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Economic growth and inter-sectoral linkages in India

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ABSTRACT

The process of economic development in an economy results in distinct structural changes. As a country progresses and the gross domestic product (GDP) basket enlarges, a shift in economic activity occurs away from agriculture towards services and manufacturing sectors, owing to higher elasticity of the latter two sectors than that of former sector. The process in turn leads to structural shifts, and consequent diminishing significance of primary activities and growing dominance of secondary and tertiary activities. This process brings with it significant changes in the production process, consumption pattern and various other social indicators. An in-depth understanding of inter-sectoral dynamics becomes all the more important for policy makers so that effective monetary, credit and fiscal policies could be designed in order to be able to achieve the broader objective of inclusive development. In this backdrop, the present paper endeavors to study linkages between agriculture and other Sectors in the Indian economy both through input-output (I-O) approach

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Introduction

There are signs of an increasing recognition among agricultural economists that agriculture is a fully integrated partner in the nation's economy and should be treated as such when modeling aggregate outcomes in this sector. While early attempts to model outcomes in agriculture ignored many of the major linkages between this sector and the general economy, a move has been underway for several years now to explicitly account for many of these linkages in one fashion or another.

Review of Literature

The interrelationships between agricultural and nonagricultural sectors during the process of economic development have been extensively discussed in the literature (Hirschman, 1958; Balog, 1961; Johnston and Mellor, 1961; Rangarajan, 1982). Agriculture provides food, raw materials, and export earnings for the growth of nonfarm sectors. On the other hand, nonagricultural sectors support agriculture by supplying inputs (fertilizers, insecticides, irrigation structures, infrastructure and markets for farm produce). Consequently, the deficiency in production of one sector becomes the limiting factor for the growth of other sectors, thereby affecting the overall growth of the economy. It is imperative to study the magnitude of production and consumption linkages of sectors for achieving a desired rate of growth (see Delgado, Hopkins and Kelly, 1998; Haggblade, Hammer and Hazel, 1991; Mureithi and Sharma, 1984; Schultz 1998).

Objectives of the Paper

The main objective of the paper is to discuss the interface between agriculture and the domestic economy. More specifically, the paper:

- (1) Briefly review the major interdependencies between agriculture and the rest of the economy
- (2) Review the mechanisms, through which these interdependencies are transmitted,

Methodology

In an interdependent economy, a sector is linked to other sectors by its direct and indirect purchases and sales. A sector's

linkage through its direct and indirect purchases is called its backward linkage. Economists have devised a simple procedure to trace the entire backward (or forward) relationship using the input-output (I-O) model given by Leontief. It allows us to calculate the total output change of the entire economy resulting from a \$1 output change in a particular sector, both from a backward and a forward point of view

According to Leontief (1970), the inter-dependence between the sectors of a given economic system can be defined by a set of linear equations that express the balance between the total input and the aggregate output of each product and service. The basic equations of the model are

$$\sum_{i=0}^n x_{ij} + F_i = X_i \quad (1)$$

$$\sum_{i=0}^n x_{ij} + V_j = X_j \quad (2)$$

$$\sum_{i=0}^n a_{ij} X_j + F_i = X_i \quad (3)$$

where

x_{ij} = amount of product of sector i used by per unit output of sector j

F_i = product of sector i delivered to the final demand

X_i = total gross output produced in sector i

V_j = final payment (added value) by sector j

X_j = total gross input required in sector j

$a_{ij} = x_{ij}/X_j$, the direct input or technical coefficient of sector i into sector j .

Thus, the structure of the system can be represented by the matrix of technical I-O coefficients of all its sectors. Eqn. (3) can be rewritten in the following matrix form:

$$AX + F = X \quad (4)$$

$$(I-A)X = F \quad (5)$$

Or

$$X = (I-A)^{-1}F = (b_{ij})F \quad (6)$$

where

A = direct input coefficient matrix of a_{ij}

X = industrial total gross input vector

F = industrial final demand vector

I = identity matrix.

$(I-A)^{-1}$ = Leontief inverse matrix

b_{ij} = The element of the Leontief inverse matrix, representing total direct and indirect requirements of sector i by per unit output of sector j to final demand

Eqn. (6) is the basic equation for I-O theory. In this equation, $(I-A)^{-1}$ is called the Leontief inverse matrix or inter-industrial linkage matrix. The total demand for industry i 's products include direct and indirect effects, and the indirect demand is caused by the inter-industrial linkage effect

Linkage between Agriculture and Other Sectors In India:

As per the standard literature on the subject, services sector experiences an accelerated growth only after a certain level of development has taken place in agriculture and industry. Experiences of the economies over-time, in this regard, have been varied. For instance, in most of the developed economies, economic development followed a sequence wherein sectors viz. agriculture, industry and services sector developed in that order. On the contrary, the experience of some of countries such as India bears out that subsequent to the development of the primary sector, tertiary sector developed without a successful transition to an industrialised economy. Investigation of structural relationships among the sectors becomes important from the policy perspective. It helps one understand not only the evolution and progression of such relationships but also the inter-sectoral adjustments over time.

A clear perspective on the inter-sectoral dynamics could be useful in devising a conducive and appropriate development strategy. Further, sharp divergences in growth rates of different sectors are found to have serious implications for income distribution, inflation and current account deficit of an economy.

A proper comprehension of the characteristics and trend of sectoral linkages also assumes importance in designing socially-just policies as also effective monetary/credit policies. The study of sectoral inter-linkages is all the more important for a developing country like India so that positive growth stimuli among sectors could be identified and fostered to sustain the economic growth momentum. This would go a long way in redressing various socio-economic problems such as poverty, unemployment and inequality.

The linkages between agriculture and other sectors of the economy have been extensively investigated in the development literature. In India, it was earlier viewed that the supply side linkages of the agriculture sector had weakened, while the demand side linkages remained strong there could be a number of developments contributing to the gradual weakening of the relationship between the performance of the agriculture sector with the rest of the economy:

1. Services sector has increasingly driven the growth of the economy backed by the services exports;
2. The consumption of services by the manufacturing sector is on the rise; similar linkages are yet to be observed for the agriculture sector;
3. The manufacturing sector is moving away from traditionally agro-based industries towards the machinery, consumer goods and construction based activities, which cater to the market segments characterised by high income elasticity;
4. Supply side linkages are also weakening due to increasing linkages of industrial sector with the rest of the world;
5. Given the surplus labour in the agriculture sector and low agricultural productivity, demand linkages are getting muted;
6. The share of 'food and beverages' in private consumption expenditure has been declining.

To begin with, agriculture sector enjoys both production and demand linkages with industrial and services sectors.

Agriculture sector has demand linkage with the industrial sector as it depends on the latter for agricultural implements and other inputs such as fertilizers and pesticides.

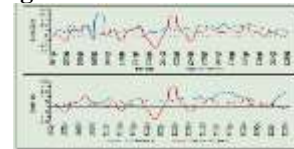
Thus, a good harvest (in turn giving a boost to agricultural income) results in increased demand for industrial products. Similarly, a good agricultural year is also likely to raise demand for services like trade, transport, banking and insurance services.

On the supply side, agricultural inputs are used in the production of various chemical and pharmaceutical products; consumer items, especially non-durable food products, etc. Thus, a fall in aggregate supply in agriculture sector is likely to cause a serious constraint in production of the industrial sector

Any sustained fall in the growth of agriculture for more than four to six quarters tends to affect the performance of the industrial sector as well as the growth of overall private consumption. The poor South-West monsoon led to a decline in the production of kharif crops during 2009-10, even though industry recorded a strong recovery from the impact of global financial crisis.

The growth pattern between the two was significantly divergent by the end of the year. However, from the demand side, weak agriculture growth affected the private consumption demand (PFCE) on account of fall in income in the rural areas (Chart A).

Chart a: Demand and agriculture side linkages of agriculture sector growth



Source: RBI annual Report

Empirical estimates indicate that there is a weakening of inter-sectoral linkages in the post-reform period in India (Table 1 & Table 2.).

Major dilution in the strength of the relationship has occurred in the case of linkages between: (a) industry and services sector and (b) industry and agriculture sector.

As per the latest input-output matrices, the share of agro inputs in manufacturing has declined from 20 per cent in 1993-94 to 5 per cent in 2006-07.

At the same time, the services sector linkages have increased relatively more with the rest of the world than the domestic economy as evident from an increase in the proportion of services exported to total output of the services sector by nearly four-fold from about 3.2 per cent in 1990-91 to more than 12.0 per cent in 2009-10.

As per the policy implications of the study, it is found that relatively stronger growth of the services sector in India vis-à-vis other sectors does not appear to be desirable and calls for a correction in terms of enhancing the growth synergies among sectors. This is likely to give a stimulus to the dormant growth potential. Towards this end, reforms in the agriculture sector which lagged behind that of the industrial and services sectors deserve policy consideration to be able to harness the export potential of agro-products. Creation of specialized infrastructure services for promoting agri-exports would strengthen the agriculture-services relationship. Finally, the public policy needs to be geared towards encasing the unorganized sector in the ambit of banking and insurance so that the latent growth potential of the sector could be fully realised

References:

1. Hirschman, A., 1958. *The Strategy of Economic Development*, New Haven, Conn., U.S.A.: Yale University Press

2. Rangarajan, C., 1982. Agricultural Growth and Industrial Performance in India. Research Report 33, Washington D.C.: International Food Policy Research Institute.
3. Rosenstein-Rodan (1943), "Problems of Industrialisation of Eastern and South-Eastern Europe", Economic Journal, 53, 202–211.
4. Sastry D.V.S, Balwant Singh, Kaushik Bhattacharya and N. K. Unnikrishnan (2003), "Sectoral Linkages and Growth Prospects: Reflections on the Indian Economy", Economic and Political Weekly, 38, 2390–2397.
5. Subramaniam, Vijay and Michael Reed (2009), "Agricultural Inter-Sectoral Linkages and Its Contribution to Economic Growth in the Transition Countries", ageconsearch.umn.edu/bitstream
6. Schultz, S., 1998. Approaches to Identifying Key Sectors Empirically by Means of Input-Output Analysis. In Input-Output Analysis Volume III, eds. H.D. Kurz, E. Dietzenbacher, C. Lager. Cheltenham, UK : An Elgar Reference Collection

Table 1: Inter-sectoral linkages (correlation matrix)

Correlation Matrix			
Phase I			
	Agriculture	Industry	Services
Agriculture	--	0.27	0.42
Industry	0.27	---	0.57
Services	0.42	0.54	----
Phase II			
Agriculture	----	0.07	0.05
Industry	0.07	--	0.38
Services	0.05	0.38	----

Period I: correlation matrix (1966-90), Period II: correlation matrix (1991-2008)

Table 2: Inter-sectoral linkages input- output table – leontief inverse and inter-sectoral elasticities

	Input- Output Table – Leontief Inverse**			Inter-Sectoral Elasticities@		
	Phase I			Phase II		
	Agriculture	Industry	Services	Agriculture	Industry	Services
Agriculture	--	0.20	0.06	---	0.41	*
Industry	0.13	---	0.27	0.23	---	0.80
Services	0.15	0.52	-----	0.25	0.88	---
Phase II						
Agriculture	0.05	0.02	--	--	0.29	*
Industry	0.07	----	0.15	0.23	--	0.23
Services	0.08	0.16	--	0.21	0.56	---

Period I: I-O Table (1993-94) and elasticity (1951-90); Period II: I-O Table (2006-07) and elasticity (1991-2008).

** : Coefficient represents requirement of row variable for producing one unit of column variable.

@: Represents percentage change in column variable with one per cent change in row variable.

: Statistically insignificant