DETERMINANTS OF FOOD INSECURITY IN PAKISTAN:
Evidence from PSLM 2010-11

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This study estimates the food insecurity using the first three measures of FGT and finds the factors responsible for it by estimating the logistic regression model for which the Pakistan Social and Living Standard Measurement (PSLM) survey data 2010-11 is used. The results show that food insecurity incidence is 28.63 per cent, whereas the food insecurity and squared food insecurity gaps are 5.28 per cent and 1.46 per cent, respectively. Results of the logistic regression model shows that it is negatively related to education, livestock, foreign remittance and female family heads, whereas it is positively related to poverty in Pakistan.

I. Introduction

Food is an essential for development and sustenance of human life as its access to food is believed to be fundamental human right. Food security assists national sustainability by better efficiency ensuing economic growth and development while it shrinks the output of persons and subverts economic growth of a country. It hauls crimes and stimulates socio-economic and political instability. Food security is a very crucial concept for globe that has evolved significantly over the past period. The meaning of food security has been known since the first World Food Conference (WFC) of 1974. It is defined by various researchers in numerous ways. The literature contains 200 definitions and 450 indicators of food security, but are widely defined by the FAO (2010), stating: "food security exists when all people at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." Household food security is an implement of this thought at the household level, as well as to individuals within the household. On the other hand, food insecurity is known to be the lack of condition declared in the definition of food security at any level, such as the household at regional and national levels. When food consumption is persistently inadequate to fulfill the daily dietary needs it leads to severe type of food insecurity, known as 'hunger' [FAO (2010)].

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Almost 1,014.5 million people remained undernourished in the world in 1990-92. After a decade in 2000-02 there were 929.9 million people left undernourished in the world. Thus, during this period there was a decreasing trend in global hunger but again the number of undernourished people increased to 946.2 million during 2005-07. However, later there was a continuous decreasing trend from 2008-10 when there were 840.5 million undernourished people in the world. Currently (in 2014) there are 805.3 million undernourished people in the globe. Although, food insecurity has decreased since 2008 but still, 11.3 per cent of the world population is undernourished. About one in every nine persons in the world is still food insecured FAO (2014)].

The degree of food insecurity differs from nation to nation, regions and eras. Its versatile condition is influenced by various characteristics and may vary in magnitude across areas, states and social groups. Influencing factors of food security are grouped into three main areas 'food availability, accessibility and consumption' [Andersen (2009)].

i)   Food availability is illustrated as a stable availability of the required bulk of food for the whole nation, depending on commodities grown in a country, imports and food support plans.

ii) Food accessibility exist when families and their members are financially able to acquire sufficient and proper foodstuff for a healthy life which is determined by the household income, division of accruing food in the household, as well as by the price of food.

iii) Food consumption is concerned with accurate use of food items that heals the required energy and indispensable nutrients transferring meals, fresh water and adequate level of hygiene. These sufficient conditions, significantly depend on household occupants' knowledge regarding food stock, level of nutrition, child care and disease management [Arif and Khlid (2007)]. Food security is a crucial dimension of household welfare, whether observed worldwide, within a country, or within a community [Bickel, et al. (2000)].

Food security is a pivotal concerned issue for developed, as well as the developing countries. Even the most developed countries face this problem, for example Australia has 5 per cent population which is food insecure [Booth and Smith (2001)]. In the same way, Canada has 10 per cent of its population which remain food insecure [Che and Chen (2002)]. There were 14 per cent food insecure households (at least at that time) throughout the year in the United States of America [Nord (2010)]. However, the plight in developing nations is worsened. According to the World food organization, out of 805 million undernourished people, 791 million are living in developing countries. The situation is worse in Africa where there were 214 million undernourished people, of the total undernourished people [FAO (2014)]. Other regions of the world have little better situation from Africa; like East Asia, South eastern Asia and Latin America [Brown, et al. (2008)].

After the introduction (Section I), the rest of the paper is presented as under, Section II presents the literature review and Section III describes the data and methodology employed in this study. Section IV draws the results and make discussion on the subject matter (food insecurity) of the paper, and finally conclusion and policy suggestions are given in Section V.

II. Literature Review

There is a vast international literature on measurement of food security and finding its main determinants [Burton, et al. (2005), Govereh and Jayne (1999), Zindi and Stack (1992)] which reports that livestock is a significant positive determinant of food security. Moreover, Chopak (1989), Jayne (1994), Zindi and Stack (1992) highlighted that off-farm income has significant positive impact on food access of household. Babatunde, et al. (2007), Kidane, et al. (2005), Najafi (2003), Rutsch (2003), Sah (2002), probed that there is positive influence of land size and land quality on food security of households. Devereux (1993) revealed that the earned income by female is extra probable to spend on food than the male income. Ellis (2000), Hayes, et al. (1997), and Paddy (2003) showed positive affiliation between the household food security and large family size because, as family size increases the variety of labor also increases. Contrary to it Brown (2004) concluded that households with large family size exerts additional pressure `on food than the labor contribution in agricultural production. Gundersen and Garasky (2012), Obamiro, et al. (2003), found positive association of households' head-age and food security of households. Bickel, et al. (2000) revealed that household food insecurity is negatively linked with poor health of young children. Hager, et al. (2010), Onianwa and Wheelock (2006) explored that increase in income of household has negative relationship with household food insecurity. Increase in education level of household has also significant negative relationship with household food insecurity (Amaza, et al. (2006), Kaiser, et al. (2003), Ojogho, (2009). Maitra and Rao (2014) Ref. is 2915 revealed that lack of assets, low level of education, female headship of households and low share of working age adults are the main determinants of food insecurity in Kolkata (Indian) slums. Therefore, poverty and food insecurity are directly linked since chronically poor cannot acquire monetary dealings to combat food insecurity, and hence, they would be very prone [Cullet (2004), Herrmann (2006)].

Pakistan is the 6th most populous country in the world with a population of about 191.71 million [Pakistan Economic Survey (2015)] with growth rate of 1.8%; and if this rate remains the same, the population of Pakistan would be doubled in the year 2045 [Bashir (2012)]. Pakistan is a developing country with agro-based economy. Its agriculture sector contributes about 20.88 per cent share of GDP and employ 43.5 per cent of the overall labor force. Approximately, 62 per cent of the total population depends on agriculture sector [Pakistan Economic Survey (2010)].

It is the 26th largest economy of the world and produces many agricultural commodities. However, still Pakistan has 39.6 million people who are food insecure [FAO (2014)].

The rural population is more prone to food insecurity than the urban population because of the provisional dealings of skepticism in their daily basis food [Haq (2008) and Yasin (2000)]. Due to poverty and inadequate food availability Pakistan became food insecure [Arif (2000)]. There prevails a discrepancy among provinces, districts and households, and even though a household may be well nourished but it can not be guaranteed that all members of the family would get the required diet, due to inequality in food allocation within the household [Khan (2009)]. Education level, family size, livestock ownership, joint family structure, age of household head and income has been found as positive significant cause of food security of household. [Bashir, et al. (2010)], and later, Bashir et al. (2012) found that household size, age of household head and family structure have negative relationship to household food security. Ali and khan (2013) revealed that livestock is significant contributing factor of household food security. High price of food items, lack of irrigation water, limited market access and high price of fertilizer are main causes of low production of farming households [Amir, et al. (2013)]. Women age and education have significant positive relationship within household food security [Naz, et al. (2014)].

Few researchers have made efforts to find the food security incidence and its influencing factors, in Pakistan. Some of them have checked it at Provincial and District levels, where as some have checked it at the rural levels. However, efforts were also made to check the socio-economic determinants of food insecurity at national level in Pakistan. Moreover, previous studies used the primary data at different districts and at the province of Punjab, which is not a representative data set at national level. Therefore, it is essential to find the key determinants of food insecurity by using the national level data set for Pakistan. The present study aims to check the food insecurity status and its causes at national level with rural/urban break-up in Pakistan by using the PSLM 2010-11 dataset. In conditions where food insecurity is a burning issue of concern, this work will play a valuable role to get attention of the policy makers.

III. Data and Methodology

1. Data

For determining the food insecurity in Pakistan this study uses the PSLM dataset 2010-11. The dataset was collected through sample survey by the Pakistan Bureau of Statistics (PBS). It is based on national sample and provides information about the demographic characteristics of households, their economic position, income level of individuals and their expenditures. The total sample size of PSLM 2010-11 survey is

16,431 households which include the 6,589 households from the urban and 9,752 households from the rural areas.

2.   Measurement of Food Insecurity

The food insecurity and hunger in a country cannot be captured through single indicator; but however, food insecurity at household level can be captured by taking information about the demographic and socio-economic indicators that have effects on food insecurity which vary from time to time. There are several ways in the literature to measure food insecurity, in all over the world. This study uses the food insecurity index which was used by Omonona and Agoi (2007) for the first time. It classifies the households into food secure and food insecure. It was used by researchers like [Agwu and Oteh (2014), Arene and Anyaeji (2010), Otunaiya and Ibidunni (2014)], to measure the status of food security.

$$F_i = \frac{\text{Per capita food expenditure of ith household}}{\text{2/3 Mean per capita food expenditure of all households}}$$

F_i shows food insecurity index: where $F_i \geq$ and $F_i < 1$ shows food insecure ith households, where as, $F_i < 1$ shows food secure ith households. A household is food secure when its per capita monthly food expenditure lies above or equal to two-third of the mean per capita food expenditure. On the other side, when per capita food expenditure falls below two-third of the mean monthly per capita food expenditure, the household has to face the food insecurity problem.

3.   Food Insecurity Gap and Severity

To measure food insecurity gap and severity the study apply Foster-Greer-Thorebecke (FGT) index (1984). This index was used by IFPRI to resolve food insecurity analysis [Hoddinott and Yohannes (2002), Tefera (2011)]. The FGT model can be expressed as:

$$F(\alpha) = \frac{1}{n} \sum_{i=1}^{q} \left[\frac{(m - y_i)}{m} \right]^\alpha \qquad (1)$$

Hoddinott and Yohannes (2002) explained that giving no weight to the severity of food insecurity and assuming $\alpha = 0$, the formula collapses to $F(0) = q/n$. This is known as the head count ratio where $\alpha = 1$ and it is called food insecurity gap. This index [F(1)] measures resources required to eliminate the insecurity of food. In case of $\alpha = 2$, it is called the severity of food insecurity [Hoddinott and Yohannes (2002), Tefera (2011)].

4. *Measurement of the Determinants of Food Insecurity*

For measuring the determinants of food insecurity the Binary logistic regression model has been used. When the dependent variable (household food insecurity) is binary (i.e., taking the value one if household is food insecure and zero if it is food secure), the logistic regression is a good choice. This logistic regression was used by Hailu and Regassa (2007), Kidane, et al, (2005), and Sikwela (2008) to assess the determinants of household food insecurity. The model express the households food security status as a function of linear combination of observable explanatory variables, some unknown parameters and an the error term. The implicit form of the model is expressed as:

$$P_i = g(I_i) \tag{2}$$

$$I_i = b_0 \sum_{j=1} b_j X_{ji} \tag{3}$$

$$F_{ins} = f\,(hheadedu,\ livestock,\ fr,\ femalehead,\ poverty) \tag{4}$$

where P_i shows the response for *ith* observation (i.e., binary variable, $P_i = 1$, a food insecure household and $P_i = 0$, for a food secure household); I_i is an underlying and unobserved index for the *ith* observation for each household; if $I_i^* > I_i$, then the household is detected as food secure, if $I_i^* < I_i$ then the household will be food insecure. Observations (P_i); (I_i^*) are stimulus index which determines the probability of being food secure, and (I_i) is the stimulus index which shows the probability of food insecurity for the household. The empirical model determines the factors which influence food security status amongst the households in Pakistan. The general form of the model is used in the study. The labeling and construction of variables are given in Table 1.

Food insecurity is a dependent variable and is binary; therefore, the binary logistic regression is used to find determinants of food insecurity. Is is given below:

$$F_{ins} = ln\frac{p_i}{1-p_i} = \alpha + \beta_1 hheadeduprimary + \beta_2 hheadmiddle + \beta_3 hheadedumatric +$$
$$\beta_4 hheadeduFA\&higher + \beta_5 livestock + \beta_6 fr + \beta_7 femalehead + \beta_8 poverty) + \varepsilon_i \tag{5}$$

where F_{ins} represents the log odds of dependent variable, α shows the intercept, β_1, β_2, β_3, ..., β_n, are coefficients of the regressors, and all regressors are taken as dummy variables. For straight forward interpretation, logit can be transformed in odds ratio by using exponential function [Garson (2011)]. Equation (5) can be converted into odds ratio as Equation (6):

$$Odds\ Ratio = ln\frac{p_i}{1-p_i} = e\,\alpha + \beta_1 hheadeduprimary + \beta_2 hheadmiddle + \beta_3 hheadedumatric +$$
$$\beta_4 hheadeduFA\&higher + \beta_5 livestock + \beta_6 fr + \beta_7 femalehead + \beta_8 poverty) + \varepsilon_i \tag{6}$$

TABLE 1

Measurement of Variables

Variables	Measurement
Food $_{ins}$	A household is considered food insecure if food index value < 1 (food insecure=1) and is considered food secure when the value of food index ≥ 1 (food secure =0). It is treated as binary variable.
Primary_Edu	Primary education of household head (if household head education is primary, education =1, 0 otherwise).
Middle_Edu	Middle education of household head (if household head education is middle education =1, 0 otherwise).
Matric_Edu	Matric education of household head (if household head education is matric education =1. 0 otherwise).
FA and Higher_Edu	Intermediate or higher education of household head (if household head education is intermediate or higher =1, 0 otherwise).
Female head	Female head (if head of a family is female =1, 0 otherwise).
LS	Livestock ownership (if household own livestock =1, 0 otherwise).
POV	Poverty status of household (if household is poor =1, 0 otherwise.
FR	Foreign remittances (if a household has Foreign remittances=1, 0 otherwise).

The odds ratio of probability is that households will be food insecure to the probability that they will be food secure. In case of binary independent variables, exponential of the respective coefficient gives the proportion of change in odds for a shift in the given independent variable to odds ratio. In the conditions the continuous independent variable coefficient is linked to the effect of per unit change in the given independent variable, to odds ratio. In both types of variables either it continues or the categorical variables and the coefficients shows the direction of change. If the outcome shows that value of coefficient is positive the probability of food would ensure that household is higher than other categories which is being kept constant during the analysis. In another way if a number of log odds is greater than one, it shows a positive association between independent and dependent variable; while a number which is less than one or between zero and one indicates a negative relationship among both, [Hoffmann (2004)]. Logistic regression can be interpreted as odds of an event occurring in one group to the odds of an event occurring in another group.

IV. Results and Discussion

Food insecurity is crucial phenomena for developing, as well as for the developed countries. Although, Pakistan is an agrarian economy and this sector contribute 20.88 per cent in the total GDP employing 43.5 per cent of an overall labor force, yet it is food insecure. Food insecurity is an important indicator to measure welfare of individuals, households and states. It shrinks the output of persons and subverts economic growth of a country. Therefore, to combat this issue there is a high need to measure food insecurity and its principal causes in Pakistan.

1. Food Insecurity

Food insecurity exists when people lack sustainable physical or economic access to sufficient safe nutritious, and socially acceptable food for a healthy and productive life. The households' food insecurity incidence, gap and severity results at national and regional levels are presented in Table 2.

TABLE 2

Incidence, Gap and Severity of Household Food Insecurity in Pakistan

	Incidence (%)	Gap (%)	Severity (%)
National	28.63	5.28	1.46
	(57.26)	(43.32)*	(30.55)*
Urban	24.47	4.4	1.26
	(30.59)*	(23.88)*	(16.09)*
Rural	30.71	5.72	1.56
	(51.18)*	(36.59)*	(26.02)*
Difference in estimates	6.23	0.83	0.33
between urban and rural areas	(-3.99)*	(1.57)**	(1.71)**

The estimates are statistically significant. *within brackets are t-values. **these are t-values showing not significant.

The results given in Table 2 reveals that 28.63 per cent population of households survey is food insecure at national level and is statistically significant. It means that 28.63 per cent of the survey households do not have enough food expenditure to meet their daily food requirement. These results are consistent with [FAO (2011)] statistics, according to which 23.1 per cent of the total population of Pakistan is undernourished. Moreover, by using HIES 2007-08 data set Asghar (2011) found that 34 per cent of the population is food insecure in Pakistan. Thus, it can be seen that as compared to 2007-08 food insecurity decreased in 2010-11. Pakistan is more food insecure than India, where FAO (2014) reports that 015.8 per cent households

are food insecure. However, Pakistan is more food secure than Bangladesh where 35.3 per cent households were food insecure [Ahmed, et al. (2013)]. Ref. is 2014.

It may be noted that even the developed countries face the food insecurity problem but their situation is better as compared to the developing countries. Pakistan is two times more food insecure than the United States of America, where 14.3 per cent households were found to be food insecure [Jensen, et al. (2014)]. The results at regional level reveal that in Pakistan food insecurity is higher (30.71 per cent) in rural zones as compared to urban zones (24.47 per cent) and the difference of food insecurity incidence between these areas is statistical; it is also evident from Figure 1. These results are consistent with NNS (2011) according to which the rural regions are more food insecure than the urban ones. In rural areas this situation might be due to lack of income generating opportunities and low level of knowledge about food utilization.
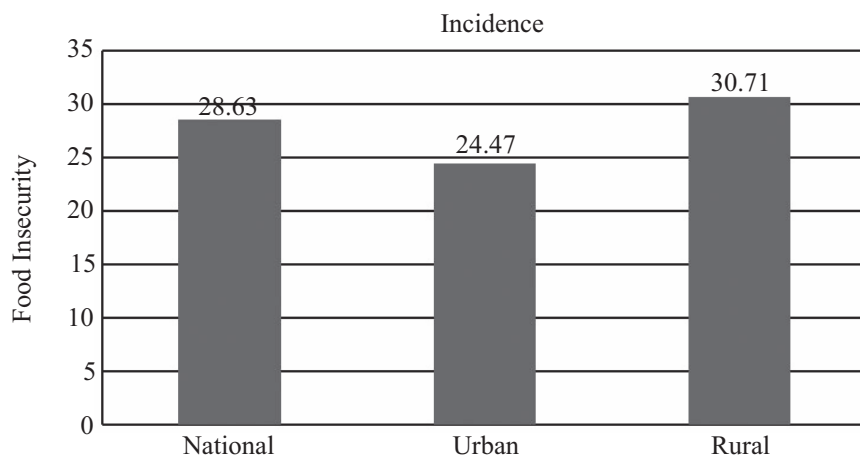
Source: Authors' estimation.

FIGURE 1

Incidence of Household Food Insecurity at National and Regional Levels

When food insecurity and poverty incidence are compared, it is found that by using the same data set, food insecurity is higher than than the poverty incidence which was found to be 12.4 per cent and 15.06 per cent, respectively [Goverment of Pakistan (2012) and, Cheema and Sial (2014)]. The reason for difference of poverty estimates is that to adjust inflation between the two years the former used the consumer price index and the latter used the composite price index. The food insecurity has the same story regarding regional level as the poverty incidence.

No doubt, the incidence of food insecurity is easy to calculate and understand, yet it is irresponsive with what is happening with those who live below the food insecurity line? Therefore, to know this, the measurement of food insecurity gap is necessary to quantify the total shortfall of food insecure households from minimum

required food expenditure. It may be inferred as an important indicator of combating food insecurity by allocating essential resources to food insecure people. The results of food insecurity gap are also given in Table 2. There is 5.28 per cent of the food insecurity gap in Pakistan. It propounds if government mobilizes and allocate resources that can fulfill 5.28 per cent of the required food expenditure of each food insecure household. This would hhelp to bring the household up to the food insecurity and thus the tentative food insecurity can be eliminated. At regional level, food insecurity gap is higher (5.72 per cent) in rural areas than in the urban areas (4.4 per cent).

The comparison of results of food insecurity gap with poverty gap shows that the former is more than double of the latter. According to Cheema and Sial (2014) poverty gap is 2.29 per cent in Pakistan. The regional level food insecurity gap has the same story as of the poverty gap. Although, the food insecurity gap shows as to how much these households are below the food insecurity line, yet this gap is unable to determine the inequalities among the food insecure people. Therefore, the calculation of the 'severity of food insecurity' is necessary to know the inequalities among food insecure households. Results of the food insecurity severity are also given in the Table 1 which reveals that severity of food insecurity in the study area is 1.46 per cent. It implies that food insecure households' expenditure on food items deviate from each other, with 1.46 per cent of the required food expenditure at national level. In rural areas the severity of food insecurity is 1.56 per cent and in urban areas it is 1.26 per cent. Thus, it is higher in rural areas as compared to urban areas which is evident from Figure 2. The comparison of the results of severity of food insecurity with poverty severity shows that the former is more than double, of the latter. According to Cheema and Sial (2014) severity of poverty is 0.55 per cent in Pakistan. The severity of food insecurity has the same story regarding regional level as severity of the poverty.

2.   *Socio-Economic Characteristics of the Households*

After explaining the results of incidence the gap and severity of food insecurity it is necessary to decompose the food insecurity incidence into socio-economic characteristics of food insecure households. Thus, this part discuss the socio-economic characteristics of survey households like household size, dependency ratio, literacy status, education level, employment status, industry and profession of household head in association with the food insecurity at household level.

a)   *Household Size and Household Food Insecurity*

It is generally expected that household size and food insecurity have positive association. Large family size affects adversely, the attributes of food insecurity because when size of a family increases, additional burden has to be borne by the family to manage expenditure. The results depict that there is a positive relationship
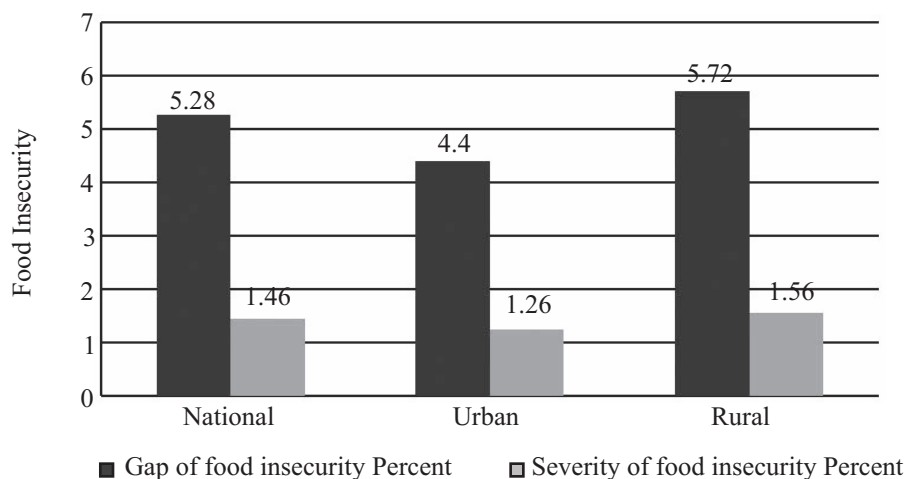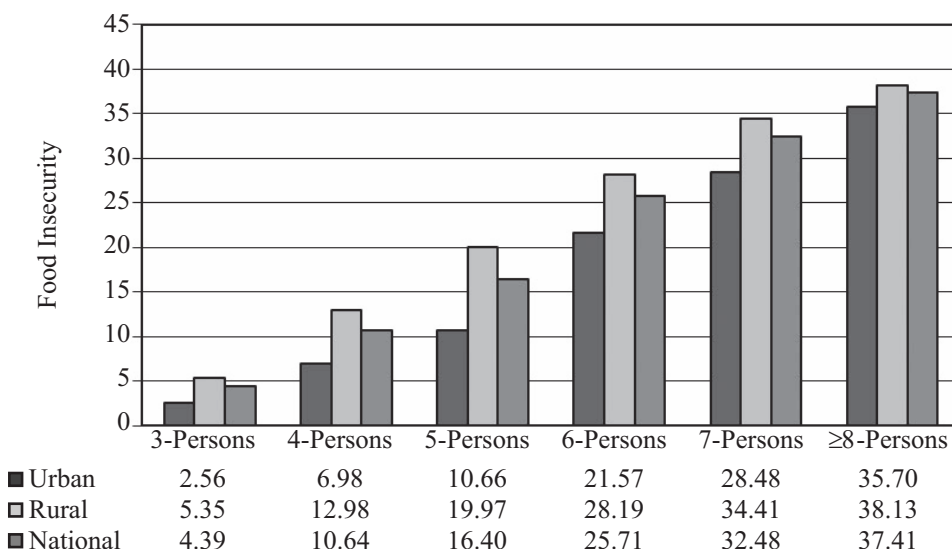
Source: Authors' estimation.

FIGURE 2

Gap and Severity of Food Insecurity in Pakistan

between household size and food insecurity in Pakistan. Figure 3 shows that when household size increases the incidence of food insecurity also increases. These results are found, both for urban and rural areas.

	3-Persons	4-Persons	5-Persons	6-Persons	7-Persons	≥8-Persons
■ Urban	2.56	6.98	10.66	21.57	28.48	35.70
□ Rural	5.35	12.98	19.97	28.19	34.41	38.13
■ National	4.39	10.64	16.40	25.71	32.48	37.41

Source: Authors' estimation.

FIGURE 3

Household Size and Food Insecurity

b)   Dependency Ratio and Household Food Insecurity

Dependency ratio is an important factor to affect food insecurity. As the number of dependents in a household increases, it leads to more chances of being food insecure which is depicted by Figure 4. The dependency ratio and household food insecurity have positive relationship.

c)   Literacy Status and Food Insecurity

The literature shows that literacy status is very important determinant of household food insecurity. If a household is literate it has more chances to become food secure as compare to a illiterate household. This hypothesis is found to be true and is being depicted in Figure 5. The results depict that food insecurity is greater in those households whose heads are illiterate as compare to the literate one.

d)   Food Insecurity and Education

The number of years spent in education are the key factors to affect food insecurity. Education catalyses the process of information flow and clues the households to explore, as wide as possible the altered ways of receiving information about nutrition and income generation activities. Adekunle (2013) also depicted that low educational level was one of the causes that bound economic, social, physical, technical and educational progress in the developing countries. Results in Figure 6 also present negative association between household food insecurity and the educational level attainment. It depicts that as education level increases the chances of household becoming more food insecure decreases.

e)   Food Insecurity by Employment Status, Industry
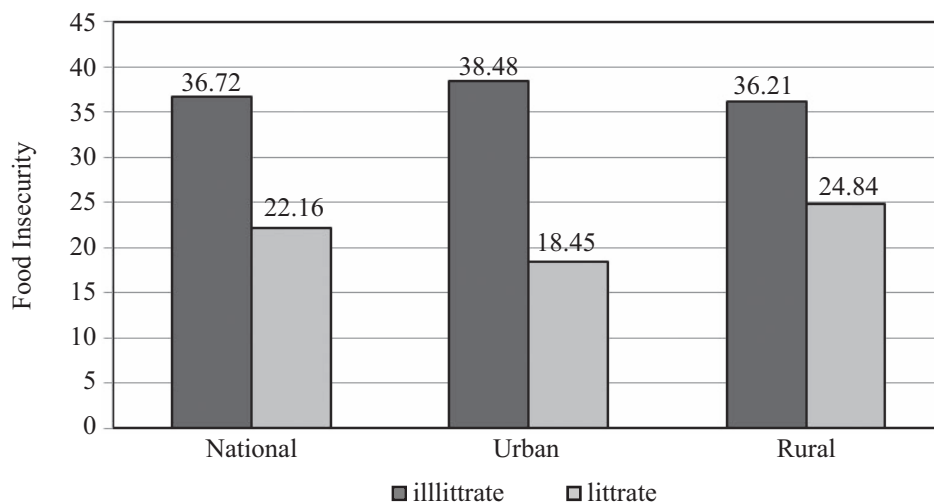   *and Profession of Households' Head*

Income of households is a major determinant of food insecurity which is affected by the households' head, employment, industry and profession. Therefore, it is very crucial to check the impact of these sources towards food insecurity of households. The results of Figure 7 reveals that due to inherited family business and lands; unpaid family workers and employers are relatively low food insecure and their ratio is highest among the paid employes and share croppers. Figure 8 shows food insecurity status by different households head industry. The results also show that households in agriculture livestock and hunting category are the most food secure. Transport and storage workers, as well as the community and social services are most food insecure. The profession of the households head plays a very pivotal role in determination of food insecurity status of the households. Results in Figure 9 depicts that legislators and senior officials headed households are the most food secure and elementary professionals are the least less food secure.
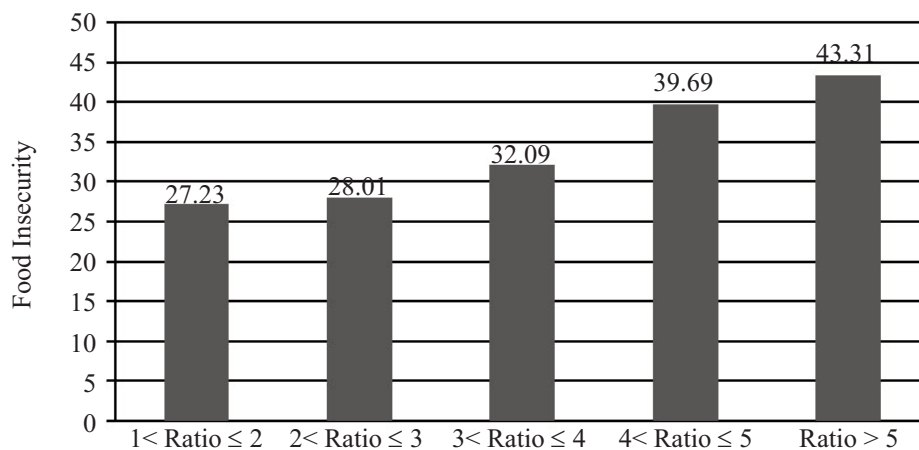
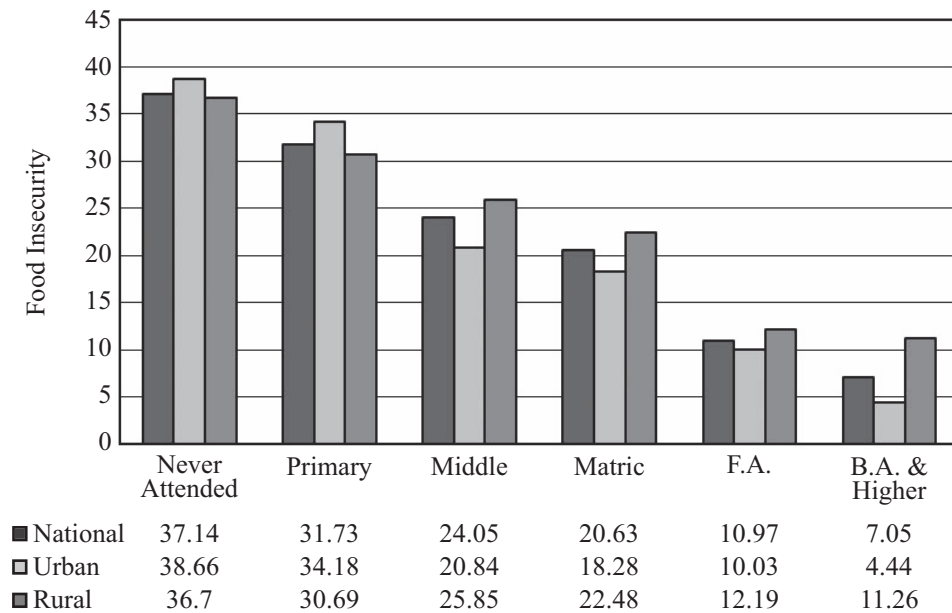Source: Authors' estimation.

FIGURE 4

Food Insecurity by Dependency Ratio in Pakistan, 2010-11
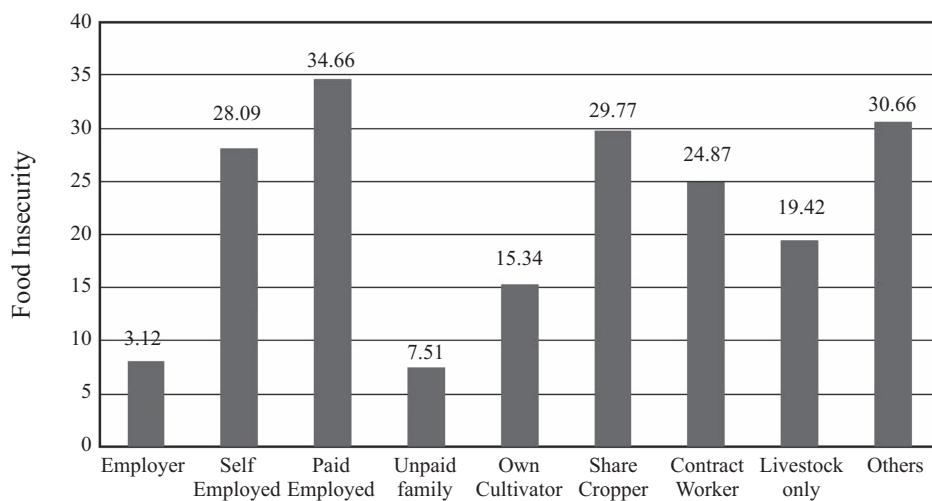

Source: Authors' estimation.

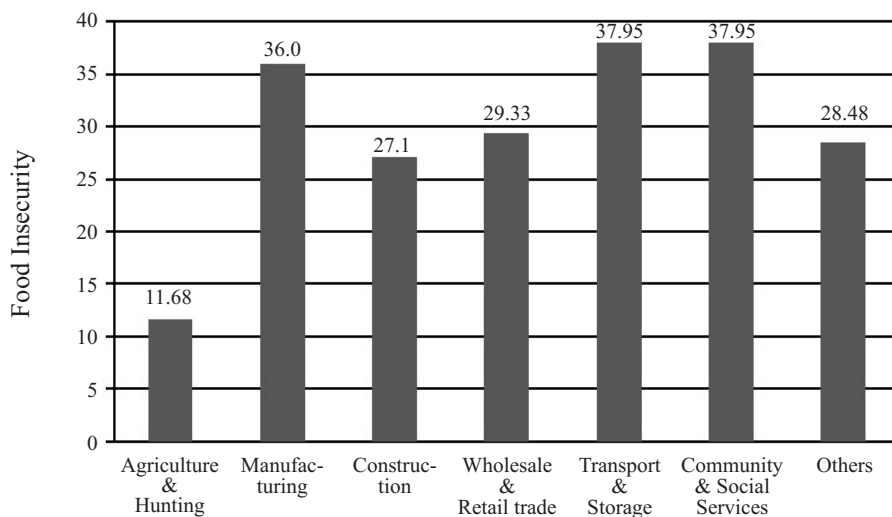**FIGURE 5**

Food Insecurity by Literacy

	Never Attended	Primary	Middle	Matric	F.A.	B.A. & Higher
National	37.14	31.73	24.05	20.63	10.97	7.05
Urban	38.66	34.18	20.84	18.28	10.03	4.44
Rural	36.7	30.69	25.85	22.48	12.19	11.26

Source: Authors' estimation.

FIGURE 6

Food Insecurity by Education

Source: Authors' estimation.

FIGURE 7
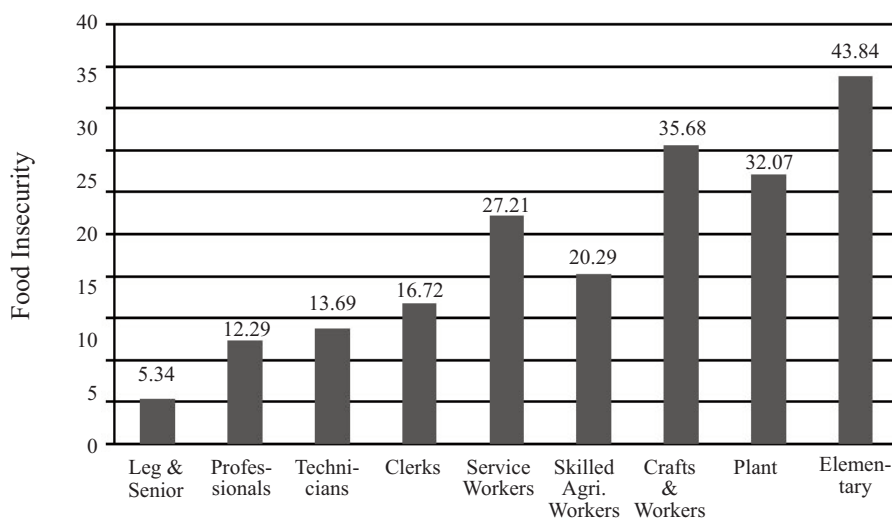
Food Insecurity by Employment Status of Household Head in Pakistan

Source: Authors' estimation.

FIGURE 8

Food Insecurity by Industry of Household Head in Pakistan

Source: Authors' estimation.

FIGURE 9

Food Insecurity by Profession of Households Head in Pakistan

3. Determinants of Food Insecurity

Logit model is estimated to find out the impact of household characteristics on food insecurity in Pakistan. To do this, food insecurity is taken as dependent variable and household related variables are taken as independent variables. Urban and rural areas of Pakistan have different socio-economic and demographic attributes. Therefore, the probability of households being food insecure is also different in both zones. This study finds out the determinants of food insecurity of households at rural, urban and national levels. The findings of logistic model are shown in Table 3.

TABLE 3

Determinants of Household Food Insecurity in Pakistan

Variable	Coefficients	S.E.	Z-Value	Odd ratio
Primary_Education	-0.05	0.06	-0.77	0.95
Middle_Education	-0.34	0.08	-4.13	0.71
Secondary_Education	-0.58	0.07	-8.08	0.56
F.A & Higher_Education	-1.47	0.09	-16.23	0.23
Live Stock	-0.62	0.06	-10.81	0.54
Foreign Remittances	-0.94	0.14	-6.62	0.39
Female head	-0.34	0.09	-3.77	0.71
Poverty	3.40	0.07	48.59	48.59
Constant	-1.27	0.04	-35.82	0.35
No. of Observations	16335			
Pseudo R^2	0.27			
LR chi2(8)	4649.63			
	(0.000)			
Pearson chi2(53)	60.55			
	(0.222)			
Model specification	Well specified*			
Overall Model Prediction	85.39			
Area below the ROC	0.79**			

Source: Authors' estimation. *Output is attached, **ROC is attached (see, Appendix-A).
Note: The model satisfies all the diagnostic tests.

In Pakistan several explanatory variables are assumed to have impact on household food insecurity. The results reveal that different education levels of household heads, age of heads, foreign remittance, ownership of livestock, female heads and poverty status of households are found to be significant ($p<0.05$). In light of the by the family summary of results and possible clarification for all, significant regressors are given below. These findings imply that households whose heads have comparatively better education are more likely to be food secure than those households

whose heads have never attended school or are less educated. The sign of coefficients and odd ratio of educational categories show negative relationship between food insecurity and the educational level of household heads, at national level. It is clarified in the role of education that working efficiency, competency, diversification of income and being visionary, create helpful atmosphere to educate the household dependents with long-term objectives to certify better living situation than the uneducated/less educated household heads. Therefore, education diminishes the probability of becoming food insecure in the households. Results are according to the theoretical actualities showing that education expansion would lead to decrease problem of food insecurity which is also consistent with the results of Aschalew (2006) and Tefera (2011).

Livestock has a negative impact on food insecurity of the households. It explain that if a household owns livestock, it has less likely to become food insecure by 0.498 times relative to those households who do not own livestock. These results are similar to [Bashir, et al. (2013), Nadlouv (1989), Zindi and Stack (1991) Ref.1992]. The results reveal that land ownership is more significant negative determinant of household food insecurity in Pakistan. It is shown that if a household is a land owner then the odds of being food insecure are less by 0.59 times, as compared to those households who do not own land. These results are consistent with those of Rutsch (2003) and Najafi (2003).

Foreign remittance is one of the key factors affecting food insecurity at household level in Pakistan. The odd ratio of foreign remittance can be interpreted if a household is a recipient of foreign remittance. It has less chance to become food insecure by 0.287 times relative to those households who are not recipients of foreign remittance. This is the fact that an increase in income by remittance will lead to positive change in the household expenditure. Thus, remittance leads to increase capacity of households to consume more food stuff. These results are in line with those of Uraguchi (2009) Ref. 2010. The study also estimates the impact of being a head of a family. The results show that households headed by females have less poverty as compared to the households headed by males.

This study also tests the impact of poverty on food insecurity. Poverty is estimated by using national poverty line of Pak.Rs.1,745/-. The coefficients of poverty show very strong positive significant impact on household food insecurity. It can be seen that if a household is poor the odds of being food insecure increases by 28.825 times relative to those households who are not poor. The odds ratio of poverty explains very strong positive connection between poverty status and food insecurity in Pakistan. Frequently the literature use food insecurity indicators as the proxy for poverty [Setboonsarng (2005) and Klaver (2010)]. These results are similar to those of Brisson (2010) and Malik (2014).

Urban and rural areas of Pakistan have different social and economic characteristics and therefore the households in these regions have varying chances of food

insecurity. This study also estimates the determinants of food insecurity at regional level in Pakistan. To check the determinants of food insecurity in urban and rural areas, same variables are assumed, as sssss for the national level. The results are given in Table 4.

Results of the urban and rural levels are also statistical significant and consistent with national level. Education level, except primary education, female heads and poverty status have some variables which significantly affect the urban food insecurity more as compared to rural areas. The foreign remittance affect the food insecurity, almost equally in both the urban and rural areas. On the other hand livestock ownership of households affects food insecurity situation more significantly in rural areas as compared to the urban areas.

TABLE 4

Determinants of Household Food Insecurity at Urban and Rural Levels

	Urban			Rural		
	Coefficients	P-Values	Odd Ratio	Coefficients	P-Values	Odd Ratio
Primary_Education	-0.11	0.28	0.89	-0.04	0.65	0.96
Middle_Education	-0.57	0.00	0.57	-0.20	0.07	0.82
Secondary_Education	-0.84	0.00	0.43	-0.41	0.00	0.66
F.A & Higher_Education	-1.84	0.00	0.16	-1.09	0.00	0.34
Live Stock	-0.43	0.00	0.65	-0.58	0.00	0.56
Foreign Remittances	-0.93	0.00	0.40	-0.94	0.00	0.39
Female head	-0.62	0.00	0.54	-0.19	0.10	0.83
Poverty	3.90	0.00	49.50	3.29	0.00	26.81
Constant	-1.06	0.00		-1.37	0.00	
No. of Observations	6586			9749		
Pseudo R^2	0.25			0.27		
LR chi2(8)	1701.20			3008.12		
	(0.00)			(0.00)		
Pearson chi2(53)	34.71			59.86		
	(0.75)			(0.21)		
Model specification	Well specified*			Well specified**		
Overall Model Prediction	85.70			85.15		
Area below the ROC	0.79*			0.80**		

Source: Author's estimation *Appendix-B ** Appendix-C.
Note: The model satisfies all the diagnostic tests.

V. Conclusion and Policy Suggestions

The current study examines the determinants of food insecurity in Pakistan by using the PSLM data 2010-11 collected by the Pakistan Bureau of Statistics (PBS). The results show that in Pakistan the food insecurity incidence, gap and squared gap are 28.63, 5.28 and 1.46 per cent, respectively. The food insecurity is higher in rural areas as compared to the urban areas.

The study also determines some socio-economic characteristics of the food insecure households. Food insecurity is higher in large size households having higher dependency ratio. The increasing numbers of dependents subverts food expenditure of households and adversely affect their food consumption. Increasing level of education of household heads amplifies earning, skills and household management, and consequently is helpful to eradicate food insecurity. Moreover, income is fundamental factor of household welfare which is earned from different occupations and industrial production. The results reveal that where household heads who are employers, the unpaid family workers are relatively less food insecure than those who are employed elsewhere. Those households who are linked with farming and hunting industry are better in food-use due to their own-food production. Senior legislators and professionals are also more food secure than the households of other occupations, especially the elementary ones.

The key aim of the study is to find determinants of food insecurity achieved by using logistic regression. The results reveal that food insecurity is negatively and significantly related to education, livestock ownership, foreign remittance and female household heads, whereas it is associated positively with poverty. The study propounds that poverty is the root cause of food insecurity of households in Pakistan because poverty is not only a problem but it also worsen each welfare dimension of the society and creates a vicious circle. At a policy level it is suggested that education should be expanded and provided at low cost, particularly in the rural areas and especially to the poor households. It may also be achieved by promoting scholarship programs, awareness for family planning to control household size and dependency ratio, especially in the poor families.

Livestock is one of the main sources of income for rural residents. Therefore, in these areas small loans and credit access should be encouraged to enable them to purchase more animals. Foreign remittance is found very significant determinant of food insecurity. The government should develop friendly relations with other nations to increase foreign remittance of Pakistan businesses or workforce comminutes.

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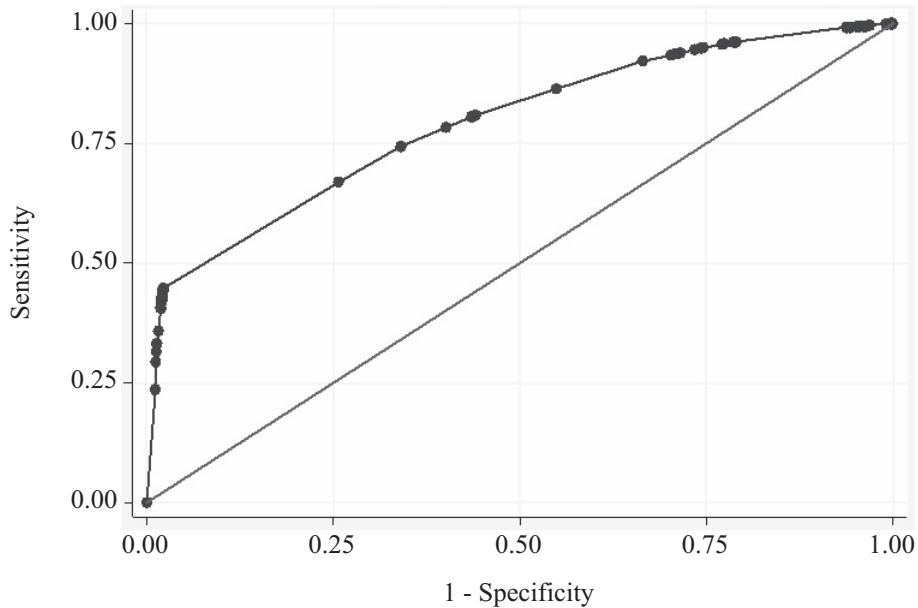
APPENDIX-A

Logistic Regression

Number of obs   =   16335
LR chi2(2)   =   4702.34
Prob > chi2   =   0.0000

Log likelihood = -6526.1649

Pseudo R2   =   0.2649

Pcpoordum	coef	Std. Err.	Z	P>|Z|	(95% Conf. Interval)	
_hat	.9919794	.0192326	51.58	0.000	.9542842	1.029675
_hatsq	-.210142	.0128657	-1.63	0.102	-.0462305	.004202
_cons	.0528166	.0458001	1.15	0.249	-.0369498	.1425831

Area under ROC curve = 0.7919

APPENDIX-B

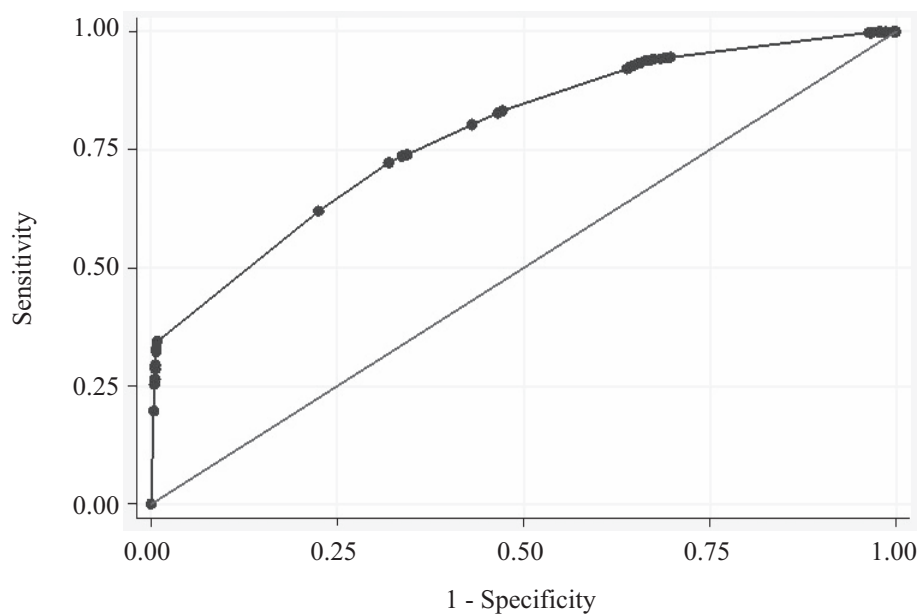Logistic Regression

Number of obs   =   6586
LR chi2(2)   =   1701.52
Prob > chi2   =   0.0000
Pseudo R2   =   0.2523

Log likelihood = -2520.7826

Pcpoordum	coef	Std. Err.	Z	P>|Z|	(95% Conf. Interval)	
_hat	.9941012	.0360572	27.57	0.000	.9234305	1.064772
_hatsq	-.008663	0.153044	0.57	0.571	-.0386591	.021333
_cons	.0177249	.0679152	0.26	0.794	-.1153865	.1508363

Area under ROC curve = 0.7848

APPENDIX-C

Logistic Regression

				Number of obs	=	9749
				LR chi2(2)	=	3009.83
				Prob > chi2	=	0.0000
Log likelihood = -3981.4056				Pseudo R2	=	0.2743

Pcpoordum	coef	Std. Err.	Z	P>|Z|	(95% Conf. Interval)	
_hat	.9911439	.233542	42.44	0.000	.9453705	1.036917
_hatsq	-.0268912	.0207438	-1.30	0.195	-.0675484	.013766
_cons	.069885	.0664266	1.05	0.293	-.0603087	.2000788

Area under ROC curve = 0.7954