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Statistical Analysis of Structure of Prices and Its Implication for Food Policy of Bangladesh

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Abstract

The role of price in agricultural development has always been and still remains one of the most contentions issues in development literature. Developing an effective domestic food policy depends on creating an environment in which alleviating poverty is a major function of the economy. With political commitment, good analysis and careful implementation, food policy offers an important vehicle for reconciling short-run equity with long-run growth and efficiency. A food strategy for achieving self-sufficiency should contribute to the generation of effective demand and equity through the production process itself. Data on the price, irrigated acreage of rice and per capita food grain stock were used for this study. Data were also reduced in the relative price of rice, which is equal to rice price deflated by the non-cereal food price index. Finally, all the reduce form data were used in the model. The modeling output, proportion of rice acreage irrigated by mechanized method has a significantly negative effect on rice price deflated by non-cereal food price index. According to chow test this results are statistically significant. Access to non-cereal food makes statement about the provision of the vital micronutrients, protein and amino acid in what people eat. Much more than calories, these matter to health vitality and life expectancy of the people. The economic consequences of the country's malnutrition problem are profound, resulting in lost productivity and reduced intellectual and learning capacity. Breaking the malnutrition barrier is an investment that the country should make for socio-economic development. This merits greater integration into definition of food security. In this paper that access to non-cereal food is and is likely to remain an important fact to the well being of the poor, and that therefore it is an important aspirant for adaptation as an important food policy issue.

Key words: Relative Price, Non-cereal Food, Chow Test, Food Security and Life Expectancy.

1 Introduction

Aggregate food availability and household food security do not necessarily overlap to any degree: this is because exchange entitlements of already impoverished starvation and death (Sen, 1981). How markets process information, especially relative to future availability from domestic production, represent defining characteristics of the pathway between aggregate availability and household's capacity for exchange (Ravallion, 1987; Montgomery, 1983). Foodgrains overdose in calories; noncereal foods are about access to nutrients that really count to what we shall call, for want of a better term, the 'quality of life', the shorthand for health, vitality and life expectancy. Access noncereal food is an important facet to the well being of the poor and it is a prime candidate for adoption as an important food policy issue.

During the period through the early 1990s, the production of food other than cereals has been the relative laggard in Bangladesh's agriculture. There are two major reasons such as technological stasis and high marketing risks especially at initial stages of the marketing chain (Mahmood et al., 1993). However cross-section data reveal that there is a fairly broad based demand for noncereal food in Bangladesh. For three of the important subclasses of noncereal food mainly: i) meat and poultry, ii) milk and dairy products and iii) edible oil, the underlying income elasticity's seemed to be high (BBS-HES, 1988/89).

2 Background of Price Variability and Its Impact

Producer prices are invariably lower and tend to be unstable in distant areas. Spatial price relationships are determined largely by transfer costs between regions provided competitive conditions prevail. When transportation and marketing charges represent a high proportion of the consumer price, small changes in retail demand can result in large percentage changes in producer returns.

The principles that determine spatial prices differences within a country apply equally well to international prices, provided no barriers exist to the movement of commodities between countries. For many agricultural commodities, of course, the conditions necessary for free trade do not exist. There is no longer a single world market for grains, sugar or dairy products. The principles that underlie price differences between regions (assuming a competitive market structure with homogeneous commodities) can be summarized as follows:

(1) Price differences between any two regions (or markets) that trade with each other will just equal transfer costs.

(2) Price differences between any two regions (or markets) that do not engage in trade with each other will be less than or equal to transfer costs.

Price differences between regions cannot exceed transfer costs. The reason for this should be obvious: any time the price difference is greater than transfer costs, buyers

will purchase commodities from the low-priced market and ship them to the higher-priced market, thereby raising prices in the former and reducing them in the latter, this form of arbitrage will continue until it is no longer profitable to ship commodities between markets- that is, until the price difference between them no longer exceeds transfer costs. Using these principles, theoretical spatial price relationships, sometimes called the structure of prices, can be determined. The structure of prices is a function of the pattern of trade (who ships to whom) and transfer costs per unit of product between regions that engage in trade. Where no trade exists between regions, and upper, but not a lower, price boundary can be established since, as pointed out above, the difference in price can not exceed transfer costs between any two regions. In the absence of trade, the precise structure of prices cannot be determined solely on the basis of transfer costs. They are easily deterred med, however, if all surplus-producing areas ship to one central market. In this case, the price in each surplus area will be equal to the central market price less the cost of shipping the product to that market. The determination of spatial price relationships becomes much more complicated When there are many regions or points of origin for surplus commodities and several markets to which the surpluses may be sent. The optimum pattern of trade in that case may not be intuitively obvious, and until the pattern of trade is identified, the structure of prices cannot be determined.

The principles involved in determining the geographical structure of prices can be summarized as follows:

(1) The lowest cost source determines the price prevailing in each deficit market.

(2) Produce sells in whichever market yields the highest net return.

(3) The price prevailing in each surplus producing area is the deficit-market price less the cost of transferring a unit of product to that market.

Transfer cost is the most important single variable determining spatial price relationships. Interregional price differences presumably are based on the least-cost method of moving commodities between points. But it may not be possible for every handler or shipper to use the least-cost system, especially where new handling methods are being introduced. It producers in a particular region offered their product for less, this would cause prices for the same commodity produced in other regions to fall by an equal amount. Such price adjustments would be necessary for producers to remain competitive. Central markets play a less important role in pricing some commodities, such as fruits and vegetables sold to processors, than in pricing grains. But even where price-making forces are dispersed, prices in different regions are closely interrelated. Interregional price differences, as pointed out earlier, cannot for very long exceed the cost of moving commodities between regions (Bressler and King, 1970).

Producer prices for grains decline as one moves from grain-deficit to grain-surplus areas or from major ports to distant supply areas. While general structure of prices in the absence of trade barriers, such as tariffs, conforms to what would be expected

based on transfer costs, there are important exceptions. Differences may exceed transfer costs, even for extended periods, because of incomplete or inaccurate information, preferences on the part of buyers for produce grown in a particular area and institutional or legal barriers to the movement of commodities between regions. Temporary factors, such as a shortage of railroad cars, elevator space, hartal, barge transportation and illegal toll collection by local influential supporters also can lead to price differences between regions that at times exceed normal transfer costs.

Geographical price relationships can be analyzed in a formal way by using spatial price equilibrium models. These models make it possible to estimate the net price that will prevail in each region and the quantity of a given commodity that any one region will sell or purchase from every other region. Such models enable one to determine the optimum or least-cost trading pattern, given supply and demand conditions within each region. Spatial equilibrium models are most useful in analyzing interregional price relationships and trading patterns where there are numerous consuming and producing regions (Grennes et al., 1978).

Spatial models can be used to ascertain the effects of changes in supply, demand or transfer costs on the pattern of trade and consequently on the structure of prices. For example, an increase in demand in a particular region caused by a shift in population influences the amount of surplus or deficit in that region. The changes in turn, can affect prices in all other regions. By working through a spatial equilibrium model, both the direct and indirect effects of a change in one or a combination of variables can be anticipated. This cannot be done without the aid of a model that explicitly recognizes the interrelationships among prices in different regions.

Empirical results from spatial equilibrium models are used mainly to assess the potential impact on trade and prices of changes in national farm policies that affect production, consumption and trade, including changes in price-support levels, tariffs, quotas, and other import restrictions or the introduction of embargoes (Dean and Collins,1966; Gemmill, 1977 and Abbott and Paarlberg, 1986). In addition, such models can be used to determine regional differentials to establish price-support levels or purchase prices (Leath and Blakley, 1971). Still another use of such models is to identify regions or situations where imperfect competition or inefficiencies in marketing and transporting or routing products exist. Interregional transfer costs are ignored in spatial equilibrium models. Production is assumed to originate at a single location in each region; likewise, consumption is assumed to occur at a specific location. Transfer costs and also the nature of competition within regions obviously can affect spatial price relationships (Greenhut, 1978; Greenhut el al., 1987 and Capozza and Van Order, 1977).

Technically, the number of regions that trade with each other, based on the solution of a spatial equilibrium model, will be much smaller than the total number of possible trading relationships (Grennes et al., 1978). Grenness et al., (1978) reported that each deficit region would tend to purchase from only one or possibly two surpluses regions, based on purely cost relationships. Japan, for example, would purchase all or at least

most of its wheat from Australia, because it is the least-cost solution given the model specification, but in practice, it buys from many suppliers. The relation between the total number of potential trades among regions and the number of trades occurring in the final solution of a spatial equilibrium model can be expressed mathematically.

In the absence of barriers to the free movement of commodities, interregional price relationships respond to changes in supply and demand in different regions and to changes in transfer costs. A change in demand or supply in one region can have far-reaching effects on other regions, including those not directly involved in trading with that region. Changes in transfer costs, likewise, can alter the relative advantages of producers in different areas. In general, a decrease in shipping costs will benefit more distant as compared with nearby producing areas. Thus, it is important to know something about the factors that influence spatial price relationships in attempting to predict changes in the competitive position of different regions.

Individuals charged with the responsibility of establishing support prices also must have an understanding of spatial price relationships. Support price differentials that are inconsistent with least-cost trading patterns and existing transfer costs can lead to uneconomic expansion of production in some regions and to higher government costs or a loss in consumer welfare.

3 Modelling Approach

Data on the rice price during the period from 1975/76 to 2000/01, irrigated acreage of rice and per capita food grain stock were used for this study. Data were also reduced in the relative price of rice, which is equal to rice price deflated by the non-cereal food price index. Finally, all the reduce form data were used in the model. The modelling output, proportion of rice acreage irrigated by mechanized method has a significantly negative effect on rice price deflated by non-cereal food price index. Rices real price is found by deflating nominal rice price by this index. This measure is a reasonably valid measure of rice's real price. According to chow test this results are statistically significant (Pindyck and Rubenfeld, 1991).

Model of Relative Price of Rice (rice price deflated by the noncereal food price index) is

$$\mathbf{Y} = \alpha_{\mathbf{0}} + \alpha_{\mathbf{1}}\mathbf{X_1} + \alpha_{\mathbf{2}}\mathbf{X_2} + \alpha_{\mathbf{3}}\mathbf{D_1} + \varepsilon \tag{1}$$

where, Y= natural log of real price of rice, X_1=natural log of the proportion of irrigated acreage of rice, X_2=natural log of Governmental per capita foodgrain stock on july, 1 of each fiscal year, and D_1=a dummy variable taking the value of 1 for three years 1990/91, 1991/92 and 1992/93 and 0 otherwise.

Irrigation policy and government stock policy are two main policies have attracted discussion during the period. The diffusion of high yield varieties (HYVs) in rice is not all due to public policy-several important HYVs were the brainchildren of farmers themselves. Also, in econometric analysis, the HYVs variable did not perform well.

The dummy variable 0 was taking this years are extreme years. 1990/91 was the year when rice output was high. The other two years when the public food policy was in a state of flux (Haggblade , 1993). We tried a time trend (T) in above model (D_1 was omitted when T was in). As shown below, inclusion of T renders the model behaviorally inarticulate. Why are we using log transform? In that case, we can read elasticity's off, directly.

Table 1 : Summary Statistics of Policy determinants of rice's real price

Dependent Variable	Regressors					R^2	D-W	Test for Heteroskedasticity
	Const	X_1	X_2	T	D_1			
Y	10.07* (38.9)	-.42* (-4.12)				.61	1.68	Positive
Y	9.12* (110.23)	-.0214* (-4.05)	-1.5E-05 (-1.13)			.63	1.99	Negative
Y	10.11* (25.3)	-.27* (-3.1)	-0.0678 (-1.52)		-.17* (-1.85)	.67	2.14	Negative
Y	8.56 (.26)	-0.54 (-1.37)	-0.08 (-1.89)	.0012 (.057)		.54	1.78	Negative

The result in table 1 show that the trend decline in rice's relative price is, far from being due to a mysterious thing called 'time' in fact due to the irrigation policy of the government. Whenever T is in the model, X_1 effect on rice relative price is highly significant. But note that developments within the market for irrigation services in three years in 1990s increase the potency of the irrigation policy variable to influence rice relative price. The responsiveness of rice relative price increases by more than 10 times D_1 is included. As well as being associated with an acceleration of rice production growth rates, the irrigation access liberalization has also enabled a mechanization of small-scale country boats on a large enough scale to make a significant difference to rice market integrations in the more recent period (Palmer et al., 1993). This is also related to the sharing of the declining relative rice price. In short, Government policy regarding irrigation has achieved a clear measure of success.

In contrast, the conduct of public stock policy has also contributed to a cheap rice policy. The coefficient on the public stock variable is always negative and not significant. The similar work showed that government stocks by depressing market expectations of future rice prices (Golleti et al., 1991) reduce spot rice prices in multivariate framework (Chowdhury 1994a; Ahmed et al., 1993; Chowdhury 1993). The irrigation variable above, significantly enough includes a large measure of decline in rice's real price. In short, government policy reforms in agricultural input markets, of which the leading edge has been irrigation, can take credit for bringing about a decline over time in prices of rice versus noncereal food. The model was used to test the existence of structural change in rice relative price.

4 Conclusion

The role of price in agricultural development has always been and still remains one of the most contentions issues in development literature. Developing an effective domestic food policy depends on creating an environment in which alleviating poverty is a major function of the economy. With political commitment, good analysis and careful implementation, food policy offers an important vehicle for reconciling short-run equity with long-run growth and efficiency. A food strategy for achieving self-sufficiency should contribute to the generation of effective demand and equity through the production process itself. According to chow test this results are statistically significant. Access to non-cereal food makes statement about the provision of the vital micronutrients, protein and amino acid in what people eat. Much more than calories, these matter to health vitality and life expectancy of the people. The economic consequences of the country's malnutrition problem are profound, resulting in lost productivity and reduced intellectual and learning capacity. Breaking the malnutrition barrier is an investment that the country should make for socio-economic development. This merits greater integration into definition of food security. The irrigation variable above, significantly enough includes a large measure of decline in rice's real price. In short, government policy reforms in agricultural input markets, of which the leading edge has been irrigation, can take credit for bringing about a decline over time in prices of rice versus noncereal food. The model was used to test the existence of structural change in rice relative price. In this paper that access to non-cereal food is and is likely to remain an important fact to the well being of the poor, and that therefore it is an important candidate for adaptation as an important food policy issue.

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