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THE CORRELATION BETWEEN FOOD PRICE INSTABILITY AND FOOD SECURITY: EXPLORING THE LINKAGES AND UNDERSTANDING THE CONSEQUENCES

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ABSTRACT

Food price instability over the last few years has hurt millions of people worldwide in the context of food security. This study focuses on examining the impact of food prices on food security, specifically in households in Pakistan. To analyze this relationship, the study utilizes data from the Pakistan Social Living Standard Measurement (PSLM) survey spanning the years 2005-2006, 2007-2008, 2011-2012, and 2015-2016. By employing a logistic regression model, the study aims to identify the factors contributing to these households' food security. The results obtained from the logistic regression model indicate a negative correlation between food security and the prices of key food items such as flour, meat, milk, and vegetables. In other words, when the prices of these essential food items increase, it reduces the likelihood of a household being food secure. This suggests that fluctuations and increases in the prices of these particular food items can have a detrimental effect on the ability of households to meet their food needs adequately. By identifying these specific food items and their impact on food security, the study provides valuable insights into the factors that influence the vulnerability of households in Pakistan to food insecurity. This knowledge can inform policymakers and stakeholders in developing strategies and interventions to address the challenges posed by fluctuating food prices and improve food security outcomes for households in the country.

Keywords: Price instability; Food security; PSLM survey; Pakistan.

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INTRODUCTION

Food and Agricultural Organization (FAO) estimated 815 million people were hungry in 2006, which increased from 75 Million to 135 Million by 2008 (FAO, 2008). The rise in food prices, fuel prices hike, climate change, wars, and civil strife, global distinction of the monetary system, and states collapse. These horrible circumstances negatively affected almost every field of life, such as food security and continuous evolution. Therefore, more than 100 million individuals fell into poverty in 2008, which extremely hampered the Millennium Development Goal (MDG) of poverty devaluation (Ivanic & Martin, 2008). Food security exists when all individuals consistently have physical, social, and financial access to adequate, protected, and nutritious food which meets their dietary related to their nutritious and healthy life (World Food Summit, 1996). According to Barrett (2010), food security incorporates several needs: food availability, access to food, and the food is culturally appropriate. Numerous factors in today's global environment exacerbate food security. It is true; we live in an era of developing and producing more food than ever. We have enough food to take care of the world's population. However, it is not dispersed appropriately, nor is all food culturally appropriate worldwide. Domestic food contrasts significantly, and the best distinction between developed and developing countries exists. The essential explanation behind

this inequity is an income-related distinction between these populaces (Hazell & Wood, 2008). It must be expressed, however, that there is craving in each country of the world, and this frequently falls along financial and social lines the oppressed, individuals, or countries frequently have less.

The effect of food price instability on food security can be measured at three levels: the national level, family intra-household distribution level, and individual level (Darnton-Hill & Cogill, 2010). The effect of household-level outcomes of the food prices rise is common in low-income, food-shortfall economies. For example, a 50% rise in staple food prices in the low-pay nations causes a 21% expansion in all-out food use, with income expenditure on food ascending from 50% to 60% or much higher (Trostle, 2008). Even the unfavorable impact of food prices hike is not a special case in fruitful economies. Food buying represents a few overlaps of the households' budget for people experiencing poverty, with numerous households spending 70% on food.

Pakistan is a developing nation. Its circumstance is a lot like other food-shaky nations. It has enough food availability. Additionally, be that as it may, people buy intensity of nourishment is incredibly hampered by the number of variables. For example, around 42 million individuals in Pakistan need more income to buy the food they require for a healthy life, with about 33% of the population under nutrition, which is shown by the far incidence of malnutrition. About half of the children are underweight, especially those under five. The human development index (HDI) positioned Pakistan at 135 among the 174 studied countries. This shows that Pakistan lags behind in financial pointers (Iram & Butt, 2004).

Pakistan is not a food-insecure country. Normal meal usage is 150 kg per man or woman in keeping with the year of cereals and pulses, with at least 130kg in 1960 and a restriction of 162kg in 1993. Per capita accessibility, be that as it is able to fell to 140kg in 1995 and marginally went as much as 145kg in 1996 (FAO, 1996). Stability refers to the appropriateness of nutritious meals on the national level, as stability in food access on the own family and individual degrees. In this manner, it is legitimately motivated via the exhibition of the agribusiness department. Just a touch quantity of clients in manufacturing international locations can undergo to keep nourishment for the complete 12 months. In this manner, aside from production, balance requires higher administration of nearby advent, meals markets becoming a member of, and rational and effective usage of buffer shares and exchange (FAO, 2002). Food price fluctuations have exacerbated the situation across the world and particularly in the developing world. Food Price, in fact, has a direct impact on food security; as price rises, access to food becomes difficult for people with lower income. This study estimated the impact of food price instability on food security using household surveys. The study can be helpful for all the stakeholders involved in reducing food insecurity. The study will also be helpful for researchers who want to study the nexus between food prices rise, and food security. The study covers the following research question.

The study ensure the following questions in detail;

1. What is the impact of food-prices instability of food security?
2. What is the nexus among food-prices instability, food insecurity, and other macroeconomic variables?

The general objective of the study is to quantify the impact of food prices instability on food security. To achieve the general objectives, specific objectives are given as under;

1. To find the impact of food prices instability on food security of household
2. To give policy recommendations to all stakeholders involve in devising policy on food security.

Food price instability over the last few years has hurt millions of people worldwide in the context of food security. Pakistan is also no exception here. Being a resource-scarce and developing country is also facing challenges in ensuring food security for all. The present study investigated the impact of food price instability on food security, as food price instability is closely connected to the concept of food security.

LITERATURE REVIEW

Dessus et al. (2008) estimated the adjustments in assuaging city poverty value due to the latest uplifting of food prices. This examines the use of compensating variant concepts by way of computing poverty deficit for stated nations. This study shooting clause capable estimate of the three parameters that produce three scenarios, particularly a crucial one, upper bond, and lower bond. The method uses series facts is household survey data for each us of a. This observed use according to capital household income and minimal profits facts fulfill the reimbursement level of a household to purchase a given basket of goods is one as a proxy of the poverty line as an independent variable. In many other nations, it suggests serious consequences for three men or women. This identifies the trade poverty deficit because of the negativity of real income effects for three households that have been poor before the price shocks. Headey (2013) analysed the effect of the global food crisis on self-assessed meals protection of 2007–08 the use of an indicator of self-assessed food safety from the Gallup World Poll; the study used survey-based totally evidence no longer simulation study gives no locating no proof that global food lack of confidence changed into higher in 2008 than it changed into in previous years, even though it affected many areas, particularly some of international locations in Africa and Latin America. The effects cast doubt on the usefulness of simulation tactics in predicting worldwide poverty tendencies, although the more state-of-the-art these strategies are, nevertheless useful for exploring the mechanisms and distributional influences of food rate impacts in an experimental place. Torlesse et al. (2003) found out how adjustments in rice charges affect toddler underweight in Bangladesh using yearly records accumulated from 1992 to 2002. They determined that being underweight is undoubtedly and strongly correlated with rice cost hikes. Other research observed similar outcomes, however, the use of micro-level records. For example, (Mkhawani et al., 2016) investigated the effect of drought on toddlers by increasing the use of the panel facts approach (term 1993–1997) in Zimbabwe, Yamano et al. (2005) tested the impact of food resources and drought on child growth in Ethiopia (term 1995–1996) assessed the dietary impact of Indonesia's monetary crises and drought and financial crisis (term 1997/1998).

More recently, Stillman & Thomas (2008) examined six dimensions of dietary fame using annual information and discovered the effect of the decline in economic pastime in Russia between 1996 and 1998. Piñeiro et al. (2000) investigated child mortality with recognition of fluctuation in world Arabica coffee expenses in Colombia and documented seasoned-cyclical toddler deaths starkly. They also cautioned that a counter-cyclical courting is probably anticipated. Further, they mainly focussed on medium to long-run results due to the yearly nature of statistics. Other researchers studied traits of mass populations that can be susceptible to expense shocks in Guatemala. Finally, the usage of representative records gathered before and after a disaster. Renate Hartwig (2009) analyzed the meals disaster because of unfavourable climatic situations in Malawi in 2002. During diverse points in the 2008 meals crisis, policy makers in conjunction to simulate the impact of the disaster (food and gas crises) on the welfare of families at local, sub-countrywide regional, and countrywide levels. For example, Ivanic & Martin (2008) located heterogeneous consequences driven principally by the family's internet seller or internet buyer position. They examined the consequences of the meals rate crisis for nine low-earnings South Asian, Latin American, and African international locations.

McCordic et al. (2019) evaluated the relationship between electricity expenses and food charges. They have a look at used the panel information of 8 Asian nations over the period 2000 to 2016. The panel-VAR model is used to evaluate the impact of employment in agriculture; biofuel charge; land used for agriculture; GDP; inflation charge; oil rate; hobby charge; and real exchange price on agriculture food fees. Findings confirmed that shocks from oil fees had a wonderful and massive impact on meal prices. The examiner counseled that biofuel energy needs to be promoted mainly in inclined economies to increase in costs of agricultural products and to endanger food protection. Balana et al. (2020) tested the impact of small-scale irrigation technology on food safety and the financial system. The study used data on small-scale irrigation

technologies in Ghana. A farm simulation version was carried out on records of selected small-scale irrigation technologies to assess their effect on the income and nutrition of smallholder farm families. Findings showed an advantageous impact of small-scale irrigation technologies on internet farm income performed by smallholder farm families. Farmer uses low capital-intensive small-scale irrigation technologies, which generate lower financial returns.

Ahmad & Farooq (2010) analysed the pricing mechanism of wheat flour and bread; that's an idea to be responsible for placing the flour rate in Pakistan. The pricing mechanism of wheat is fundamental with the aid of a guide fee. This observation is based on this query "Does food inflation the outcome of an inefficient pricing mechanism in Pakistan?" They have a look at chosen information of time series of two decades 1990-ninety one to 2009-10mp of financial yr. This study has used a technique of Linear Regression Analysis. This analysis showed that extra help charge is the principal motive for inefficiency. Input price, including subsidy, is in addition powerful for the kingdom earlier than assist a price. According to a study by Salarkia et al. (2014), the production of wheat should not be underestimated, emphasizing the need for a macro-administration policy that prioritizes wheat production and supports the income of wheat growers. They propose adopting a similar approach to the support fee system implemented during agricultural growth in the 1960s. The Food and Agriculture Organization (FAO) recognizes Pakistan as the 7th largest wheat producer globally.

METHODOLOGY

The study aims to estimate the impact of food price instability on food security over different periods of time. For this purpose, Secondary data from PSLM of 2005-2006, 2007-2008, 2011-2012, and 2015-2016 has been used. A detailed description of variables is given as follows.

Description of Variables

Following is the description of a variable of the model.

Food Security

Food security and craving cannot be estimated through any one indicator in the country. There are numerous ways to calculate food security, but the researchers used the (Fi) food security index, which Cheema (2016) used.

It classifies the households into a food-insecure household and the food-secure household.

$$Fi = \frac{\text{percapitafoodexpenditureofthhousehdd}}{2/3\text{meanofperapitafoodexpenditureofillhousehdd}} \quad (1)$$

While if $Fi < 1$, it represents that ith household is food secure. A household is food secure when it's monthly per capita expenditure on food lies below 2/3 of the household mean per capita food expenditure for all households. Furthermore, when the per capita expenditure of food lies above or equal to two-thirds of the mean per capita food expenditure of all households, the household will be considered food insecure (Cheema, 2016).

The ratio of food expenditure to total income

The study calculated monthly income by converting per year income into months by dividing 12 by total yearly income. The food expenditures of households are obtained by merging per year of income and expenditure on food. The dummy ratio of food expenditure to total income is constructed that is equal to 1 if the household's share of food expenditure in total income is greater than 70%. As the ratio of food expenditure to total income increases, the chances of households being food-wise insecure also increase.

Flour Prices

Flour is necessary food for every human being. It contains calories and a variety of significant nutrients. Everyone eats flour on a daily basis. So, the flour prices are taken as an independent variable. There are four types of wheat flour in the data that is wheat flour fine/superior, wheat flour average quality (loose), wheat flour bag, and wheat flour bag other quantity. The variable of flour prices is constructed by merging total flour prices into 20kg bag prices (FP).

Milk Prices

Milk is essential for human body growth. It also contains numerous nutrients. There is fresh milk, milk tetra pack, Milk powder, and dry milk powder for children. The milk prices are obtained from household survey data of Pakistan for four years (2005-2006), (2007-2008), (2011-2012), and (2015-2016). The variable is constructed by merging all milk prices (MP).

Meat Prices

Meat is also very essential for human body maturation. So, considered meat prices as an independent variable because their prices affect food security. The variable of meat prices is obtained by merging the prices of mutton, beef, and chicken.

Vegetable Prices

All vegetables contain multiple fibers and vitamins. Vegetables are food for all kinds of people, whether they are rich or poor. So, vegetables are independent variables in this study. This study takes all kinds of vegetables. The variable of vegetable prices (VP) is generated by merging data of these vegetable prices taken from Household surveys of years (2005-2006), (2007-2008), (2011-2012) and (2015-2016).

Regional variables

This study has constructed the following regional variables to capture any possible regional variation of food security at the provincial and rural-urban levels.

Province Punjab: Punjab is the largest province of Pakistan according to population. Most of the area of Punjab is covered by rural areas, where most people's occupation is farming, and they use their own flour, vegetables, meat, and milk. The study has constructed a dummy variable for the province of Punjab that is equal to 1 if the household belongs to Punjab and 0 otherwise.

Province Sindh: Sindh is the second largest province of Pakistan according to population. Most of the population of Sindh is covered by urban areas. The study has constructed a dummy variable for the province Sindh that is equal to 1 if the household belongs to Sindh and 0 otherwise.

Province KPK: Khyber Pakhtunkhwa is the richest province of Pakistan according to minerals and also for tourism. The study has constructed a dummy variable for province KPK that is equal to 1 if the household belongs to KPK and 0 otherwise.

Baluchistan: Baluchistan is the largest but most underdeveloped province of Pakistan. The income level of the household in Baluchistan is very low compared to the household from other provinces. The chances of food insecurity can be higher in this province as compared to others. This study has used Baluchistan as a reference category to measure provincial variations in food security.

Urban-Rural: In the urban area, people have better job opportunities. Rural households produce their own food, so there can be a difference in food security at the rural and urban levels. To capture the difference, this study has constructed a dummy variable for Urban that is equal to 1 if the household belongs to urban area and 0 otherwise.

Model

To accomplish the objectives of the study, the logistic regression model has been used, the dependent variable is food security, and it is a dichotomous variable, so the binary logistic regression model is considered an appropriate model for economic analysis. Logistic regression is the suitable regression

analysis to act when the dependent variable is binary. It's functional for circumstances where there could be a capacity to forecast the existence or absence of a distinguishing or results based on values of a set of predictor variables. It is near to a linear regression model but is suited to models where the dependent variable is dichotomous. Its coefficients can be used to estimate the odd ratios for each of the independent variables in the model. Logistic regression, on the other hand, is used to ascertain the probability of an event; this event is captured in binary format, i.e., 0 or 1.

When the dependent variable (household food security) is binary (i.e., taking the value one if the household is food-wise insecure and zero if it is food-wise-secure), the logistic regression is a good choice. This logistic regression was used by Kidane et al. (2005), Asefach & Nigatu (2007), and Cheema (2016) to assess the impact of food price instability on household food security.

The model is calculated to check the relationship of the total food security with a dummy of the ratio of food expenditure to total income, flour prices, milk prices, meat prices, and vegetable prices, a dummy of food security in the province; Punjab, Sindh, Baluchistan, KPK and urban areas.

$$P(FS) = 1 | DFY_i, FP_i, MP_i, MTP_i, VP_i, DPUN_i, DSI_i, DKPK_i, DURB_i) = F(\alpha_0 + \alpha_1 DFY_i + \alpha_2 FP_i + \alpha_3 MP_i + \alpha_4 MTP_i + \alpha_5 VP_i + \alpha_6 DPUN_i + \alpha_7 DSI_i + \alpha_8 DKPK_i + \alpha_9 DURB_i) \tag{2}$$

Where;

FS= Food Security, DFY= Ratio of food expenditure to total income, FP = Flour prices, MP = Milk prices, MTP = Meat prices, VP = Vegetable prices, DPUN = Dummy of Punjab Province, DSI = Dummy of Sindh Province, DKPK = Dummy of KPK Province, DURB = Dummy of Urban areas.

RESULTS AND DISCUSSION

Table 1 shows the results of household survey data of Pakistan from 2015 -2016. The households who spend 70% or greater amount of their total income on food are 0.58 times less likely to be food-wise secure as compared to those households who spend less than 70% of their total income on food. This can be interpreted in another way. The odds of food security of those households who spend more than 70% of their total income on food is 41.78% smaller than the odds of food security of those households who spend less than 70% of their total income on food.

Table 1. Results of the logistic regression model.

Variabes	[Exp.(β)-1]*100	Odd Ratio	Std. Error	P-Value	Coefficient	Marginal Effects
DYF	-41.7721	.5822786	.0648921	0.000	-.5408062	-.084
FP	-2.0656	.9793439	.0041487	0.000	-.0208724	-.003
MP	-2.4168	.9758311	.0016859	0.000	-.0244658	-.003
MTP	-0.3169	.9968305	.0002447	0.000	-.0031745	-.000
VP	-0.8996	.991003	.0023769	0.001	-.0090377	-.001
DPUN	-47.3978	.5260215	.042343	0.000	-.6424132	-.100
DSI	-14.5768	.8542312	.0668328	0.044	-.1575534	-.024
DKPK	-36.9964	.6300354	.0517974	0.000	-.4619792	-.072
DURB	-33.4266	1.502103	.0619642	0.000	.4068662	.063

Log likelihood = -9071.1481.

The odds of food security decrease by 2.06% with a rupee increase in the price of flour. When the price of milk increases by one rupee, the odds of food security decrease by 2.41%. Similarly, the odds of food security decrease by 0.31% with a rupee increase in the price of meat. When the price of milk increases by one rupee, the odds of food security decrease by 0.9%. Flour, Milk, Meat, and Vegetables are necessary items of food. The prices of these food items have a negative relationship with the food security of households; if the price rises, it will reduce the likelihood of a household being food-wise secure. The odds

of food security of those households who live in Punjab are 47.39% smaller than the odds of food security of those households who belong to Baluchistan. In the same way, the odds of food security of those households who live in Sindh are 14.6% smaller than the odds of food security of those households who belong to Baluchistan, and the odds of food security of those households who live in KPK is 36.99% smaller than the odds of food security of those households who belong to Baluchistan. The results on regional variation show the odds of food security of those households who live in Urban is 33.42% smaller than the odds of food security of those households who belong to Rural.

CONCLUSIONS

The current study investigated the impact of food price instability on food security. It has two main objectives: first, to analyze relationship between food price instability and food insecurity, and second, to provide policy recommendations to stakeholders. Fluctuating food prices have a significant direct effect on food security, particularly in developing countries. While countries with better production capacities can also experience food security challenges, the factors contributing to these challenges are more prevalent in developing nations. These factors include limited access to new markets, inadequate production measures, and inefficiencies in policy management. The study considered macro-level variables that help understand the underlying causal relationship between food price instability and food security. The estimation data is sourced from the PSLM 2015-2016, which includes 25,586 observations. A logistic regression model is employed for estimation due to the dichotomous nature of the dependent variable. As previously discussed, flour, milk, meat, and vegetables are essential daily food items. If the prices of these food items increase, it reduces the likelihood of households being food secure. Food prices are directly linked to food security. The study proposes the following policy recommendations: Firstly, to address food insecurity caused by the rise in flour prices, the government should increase wheat production and ensure equal distribution of wheat to provinces based on population. Market inefficiencies in the flour market contribute to the price hike, so the government should take concrete steps to eliminate these inefficiencies through proper planning and data-driven decision-making.

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