368.0*	159.8	-89.33	-235.2	-271.6	247.7	-325.4	146.9	-59.35	-194.0	-246.8	132.0
	(216.6)	(210.1)	(284.9)	(471.3)	(334.6)	(458.6)	(198.0)	(198.2)	(266.7)	(328.1)	(296.3)	(392.1)
Emp ratio	4,560***	5,253***	1,423	1,016	371.4	2,444	4,606***	4,920***	1,754	1,404	384.9	1,562
	(1,613)	(1,786)	(1,836)	(2,946)	(3,019)	(3,616)	(1,503)	(1,667)	(1,745)	(2,119)	(2,432)	(3,012)
Dependency	-773.1	1,243	730.6	799.3	107.9	1,042	-789.5	1,071	858.7	473.8	192.6	438.0
	(1,006)	(1,235)	(1,230)	(2,169)	(2,730)	(2,782)	(962.5)	(1,131)	(1,147)	(1,436)	(2,162)	(2,338)
_m1	-3,261**	4,843	2,220	-2,926	1,551	3,175	-5,296	1,752	7,760	-1,100	3,664	-213.5
	(1,663)	(7,914)	(7,920)	(8,239)	(9,141)	(7,646)	(3,556)	(9,091)	(9,356)	(8,834)	(10,437)	(9,688)
_m2	6,940	-576.2	-7,991	-11,497	2,428	-4,860	7,753	-1,177	-9,077	-9,239	3,679	-3,372
	(4,923)	(844.1)	(7,101)	(10,254)	(13,447)	(9,987)	(6,304)	(1,633)	(8,911)	(8,392)	(13,486)	(11,573)
_m3	4,066	3,150	1,145	-9,450	2,209	11,776	2,864	4,982	2,866*	-6,295	5,280	18,911
	(5,848)	(4,510)	(920.0)	(16,462)	(7,238)	(16,712)	(6,251)	(5,141)	(1,464)	(13,198)	(5,665)	(12,991)
_m4	11,300	5,181	18,313	3,961	22,218	-24,873	10,088	1,394	26,268	6,820	26,239	-32,184
	(16,414)	(12,477)	(15,247)	(4,694)	(15,469)	(20,807)	(20,033)	(16,217)	(18,949)	(7,127)	(16,974)	(23,237)
_m5	-14,532	-6,251	4,225	-927.5	304.9	11,025	-19,020	-8,326	8,063	-3,100	1,354	12,757
	(13,376)	(9,517)	(8,605)	(8,671)	(2,441)	(11,726)	(16,561)	(11,843)	(10,659)	(11,771)	(4,263)	(13,407)
_m6	-5,157	14,753*	-111.5	-816.5	5,579	638.7	-5,891	13,954	5,769	3,309	7,930	-1,160
	(11,291)	(8,029)	(8,512)	(8,069)	(9,886)	(2,782)	(14,721)	(9,704)	(10,096)	(9,589)	(11,166)	(5,125)
Constant	6,626	15,180	16,118	-352.6	26,491*	-142.1	5,058	10,369	18,606	983.6	24,576**	699.1
	(6,809)	(12,415)	(14,220)	(13,679)	(13,636)	(12,533)	(6,251)	(12,223)	(13,015)	(12,080)	(11,524)	(11,094)
Observations	2,875	597	1,445	654	425	381	2875	597	1445	654	425	381

1. Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%
2. Regional and Provincial dummies are also added in the regression

Table IX: Test on Coefficients of Selectivity Variables

	Formal	Clerks	Sales Workers	Craft related workers	Machine Operators	Elementary
	DMF1					
m1 =m2=m3= m4 =m5 =m6=0	10.1	7.94	8.25	1.83	7.18	4.71
	(F6,2875)	(F6,597)	(F6,1445)	(F6,654	(F6,425)	(F6,381)
	DMF2					
m1 =m2=m3= m4 =m5 =m6=0	8.98	8.09	9.16	3.41	8.15	5.55
	(F6, 2875)	(F6, 597)	(F6, 1445)	(F6, 654)	(F6, 425)	(F6, 381)

Table X: Consumption Expenditures Effect from Counterfactual Analysis

Occupation	Expected/Actual earnings	Counterfactual expected earnings	Treatment Effect	% increase
	DMF1			
Informal clerks	6258.097	7750.753	1492.65***	23.85
Informal sales workers	6718.087	7750.352	1032.26***	15.36
Informal craft workers	5940.677	7754.503	1813.82***	30.53
Informal machine operators	6128.733	7750.72	1621.99***	26.46
Elementary occupation	5340.962	7747.572	2406.61***	45.06
	DMF2			
Informal clerks	6250.429	7750.18	1499.75***	23.99
Informal sales workers	6706.929	7741.86	1034.93***	15.43
Informal craft workers	5928.536	7746.79	1818.26***	30.67
Informal machine operators	6086.969	7743.59	1656.62***	27.22
Elementary occupation	5290.794	7741.05	2450.26***	46.31

Appendix V (Educational and Occupational Mobility)

Table XI: Son's Education against their Father's Education (Informal Employment)

Education of Fathers	Education of Sons						
	Never Attended School	Primary	Middle	Matric	Graduation	Post - Graduation	% (N)
Rural							
Never Attended	39.22	25.0	14.22	14.71	6.86	0.00	100(204)
Primary	8.24	31.76	17.65	23.53	18.82	0.00	100(85)
Middle	9.43	15.09	28.3	37.74	7.55	1.89	100(53)
Matric	17.24	13.79	20.69	34.48	13.79	0.00	100(29)
Graduation	0.00	9.09	18.18	45.45	18.18	9.09	100(11)
Post-Graduation	---	---	---	---	---	---	---
Urban							
Never Attended	32.55	19.27	21.62	18.21	8.11	0.24	100(851)
Primary	10.8	24.93	24.38	24.1	13.57	2.22	100(361)
Middle	9.24	21.01	21.43	31.93	14.29	2.1	100(238)
Matric	3.69	8.92	16.0	40.0	27.08	4.31	100(3250
Graduation	2.44	3.66	14.63	17.07	47.56	14.63	100(82)
Post-Graduation	0.00	0.00	6.25	12.5	56.25	25.0	100(16)

Table XII: Variables for Educational/Occupational Mobility Model

Variable Name	Definition
Dependent variables	
Occupation of Son	Dummy =1 if son is employed informally and residing with his father, 0 otherwise
Education of Son	Completed years of Schooling
Explanatory Variables (Educational Mobility)	
Age of son	Age of informally employed son
Age square of son	----
Education of father	Completed years of education of father
Number of Siblings	Total number of children aged below 25 in a family
Number of Workings	Total number of working member in family
Explanatory Variables (Occupational Mobility)	
Father's employment	Dummy =1 if father is employed informally, 0 otherwise
Age of son	Age of informally employed son
Age square of son	----
Education of Son	Completed years of Schooling

Information on fathers and sons age, education and income is provided in Table XIII. Employed father and sons with positive income are considered for educational and occupational mobility analysis. For full sample, father's mean age is 55 years while for sons it is 25 years. The minimum age of 36 and 20 years were to be observed for fathers and sons, respectively. Similarly, the age of 92 and 50 years were observed for father and sons respectively. The information on age, education and income is also provided at regional and provincial level.

Table XIII: Descriptive Statistics with Respect to Socioeconomic Characteristics

	Mean	Min	Max	St.dev	N
		Working Fathers			
Full Sample					
Age	55.31369	36	92	6.922195	3156
Education	5.504753	0	18	5.263303	3156
Employment Income (Annual)	251426.51	12000	7200000	307776.058	3156
Urban Sample					
Age	55.52588	36	92	6.951293	2647
Education	5.683793	0	18	5.303215	2647
Employment Income	259389.7	12000	7200000	327661.6	2647
Rural Sample					
Age	54.21022	40	86	6.667365	509
Education	4.573674	0	18	4.95223	509
Employment Income	210014.7	18000	1200000	164460.4	509
Punjab					
Age	55.68876	36	92	7.108468	1388
Education	5.56196	0	18	4.988789	1388
Employment Income	234980.3	18000	2760000	227387.6	1388
Sindh					
Age	54.77681	38	77	6.713045	802
Education	6.167082	0	18	5.250244	802
Employment Income	234192.6	30000	4200000	260295.4	802
KP					
Age	55.72425	40	78	6.655315	602
Education	4.596346	0	18	5.31455	602
Employment Income	296758.6	12000	7200000	503398.8	602
Balochistan					
Age	54.38736	39	80	6.950114	364
Education	5.32967	0	22	5.975718	364
Employment Income	277138.3	36000	2400000	225655.4	364

	Working Sons				
Full Sample					
Age	25.56052	20	50	4.86077	3156
Education	8.262041	0	18	4.928275	3156
Employment Income	162508.5	4800	2700000	135819.9	3156
Urban Sample					
Age	25.67359	20	50	4.91669	2647
Education	8.466944	0	18	4.915878	2647
Employment Income	169580.9	4800	2700000	144532	2647
Rural Sample					
Age	24.9725	20	44	4.518034	509
Education	7.196464	0	18	4.859513	509
Employment Income	125729.5	11000	480000	64385.26	509
Punjab					
Age	25.82781	20	50	5.057125	1388
Education	8.117435	0	18	4.693939	1388
Employment Income	166636.6	4800	2700000	152898.8	1388
Sindh					
Age	25.15835	20	48	4.54426	802
Education	8.620948	0	18	4.925762	802
Employment Income	153351.6	4900	1500000	126820	802
KP					
Age	25.6495	20	50	4.943111	602
Education	4.943111	0	18	5.187955	602
Employment Income	166182.6	7000	960000	121138	602
Balochistan					
Age	25.28022	20	43	4.570663	364
Education	8.700549	0	18	5.288993	364
Employment Income	160866.2	18000	720000	104617.8	364

Table XIV: Test of Independence of Irrelevant Alternatives (IIA)

Ho: Odds(Outcome-J vs Outcome-K) are independent of other alternatives										
	full sample		urban sample		rural sample		age>25		age<25	
Variables	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2
Formal	386.4	0.00	477.91	0.00	0.00	1.00	412	0.00	137.72	0.00
clerks	693.35	0.00	500.41	0.00	0.00	1.00	270.77	0.00	184.37	0.00
sales workers	256.89	0.00	346.83	0.00	0.00	1.00	-2.43	---	-362.98	---
craft workers	-425.74	---	-345.3	---	209.44	0.00	83.88	0.00	131.74	0.00
machine operators	11.85	1.00	57.75	0.0049	0.00	1.00	-4.94	---	53.2	0.0107
elementary	40.01	0.296	-142.85	000	0.00	1.00	120.3	0.00	213.18	0.00

Table XV: Wald test of multinomial logit model (full sample)

Ho: All the coefficients associated with the given variables are zero											
		Full sample		Urban Sample		Rural Sample		Age>25		Age<25	
Variables	DF	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2	χ^2	p> χ^2
clerks	5	30.428	0.00	25.82	0.00	5.686	0.338	19.108	0.002	11.331	0.045
sales workers	5	75.222	0.00	71.017	0.00	16.45	0.006	49.854	0.00	29.973	0.00
craft workers	5	97.127	0.00	85.275	0.00	19.41	0.002	77.964	0.00	27.474	0.00
Machine ope	5	54.848	0.00	46.93	0.00	13.14	0.022	32.646	0.00	27.724	0.00
elementary	5	136.77	0.00	121.26	0.00	16.09	0.007	67.011	0.00	73.531	0.00
age_C	5	11.77	0.038	12.175	0.032	6.395	0.27	2.949	0.708	2.194	0.822
age_square_C	5	7.067	0.216	7.522	0.185	4.778	0.444	2.818	0.728	2.025	0.846
Education	5	447.252	0.00	382.368	0.00	71.405	0.00	270.818	0.00	173.331	0.00
urban	5	37.032	0.00	---	---	---	---	10.87	0.054	33.881	0.00
Punjab	5	7.562	0.182	6.673	0.246	13.139	0.022	9.351	0.096	9.616	0.087
Sindh	5	14.357	0.013	19.646	0.001	0.327	0.997	10.395	0.065	9.11	0.105
Balochistan	5	18.207	0.003	17.003	0.004	10.982	0.052	12.052	0.034	14.095	0.015

Appendix VI (Returns to Education)

Table XVI: Definition of Informal Employment used in Returns to Education Literature

Author(s)	**Definition of informal workers**
Gindling (1991)	1. workers without belonging to cooperatives, union or professional organization 2. workers not having post graduate education
Funkhouser (1996)	1. self-employed 2. wage and salary workers in firms (with four and less than four workers) excluding professionals and technical occupations. 3. Domestics family workers
Saavedra & Chong (1999)	wage employment 1. without a signed contract and belonging to union 2. without health insurance or pension 3. without any entitlement to vacations 4. out of public sector employment self-employed worker 1. without having registration with tax authority
Tansel (2001)	1. without coverage of any social security program 2. sole workers of their enterprises excluding professionals and technicians
Gong & van Soest (2002)	1. self employed 2. managers of a firm without employees
Pisani & Pagán (2004)	workers of a firm with five or less than five employees
Amuedo-Dorantes (2004)	employment without any contract
Ewoudou & Vencatachellum (2006)	1. wage earners whose employers are not registered for tax 2. self-employed without any tax registration
Packard (2007)	1. non-contract wage employment

	2. self-employment
Stifel et. al. (2007)	workers without pension and social security
Arias & Khamis (2008)	workers without social security & pensions
Kuepie et. al. (2009)	production units with no fiscal or statistical identity or without any formal accountancy
Tegoum (2009)	The informal enterprises 1. without having a taxpayer number 2. without any formal accounts.
Devicienti *et al.,* (2009)	3. non-wage earners in small firms (firms with less than five workers), 4. non-registered wage earners those who evading taxes and domestic workers
Klarita et. al. (2011)	1. employment without any registration to the state for tax 2. without social security, and labor law purposes
Yamasaki (2012)	1. working for a private company/institution whose employer (institution, business or private individual) is not registered for the Value Added Tax 2. owns a business not registered for the VAT
Nazir & Ramadan (2014)	employment without contract and social security
Canelas (2015)	employment with lack of social security coverage
Kume (2016)	employment without social security and payment of tax
Nasir (2001)	1. non-farm non-financial establishments employing less than ten workers 2. farm workers

Table XVII: Variables for Returns to Education Model

Variable Name	Definition
Dependent variables	
Earnings	Monthly Income earned by Informally employed workers
Informal Employment	
Formal Employment	Dummy=1 if formally employed workers, 0 otherwise
Clerical Support Workers	Dummy=1 if Clerical Support Workers, 0 otherwise
Sales Workers	Dummy=1 if Sales Workers, 0 otherwise
Craft and Related Trade workers	Dummy=1 if Craft and Related Trade workers, 0 otherwise
Plant & Machine Operator & Assemblers	Dummy=1 if Plant & Machine Operator & Assemblers, 0 otherwise
Elementary Occupations	Dummy=1 if Elementary Occupations, 0 otherwise
Explanatory Variables	
Age	Age of employed person
Education	Education of employed person
Dependency Ratio	Number of Dependents to the total member of households
Marital Status	dummy =1 if the informally employed worker is married, 0
No of employed	Total number of family member who are currently working
Family Size	Total number of members in a family

Table XVIII: Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
		Full Sample			
Employment income	29,862	18840.97	18471.89	1000	250000
age	29,862	35.63006	12.90727	10	99
Age square	29,862	1436.094	1012.663	100	9801
Schooling	29,862	7.092794	5.414539	0	21
Family size	29,862	7.405967	3.695655	1	63
Number of Employed	29,862	2.434599	1.449989	1	13
		Formal Employment			
Employment income	6,801	32884.34	28629.58	1000	250000
age	6,801	39.13351	12.1477	12	92
Age square	6,801	1678.976	1017.691	144	8464
Schooling	6,801	11.96839	4.440327	0	21
Family size	6,801	7.251581	3.901594	1	63
Number of Employed	6,801	2.135127	1.243857	1	10
		Informal Employment			
Employment income	23,061	14699.39	11172.44	1000	181583
age	23,061	34.59685	12.94331	10	99
Age square	23,061	1364.464	999.9955	100	9801
Schooling	23,061	5.654915	4.803249	0	21
Family size	23,061	7.451498	3.631527	1	63
Number of Employed	23,061	2.522917	1.494006	1	13

Table XIX: Parameters Estimates of Informal Sector Employment, Multinomial Logit Model (First Stage Equation)

Dependent variable (Occupations)	Estimated Coefficients					Marginal Impacts				
	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupations	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupation
Schooling Years	-0.0344***	-0.354***	-0.476***	-0.476***	-0.500***	0.0127***	-0.0135***	-0.0319***	-0.0165***	-0.0238***
	(0.0108)	(0.00710)	(0.00818)	(0.00957)	(0.00898)	(0.000446)	(0.00104)	(0.000842)	(0.000611)	(0.000668)
Age	0.00306	-0.0947***	-0.0797***	-0.00719	-0.0925***	0.00274***	-0.0117***	-0.00451***	0.00483***	-0.00455***
	(0.0205)	(0.0120)	(0.0136)	(0.0171)	(0.0150)	(0.000873)	(0.00191)	(0.00161)	(0.00129)	(0.00131)
Age square	-0.000214	0.000771***	0.000400**	-0.000403*	0.000463**	-2.47e-05**	0.000137***	1.57e-05	-7.13e-05***	1.81e-05
	(0.000242)	(0.000141)	(0.000164)	(0.000208)	(0.000184)	(1.04e-05)	(2.30e-05)	(1.99e-05)	(1.59e-05)	(1.65e-05)
Marital Status	0.174*	0.286***	0.271***	0.434***	0.237***	-0.00207	0.0203*	0.00997	0.0212***	0.00230
	(0.0996)	(0.0641)	(0.0709)	(0.0880)	(0.0774)	(0.00427)	(0.0105)	(0.00850)	(0.00669)	(0.00677)
No of Employed	-0.0696**	0.0185	0.131***	0.0180	0.0986***	-0.00515***	-0.00698**	0.0171*	-0.00232	0.00711***
	(0.0345)	(0.0208)	(0.0224)	(0.0273)	(0.0243)	(0.00147)	(0.00326)	(0.00257)	(0.00202)	(0.00204)
Family Size	0.0108	0.00823	-0.0282***	0.00162	-0.0231**	0.000739	0.00404***	-0.00441***	0.000664	-0.00224***
	(0.0110)	(0.00718)	(0.00835)	(0.00982)	(0.00909)	(0.000473)	(0.00119)	(0.00103)	(0.000749)	(0.000814)
Urban	0.328***	0.251***	0.318***	0.0282	-0.416***	0.0104**	0.0449***	0.0411***	-0.00741	-0.0646***
	(0.0990)	(0.0572)	(0.0631)	(0.0715)	(0.0626)	(0.00423)	(0.00916)	(0.00748)	(0.00525)	(0.00515)
Punjab	0.104	0.248***	0.167**	0.225***	-0.0553	-0.000805	0.0359***	0.00806	0.0105*	-0.0225***
	(0.0909)	(0.0579)	(0.0652)	(0.0764)	(0.0701)	(0.00367)	(0.00930)	(0.00786)	(0.00600)	(0.00651)
Sindh	0.456***	0.468***	0.528***	0.252***	0.368***	0.00544	0.0375***	0.0381***	-0.00810	0.00427
	(0.0943)	(0.0636)	(0.0713)	(0.0873)	(0.0767)	(0.00401)	(0.0103)	(0.00899)	(0.00652)	(0.00750)
Balochistan	0.362***	0.203***	-0.271***	-0.308***	-0.380***	0.0210***	0.0720***	-0.0384***	-0.0237***	-0.0402***
	(0.112)	(0.0777)	(0.0951)	(0.115)	(0.104)	(0.00588)	(0.0135)	(0.0104)	(0.00771)	(0.00858)
Constant	-1.935***	4.948***	5.623***	4.029***	7.337***					
	(0.439)	(0.253)	(0.279)	(0.339)	(0.297)					
Observations	21,676	21,676	21,676	21,676	21,676	21,676	21,676	21,676	21,676	21,676
Wald test on selection instruments (χ^2)	4.08**	0.79	34.25***	0.43	16.52***					
Log likelihood	-22688.974									

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.

Table XX: Multinomial Endogenous Switching Regression – Employment Earnings (Estimates Corrected by BFG Technique: Second Stage)

Dependent variable (Earnings)	Formal	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupation	Formal	Clerks	Sales workers	Craft workers	Machine operators	Elementary Occupation
	DMF 1						DMF2					
Schooling year	13,651***	-1,139	36.22	-1,679**	-791.5	-878.6	6,009***	593.9	-124.2	342.2	509.2	155.9
	(3,965)	(1,690)	(445.4)	(730.1)	(1,893)	(645.4)	(1,208)	(1,223)	(578.1)	(324.7)	(632.5)	(203.3)
Age	3,980***	2,066***	2,349***	1,476***	1,510	606.3*	1,896**	2,403***	1,234	685.7**	633.4	426.3**
	(1,135)	(775.6)	(514.1)	(554.5)	(1,379)	(345.0)	(824.1)	(668.8)	(754.6)	(343.7)	(937.5)	(184.9)
Age square	-26.73**	-21.49**	-25.77***	-17.37**	-16.23	-7.751*	-12.59	-26.93***	-16.00*	-7.715*	-6.233	-5.315**
	(10.76)	(8.780)	(6.198)	(6.867)	(17.75)	(4.270)	(9.799)	(7.915)	(9.634)	(4.625)	(13.03)	(2.490)
Marital Status	-2,900	-818.1	3,282**	2,369	2,527	553.2	5,439	2,003	2,295	1,059	1,886	923.2
	(5,396)	(2,056)	(1,526)	(1,950)	(4,065)	(829.9)	(3,444)	(1,406)	(3,268)	(1,033)	(2,482)	(647.9)
_m1	31,300**	55,853**	63,825***	-13,811	26,823*	19,857***	22,506*	35,055	83,123***	21,377*	34,906**	15,945***
	(12,668)	(21,954)	(18,653)	(15,091)	(15,837)	(6,117)	(12,186)	(24,310)	(25,754)	(11,598)	(17,102)	(4,481)
_m2	50,396	-3,803	32,496	693.8	-21,536	-30,414*	210,769***	5,801	102,949***	30,455	54,429*	24,518
	(62,710)	(6,444)	(28,894)	(18,591)	(31,822)	(15,702)	(58,476)	(11,394)	(33,795)	(21,116)	(28,121)	(17,619)
_m3	-108,239*	-18,836	-6,927**	-68,391***	-26,307	-24,976	26,730	-38,442	11,715	-6,841	27,973	2,220
	(57,812)	(29,983)	(3,296)	(19,815)	(54,884)	(15,649)	(32,174)	(28,098)	(9,541)	(12,568)	(41,548)	(7,592)
_m4	154,509***	84,741***	142,326***	25,342***	48,227	17,299	182,035***	90,429***	156,734***	29,392***	68,842***	43,914***
	(40,999)	(21,767)	(21,270)	(4,815)	(30,561)	(19,201)	(29,525)	(20,612)	(23,826)	(3,695)	(14,736)	(6,095)
_m5	-66,798	92,606***	83,615***	17,196	10,725	18,924	-68,568	128,575***	56,905	-3,427	5,982	7,097
	(43,016)	(28,051)	(30,291)	(26,105)	(16,079)	(17,597)	(57,386)	(41,305)	(69,416)	(25,836)	(18,618)	(15,167)
_m6	-124,324***	-2,423	-12,687	-75,202***	-7,136	6,867	-82,286**	-14,195	107,954**	11,233	32,220	6,267*
	(21,218)	(23,868)	(24,116)	(23,884)	(26,515)	(5,171)	(34,221)	(31,306)	(52,733)	(18,113)	(21,244)	(3,302)
Constant	-332,895***	66,444	62,894**	-123,965***	-24,260	6,508	-109,271***	-11,200	95,595**	-34,062***	34,769	12,631***
	(100,145)	(67,574)	(30,120)	(27,018)	(84,278)	(9,260)	(35,914)	(60,171)	(37,772)	(13,022)	(53,421)	(2,882)
Observations	6416	1170	5192	3974	2028	2898	6416	1170	5192	3974	2028	2898

Bootstrapped Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.

Table XXI: Coefficient of Selectivity Variables in Earning Equations (Proportionality Hypothesis between formal/informal occupations)

	Formal	Clerks	Sales Workers	Craft related workers	Machine Operators	Elementary
			DMF1			
m1 =m2=m3= m4 =m5 =m6=0	74.10*** (F6, 6416)	56.91*** (F6, 1170)	89.64*** (F6, 5192)	60.27*** (F6, 3974)	31.56*** (F6, 2028)	40.64*** (F6, 2898)
			DMF2			
m1 =m2=m3= m4 =m5 =m6=0	93.45*** (F6, 6416)	56.26*** (F6, 1170)	153.96*** (F6, 5192)	122.00*** (F6, 3974)	35.74*** (F6, 2028)	139.09*** (F6, 2898)

Table XXII: Counterfactual estimates of earnings

Occupation	Expected/Actual earnings	Counterfactual expected earnings	Treatment Effect	% increase
		DMF1		
Informal clerks	19419.56	23431.47	4011.91***	20.65
Informal sales workers	21342.05	24136.35	2794.30***	13.09
Informal craft workers	17978.08	24064.85	6086.76***	33.85
Informal machine operators	18768.15	24255.08	5486.93***	29.23
Elementary occupation	14569.49	24764.4	10194.9***	69.97
		DMF2		
Informal clerks	16829.8	18923.36	2093.56***	12.44
Informal sales workers	18754.95	22504.57	3749.62***	19.99
Informal craft workers	15545.66	22389.95	6844.29***	44.03
Informal machine operators	17031.03	22270.82	5239.79***	30.77
Elementary occupation	13235.65	22502.72	9267.07***	70.02

*** p<0.01, ** p<0.05, * p<0.1 shows significance at 1%, 5% and 10%.<0.05, * p<0.1 shows significance at 1%, 5% and 10%.