AGRICULTURE AND SECTORAL INTER-LINKAGE IN TIMES OF GLOBALISATION - A CRITICAL EVALUATION

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Abstract

The aim of this paper is to describe a static and dual economic model which is also open. We attempt to explain the nature of sectoral inter-linkage in a dual economy in light of globalisation and liberalisation and put forward a simple framework which discusses the agricultural-industrial inter-linkage in an open economy. We have considered the situation where industrial production is demand driven and food prices adjust to clear the market. The main objective of the paper is to show that better performance of the agricultural sector has a strong positive effect in generating growth and employment in the industrial sector.

JEL Classification: F41, J23, L13, Q01, Q02

Keywords: Open Economy, Dual Economy, Sectoral Inter-linkage, Demand Determined Industrial Sector, Perfectly Competitive Agricultural Sector

1. INTRODUCTION

India is predominantly an agrarian economy because of high share of agriculture in employment and livelihood creation. The agricultural sector accounts for nearly 50% of the employment opportunities and 1/3rd of the GDP in the Indian Economy. Empirical evidence confirms the existence of strong inter-linkages between the agricultural sector and all the other sectors including the industrial sector. The linkages have been extensively investigated in development literature. In early analyses agriculture was assumed to play the role of providing raw materials, food and labour for the development of the industrial sector. In subsequent analyses, inter-sectoral linkages both from the demand and supply side have gained prominence.

After the green revolution bumper production of some crops occurred mainly due to hybrid seeds, fertilisers, machinery etc. The positive impact of the new agricultural strategy ran in terms of converting India to a net exporter of food through higher food production from a net importer of food grain primarily due to higher agricultural productivity per hectare. After the reforms of 1991 and the WTO provisions, the agricultural sector was opened due to trade liberalisation. Thus due to gradual export orientation, our agricultural goods started finding markets abroad. Data shows that the share of agriculture and allied goods account for one-fifth of the total export earnings in India. The industrial sector, however, is import-dependent in India. The greater availability of foreign exchange through agricultural export has helped in the import of machinery. This has stimulated the industrial production and increased employment opportunity in the industrial sector. More employment has led to poverty reduction and improvement in the social sector (health and education) and has also reduced regional and other disparities.

Hence keeping in mind the present scenario, in light of Globalisation Reforms of 1991, we consider a labour surplus economy similar to Rakshit (1982) and augment it with an open economy approach. In this model, we will explain the working of the agricultural sector in shaping macroeconomic development in developing countries. There is no gainsaying that openness, agricultural export and industrial employment are highly interconnected. The dual economic model constructed in the paper may be applicable to a large class of emerging economies. The agricultural output is not only used for domestic purposes, but the surplus is also exported. The agricultural sector is characterised by flexible prices and market-clearing wage rate. On the other hand, the industrial sec-

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tor is demand-driven.

The paper can be categorised in the following sections. Section II deals with literature review, Section III explains the working of the model, Section IV discusses the comparative statics and section V serves as a conclusion and provides a detailed summary of the findings.

2. LITERATURE REVIEW

The emphasis on analysing prioritised sectors and studying the interlinkages across sectors rather than studying them in isolation has assumed significance from Hirschman's Theory of 'Unbalanced Growth'. The theory primarily states that the sectors with the maximum linkages can stimulate a rapid growth of production, employment and income. Economists have now realised that the study of these interlinkages in an economy can serve as a major guideline for framing relevant policies for accelerating the process of growth and development.

In developing countries like India, the symbiotic relationship and mutual interdependence between the agricultural and the industrial sectors can be considered as a driving force for the process of development. There exist several works of literature on the topic of sectoral inter-linkages between the agricultural and the industrial sectors. They often emphasise on how strong sectoral inter-linkages ultimately prove to be beneficial for both the sectors as good performance in one sector causes better performance in the other.

Dilip Saikia (2011) says that even though India has seen exponential growth in the service sector and the contribution of the agricultural sector towards the Gross Domestic Output has seen a fall in the past decades, it need not necessarily imply that the sector has no meaningful implication for India's economic growth and industrialisation. Even now, the agriculture sector accounts for approximately one-fifth of national income and supports more than 52% of the population in the country. Though the "agriculture-industry" linkage has been deteriorating over the years, it still plays an important role in determining the overall growth of the economy.

Jorn Rattso and Ragnar Torvik (2003) gave the example of how Sub-Saharan Africa adopted a policy of heavy taxation on agriculture and used it to boost industrialisation. However, this policy fell flat on its face as the much-promised industrialisation did not take place and both sectors suffered; further affirming our belief that a strong agricultural sector is essential for better performance of the industrial sector.

Agriculture and industry are integral components of the development process due to their mutual interdependence and symbiotic relationship. The contribution of agriculture in general, and industry, in particular, is well known in almost all developing countries. This interdependence may vary over time. According to empirical literature this inter-relationship has been discussed from various channels. This linkage becomes stronger as the technology of agricultural production improves. Rangarajan (1982) mentions that the linkage will be weakened if the agricultural inputs used in industries are exported from abroad instead of being domestically processed. An upsurge of production in the agricultural sector improves government savings which may be reflected in higher public investment boosting the production in the capital goods industries. Ahluwalia (1986) and Rangarajan (1982) also describe how the fluctuations in agricultural production may affect profitability due to the impact of the terms of trade. These linkages present the potential capacity of each sector to stimulate other sectors. Rangarajan (1982) also found that a 1 per cent growth in agricultural production can bring about a 0.5 per cent increase in industrial production.

Satyasai and Baidyanathan (1997) reflects on the close relationship between the agricultural and industrial sector due to the agro-based industrial structure. They found that the output elasticity of industry with respect to the output of the agricultural sector during 1950-51 to 1965-66 was 0.13. According to Rangarajan (1982), Bhattacharya and Rao (1986) describe the cause of deteriorating linkages between agriculture and industry is the decline in demand for agricultural product coupled with a dwindling share of agro-based industries and slow growth in employment. Sastry et al (2003), Chowdhury and Chowdhury (1995) found an increase in the backward production linkages between these two sectors and a decline in the forward production linkage. They also found a significant impact of agricultural output on industrial output and the fact that the industry's demand linkage to agriculture has increased.

Ahluwalia (1985) argued that it was poor infrastructure and poor productivity performances during the mid-sixties and not the wage good constraint that acted as supply constraints to the industrial growth.

Although we have referred to the papers above, our model is independent of the aforementioned papers. We have drawn references from these papers only, our model uses other mechanisms and arrives at a different conclusion about the role played by sectoral inter-linkages and how Globalisation affects the agricultural sector.

The Lewisian "two-sector" growth model emphasised on the crucial role of capitalist surplus in the development

process. His model suggested how cheap surplus labour speeds up capital accumulation and leads to high productive growth in the modern sector. Lewis (1954) largely stressed on the quantitative growth in the savings rate and income distribution in favour of the saving class. Fei and Ranis (1961) stressed on the 'balanced-agricultural-industrial growth' path as a successful development strategy. Kuznets (1968) revealed that technological advancement can bring about improvement in agricultural as well as industrial production. He stressed on how agricultural productivity was an indispensable base of growth.

Thus, the theoretical literature has broadly highlighted 'agriculture-industry' linkages and the contribution of agriculture, non-agriculture and the industrial sector in augmenting output and employment growth. At this juncture, it is important to note that although we have drawn inspirations from the aforementioned papers, the model presented in the following section has been developed independently of the sources mentioned above.

3. THE MODEL

3.1. Assumptions

i. The economy has a given labour force. There is no mobility of labour between the agricultural and industrial sectors due to differences in skill requirements.

ii. The agricultural sector uses fertilisers distributed by the Government at an administered price.

iii. Labour Supply is perfectly inelastic in the agricultural sector (fixed at $\overline{L_X}$)

iv. The Agricultural Sector produces one output i.e. food, which is sold in both the domestic and international markets. We assume a fixed exchange rate in this model.

v. The industrial output is demand determined. So, we consider a perfectly elastic aggregate supply curve.

vi. While the wage rate in the agricultural sector is market-clearing, wage in the industrial sector is partially indexed to the food price due to the existence of trade unions.

vii. The price of the industrial output follows the Kaleckian markup technique.

We define the following symbols to be used in the representation of our model

X = Output of the agricultural sector

Y = Output of the industrial sector

$L_X = \overline{L_X}$ = Labour employed in the agricultural sector

P_X = Food price

R = The amount of fertiliser supplied

T = Land acquired for agricultural purposes

λ = Productivity of land

P_R = The government administered price of fertiliser

P_T = The rental cost of land

W_X = Nominal wage of labour employed in the agricultural sector

P^* = Price of foreign goods in foreign currency

$e = \bar{e}$ = Nominal exchange rate which is assumed to be fixed

$\bar{P}$ = Minimum procurement price

G_1 = Government expenditure on agricultural product

G_2 = Government expenditure on industrial product

C_C = Marginal propensity to consume of the capitalist

P_Y = Price in the industrial sector

k = Kaleckian mark-up

L_Y = Labour employed in the industrial sector

β = Proportion of wage income spend on consumption of food by workers of both the sectors

ω = Nominal wage received by the workers in industrial sector

A = Fixed expenditure on industrial goods by landlords

I = Investment Expenditure (considered to be autonomous)

$l = \frac{L_Y}{Y}$ = Labour coefficient in the industrial sector (assumed to be fixed)

Z = Lump sum tax collected by the government (levied on the industrial sector)

γI = Investment expenditure on domestically produced capital goods

a_I = Input coefficient of the intermediate good (assumed to be fixed)

P_I = Price of the intermediate input in foreign currency

3.2. The Agricultural Sector

As we have already mentioned that our economy has a dualistic nature, we begin our discussion with the agricultural sector.

The agricultural sector produces a single output (say food) which is sold both in the domestic markets and the foreign markets. We consider the key determinants of agricultural production to be labour, fertiliser and land. The food price P_X is market-clearing. Accordingly, we define our production function as-

$$X = F(L_X, R, \lambda T), \qquad \lambda > 0 \tag{i}$$

All the factors of production exhibit diminishing returns to factor proportions and thus, we have,

$$\frac{\partial F}{\partial L_X} > 0 , \frac{\partial^2 F}{\partial {L_X}^2} < 0$$
$$\frac{\partial F}{\partial T} > 0 , \frac{\partial^2 F}{\partial T^2} < 0$$
$$\frac{\partial F}{\partial R} > 0 , \frac{\partial^2 F}{\partial R^2} < 0$$

Profits of the landlords can be given as:

$$\pi_A = XP_X - W_X L_X - \overline{P_R} R - P_T T$$

$$\pi_A = F(L_X, R, \lambda T) P_X - W_X L_X - \overline{P_R} R - P_T T \ \text{(from (i))} \quad \text{(ii)}$$

The optimisation conditions are as follows-

$$MP_L{}^X = \frac{W_X}{P_X} \quad \text{(iii)}$$

$$MP_R{}^X = \frac{\overline{P_R}}{P_X} \quad \text{(iv)}$$

$$MP_T{}^X = \frac{P_T}{P_X} \quad \text{(v)}$$

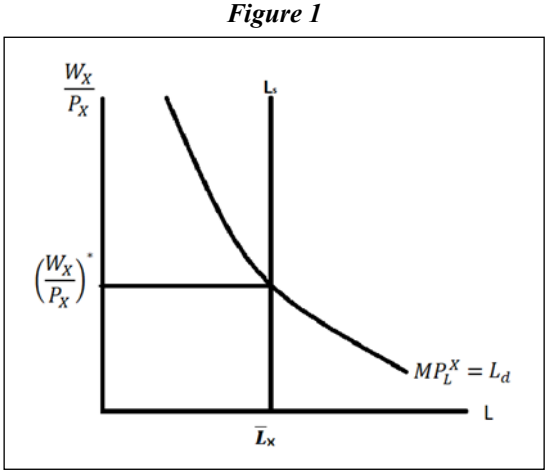
Factor Markets:

The labour market in the agricultural sector is perfectly competitive. Labour supply is perfectly inelastic at $L_X = \overline{L_X}$. Since the labour market is perfectly competitive, the Labour demand curve (L_d) is given by $MP_L{}^X$. Thus, we can write,

$$MP_L{}^X = L_d$$

Now we have the following figure:

Figure 1



The equilibrium wage obtained is $\left(\frac{W_X}{P_X}\right)^*$ which is market-clearing.

Equilibrium in the Agricultural Sector:

We measure the market demand for food in terms of food units. Now the demand for food comes from four sources, demand from agricultural and industrial workers who spend a fixed proportion of their income (β) on consumption of food and lastly, the amount of food exported which is a function of real exchange rate ($\frac{\bar{e}P^*}{P_X}$). Here P^* is the price of the foreign good in foreign currency and is assumed to be fixed. The government also demands an amount G_1 at a price $\bar{P}$.

$$X = \beta\left(\frac{W_X \overline{L_X} + \omega L_Y}{P_X}\right) + X\left(\frac{\bar{e}P^*}{P_X}\right) + \frac{\bar{P}G_1}{P_X} \quad \text{(vi)}$$

Or,

$$X = \beta\left(\frac{W_X \overline{L_X} + \omega lY}{P_X}\right) + X\left(\frac{\bar{e}P^*}{P_X}\right) + \frac{\bar{P}G_1}{P_X}$$

Which is the food market equilibrium condition.

The agricultural output is already determined, given the labour supply. Thus, from equation (vi) we determine the equilibrium food price, such that

$$P_X = f(Y, X, \omega, \bar{e}, G_1) \quad \text{(vii)}$$

Thus, primarily we observe that if industrial output (Y) rises, then the consumption demand of the industrial workers goes up, as a result of which the food price will also rise. Hence, we have

$$f_1 = \frac{\partial P_X}{\partial Y} > 0$$

Further, as the supply of food increases, prices fall, hence we get

$$f_2 = \frac{\partial P_X}{\partial X} < 0$$

As the wage of the workers rise, demand for X also rises and hence, food price rises.

$$f_3 = \frac{\partial P_X}{\partial \omega} > 0 \ ; \ f_4 = \frac{\partial P_X}{\partial W_X} > 0$$

Lastly as government expenditure on agricultural goods increases, food price rises.

$$f_5 = \frac{\partial P_X}{\partial G_1} > 0$$

3.3. Industrial Sector

The industrial sector is said to be demand determined. Thus, the Aggregate Supply curve is perfectly elastic in the Industrial sector.

There are two factors of production namely labour (L_Y) and an intermediate input (In) that is imported from the foreign market.

Here, we have abstracted from the real world in the sense that we have considered only two factors of production. This simplified assumption enables us to avoid algebraic complexities without affecting the economic logic of the

scenario.

The nominal wage of the industrial workers is partially indexed to food price

$$\omega = aP_X{}^{\alpha};\ 0 < \alpha < 1 \qquad \text{(viii)}$$

Price of the industrial output follows the Kaleckian markup pricing formula.

$$P_Y = k\left[\omega\frac{L_Y}{Y} + \bar{e}P_I a_I\right], k > 1$$

Or

$$P_Y = k[\omega l + \bar{e}P_I a_I], k > 1,\ \ where\ l = \frac{L_Y}{Y} \qquad \text{(ix)}$$

Where k > 1 reflects the oligopolistic structure of the industrial sector.

Here, $\frac{\partial P_Y}{\partial P_I} = ka\bar{e} > 0$

Further, we also note that,

$$\frac{\partial \omega}{\partial P_X} = \alpha a P_X{}^{\alpha-1} > 0$$

$$\frac{\partial^2 \omega}{\partial P_X{}^2} = \alpha(\alpha-1)aP_X{}^{\alpha-2} < 0\ (since\ 0 < \alpha < 1)$$

This clearly indicates that an increase in food price raises the wages of the industrial workers less than proportionately.

The demand for the industrial output also accrues to capitalist's consumption of output (here we relaxed the standard assumption that all profits are saved by the capitalists), the demand of industrial goods by the landlords. Here we explicitly assume that the landlords have a fixed nominal expenditure (A) on the industrial good. A proportion of the investment expenditure (γI, where 0<γ<1) is on domestically produced industrial goods and the remaining [(1-γ)I] is on foreign capital goods. Thus, the industrial profit net of tax is given by-

$$\pi_Y = (Y - \frac{\omega l Y}{P_Y} - Z - \frac{\bar{e}P_I a_I Y}{P_Y}) \qquad \text{(x)}$$

The aggregate demand for the industrial good is given as:

$$AD_Y = C_C\left(Y - \frac{\omega l Y}{P_Y} - Z - \frac{\bar{e}P_I aY}{P_Y}\right) + \frac{A}{P_Y} + \gamma I + G_2 \qquad \text{(xi)}$$

Where $0 < C_C < 1$ is the MPC of the capitalists

Here, $\frac{\partial AD_Y}{\partial \pi_Y} = C_C > 0$

Equilibrium In The Industrial Sector:

Since the industrial output is demand determined we have, $Y = AD_Y$

Hence,

$$Y = C_C\left(Y - \frac{\omega l Y}{P_Y} - Z - \frac{\bar{e}P_I aY}{P_Y}\right) + \frac{A}{P_Y} + \gamma I + G_2 \qquad \text{(xii)}$$

Or,

$$\left[1 - C_C\left(1 - \frac{\omega l}{P_Y} - \frac{\bar{e}P_I a}{P_Y}\right)\right]Y = \left(\frac{A}{P_Y} + \gamma I + G_2 - C_C Z\right)$$

We have the equilibrium value of the industrial output as:

$$Y^* = \frac{\eta_1}{\eta_2} \qquad \text{(xiii)}$$

Where, $\eta_2 = \left[1 - C_C\left(1 - \frac{\omega l}{P_Y} - \frac{\bar{e}P_I a}{P_Y}\right)\right]$

And $\eta_1 = \left(\frac{A}{P_Y} + \gamma I + G_2 - C_C Z\right)$

Therefore, the equilibrium output can be expressed as:

$$Y = f(P_X, P_Y, P_I, \omega, I, G_2) \qquad \text{(xiv)}$$

We now try to explain the partial effect of each variable on industrial output. If food price increases then the wage of industrial workers increases due to wage indexation, hence the capitalist consumption of industrial goods falls, the demand for industrial output falls too.

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$$\mu_1 = \frac{\partial Y}{\partial P_X} < 0$$

An increase in industrial price would result in reduced demand for industrial output.

$$\mu_2 = \frac{\partial Y}{\partial P_Y} < 0$$

An increase in the wage bill of industrial workers leads to a decrease in capitalist consumption, hence the demand for industrial output decreases due to an increase in the wage rate.

$$\mu_3 = \frac{\partial Y}{\partial \omega} < 0$$

An increase in investment demand would raise the industrial output. Further, an increase in Government expenditure leads to an increase in demand in the industrial sector.

$$\mu_4 = \frac{dY}{dI} > 0$$

$$\mu_5 = \frac{\partial Y}{\partial G_2} > 0$$

Further if the price of the imported intermediate input increases then the cost of production increases and correspondingly the profit of the capitalists fall and hence the demand for the industrial output falls.

$$\mu_6 = \frac{\partial Y}{\partial P_I} = \frac{\partial Y}{\partial P_Y}.\frac{\partial P_Y}{\partial P_I} = \mu_2 \frac{\partial P_Y}{\partial P_I} < 0$$

3.4. Equilibrium In The Economy:

The four endogenous variables that we aim to determine simultaneously in this model are P_X, ω, P_Y, Y . These can be obtained from equations (vi), (viii), (ix) and (xii) respectively.

Logically, it can be explained as Y rises, we observe an increase in labour employment and imported intermediate inputs in the industrial sector. Hence the workers' consumption of food increases and the food prices P_X increases. Thus, we get a positively sloped locus FF between P_X and Y representing the food market equilibrium. Solving equation (vi) for food price for each output level of the industrial sector will also generate the same.

Solving equation (xii) for industrial output level for each level of food price will generate a negatively sloping locus YY. By virtue of intuition, we observe as the price of the agricultural output increases, due to partial indexation, the wages of the workers of the industrial sector will also increase. As a result, the profit of the capitalists will fall and since the capitalists actually spend a portion of their profits in consumption of the output, the demand for the industrial output falls and this generates the negatively sloped YY curve.

The fall in profit of the capitalists is evident as shown below:

$$\pi_Y = \left(Y - \frac{\omega l Y}{P_Y} - Z - \frac{\bar{e} P_I\, aY}{P_Y}\right)$$

Replacing the values of equations, we get,

$$\pi_Y = \left(1 - \frac{1}{k}\right) Y - Z$$

$$\pi_Y = \left(1 - \frac{1}{k}\right) Y(P_X, P_Y, \omega, I, G_2, P_I) - Z$$

$$\frac{\partial \pi_Y}{\partial P_X} = \left(1 - \frac{1}{k}\right)\left[\frac{\partial Y}{\partial P_Y}.\frac{\partial P_Y}{\partial P_X} + \frac{\partial Y}{\partial P_X} + \frac{\partial Y}{\partial \omega}.\frac{\partial \omega}{\partial P_X}\right]$$

Now, $\frac{\partial P_Y}{\partial P_X} = kl\left(\alpha a {P_X}^{\alpha-1}\right) > 0$

$$\frac{\partial P_Y}{\partial P_X} = kl\frac{\partial \omega}{\partial P_X} \left(since\ \frac{\partial \omega}{\partial P_X} = \alpha a {P_X}^{\alpha-1}\right)$$

Now we have

$$\frac{\partial \pi_Y}{\partial P_X} = \left(1 - \frac{1}{k}\right)\left[\frac{\partial Y}{\partial P_Y}.kl\frac{\partial \omega}{\partial P_X} + \frac{\partial Y}{\partial P_X} + \frac{\partial Y}{\partial \omega}.\frac{\partial \omega}{\partial P_X}\right]$$

$$\frac{\partial \pi_Y}{\partial P_X} = \left(1 - \frac{1}{k}\right)\left[\frac{\partial \omega}{\partial P_X}\{kl.\frac{\partial Y}{\partial P_Y} + \frac{\partial Y}{\partial \omega}\} + \frac{\partial Y}{\partial P_X}\right] \quad \text{(xv)}$$

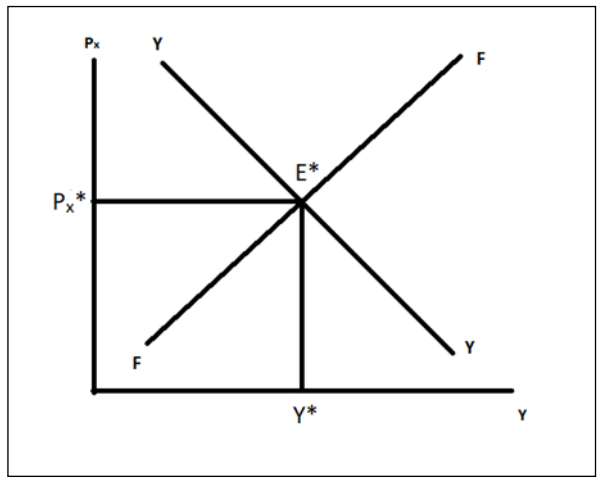
Where,

$$\frac{\partial \omega}{\partial P_X} > 0, \frac{\partial Y}{\partial P_Y} < 0, \frac{\partial Y}{\partial \omega} < 0, \frac{\partial Y}{\partial P_X} < 0, \frac{\partial G_2}{\partial P_X} = 0, \frac{\partial P_I}{\partial P_X} = 0 k > 0$$

Thus, $\frac{\partial \pi_Y}{\partial P_X} < 0$

Finally, we draw the two loci and obtain the equilibrium values of P_X, Y as shown in Fig 2 below.

Figure 2



FF and YY curve are shown together in the above figure. From equilibrium E* we obtain the values of ${P_X}^*$ and Y* which clears both the food market and industrial output market simultaneously. By plugging the values of ${P_Y}^*$ in equation (viii) we get ω^* and by plugging that in equation (ix), we get ${P_X}^*$ (since L_Y is determined earlier).

3.5. Balance of Payments:

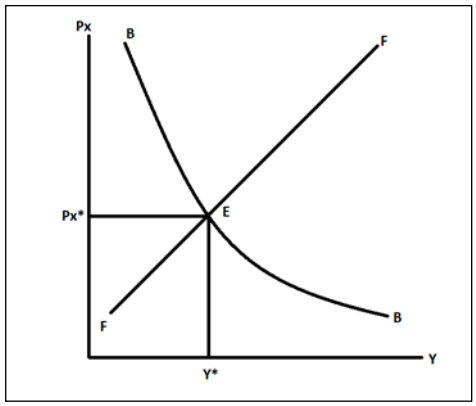
To maintain the balance of trade the net exports must be equal to the net imports. In domestic currency export is given by $P_X X(\frac{\bar{e}}{P_X})$ where P_X is the food price and X represents the exportable agricultural commodity. The right-hand side of the equation gives the volume of import demanded which includes import of the intermediate good. $P^*$is the price of the foreign good in foreign currency and 1-λ is the proportion of investment expenditure on foreign capital good. P_I is the price of the intermediate good and a is the coefficient of intermediate import.

$$P_X X\left(\frac{\bar{e}P^*}{P_X}\right) = \bar{e}P^*(1 - \gamma)I + a_I P_I Y \quad \text{(xvi)}$$

The above equation will be stable if it satisfies the Marshall-Lerner's condition that the sum of absolute import and export elasticity should be greater than 1. If food price falls the export of agricultural good must rise more than proportionally, therefore, we find a rise in the volume of exports. To maintain the balance of payment equi-

librium Y must also rise. We get an inverse relation between industrial output and food price, that is if the price of the agricultural output falls there is an expansion in the industrial sector. This relation is graphically represented by the BB curve which is negatively sloped.

Figure 3



The above shows the point where the exporting sector and the foreign exchange market clears.

4. COMPARATIVE STATICS

In this section, we perform comparative static exercises to explain how the expansion of the agricultural sector, fiscal expansion and an increase in autonomous imports affects our dual economic model.

4.1. Expansion Of Agricultural Output:

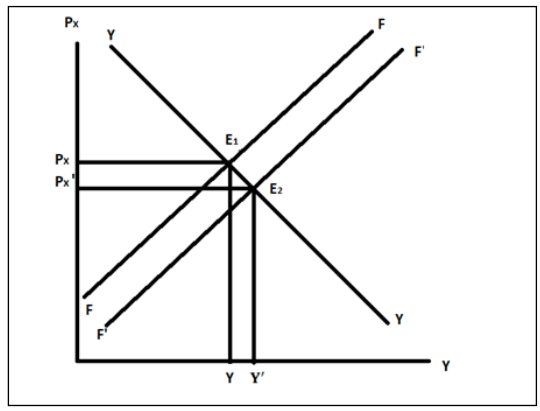
We assume that food supply has increased in the agricultural sector through technological progress. The increased production of food causes food prices to fall which brings the food market to equilibrium. As a result, the FF curve shifts downwards.

As food prices fall, due to partial wage indexation of the industrial workers, the nominal wage of the industrial workforce falls less than proportionately (as discussed earlier), as a result of which the demand for capitalist consumption of the industrial output increases which results in an expansion of industrial output and the food price falls. However, it should be noted that the industrial output increases by a lesser amount as compared to a fall in the price of the agricultural output due to a less than proportionate fall in the wages of the industrial workers.

In Fig 4, E_2 corresponds to the new equilibrium denoting lower food prices and higher industrial output.

We have assumed that the factors of production in the agricultural sector are complements, hence an increase in the productivity of the land causes the ${MP_L}^X$ curve to shift outwards as shown in Fig 5. As a result, there is an increase in the real wage rate of agricultural workers. Thus,

Figure 4

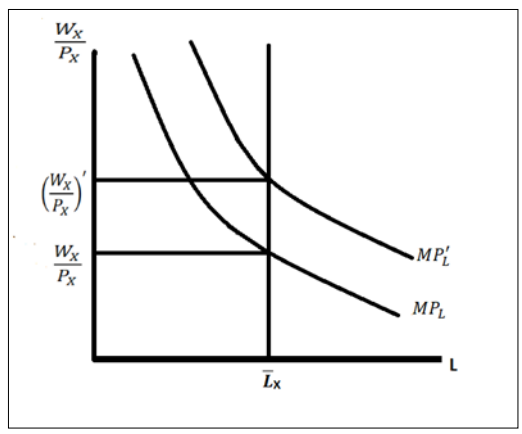


we can unambiguously conclude that agricultural workers are better off. We have already seen that

$$\frac{\partial P_Y}{\partial P_X} = kl\frac{\partial \omega}{\partial P_X} \left(since\ \frac{\partial \omega}{\partial P_X} = \alpha a {P_X}^{\alpha-1} \right)$$

This clearly implies that the real wage of the industrial workers $\left(\frac{\omega}{P_Y}\right)$ falls.

Figure 5



4.2. Fiscal Expansion

Case 1

We first assume the case that Government imposes solvency constraint $G_1 + G_2 = Z$ (FRBM Act) is binding on the government. Here G_1, G_2, Z are in terms of the industrial output. An increase in G_1 will lead to a decrease in G_2, where G_1 is government spending on agricultural output and G_2 is government spending on industrial output. At the initial equilibrium food price, an increase in G_1 results in an increase in demand for food and the price of food rises which causes a shift of the FF curve towards the left. Given solvency constraint G_2 falls which results in a shift of YY curve towards the left. In this diagram, E_1 and E_2 are our initial and final equilibria respectively.

It is worth mentioning that although our model implies industrial contraction, the effect on food price remains

ambiguous. This is because industrial contraction reduces employment which in turn reduces the demand for food. Hence, food prices would not increase as much as it would have risen for a given industrial production. Fig 6.1 and Fig 6.2 below portrays the two possible cases.

Figure 6.1

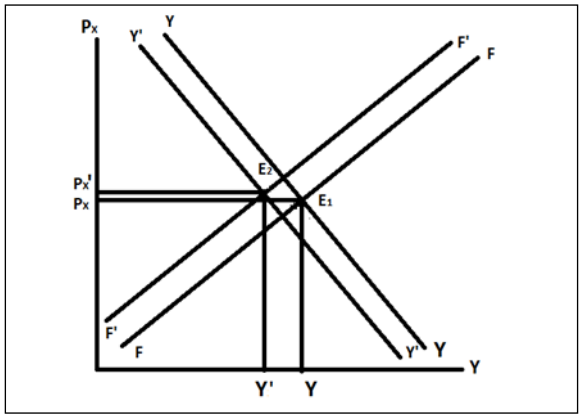
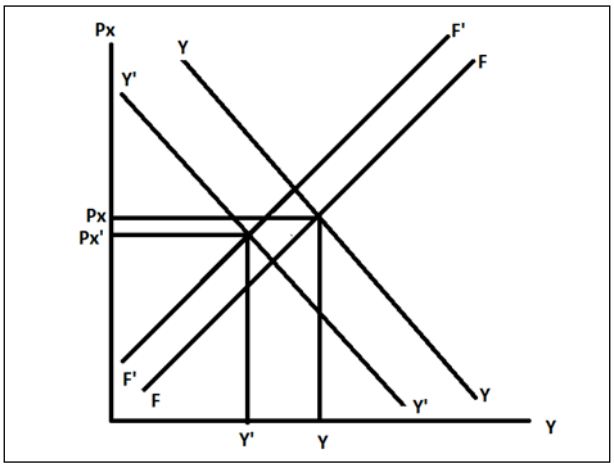


Figure 6.2



Here, we obtain interesting implications for the workers. Given an increase in G_1 the demand for the agricultural output increases which in turn increases the demand for labour and thereby leading to an increase in the real wages of the agricultural workers. However, as the effect on food price remains ambiguous, the implications for the real wage of the industrial workers also remains ambiguous.

If the net effect is an increase in the food price, then as it is already mentioned P_Y changes more than proportionately than ω and thus $\left(\frac{\omega}{P_Y}\right)$ falls. If the reverse occurs, i.e, the net effect is an increase in the food price in $\left(\frac{\omega}{P_Y}\right)$ rises and the industrial workers are better off.

Case 2:

We now take the opposite case where a rise in G_2 is accompanied by a fall in G_1. The rise in G_2 shifts the YY curve towards the right, a fall in G_1 shifts the FF curve downwards. Hence our model analyses a possibility of an increase in Y, however, the effect on food price remains ambiguous. Given industrial expansion, there is higher employment which fuels a rise in the demand for food. Naturally, food prices will not fall as much as it would for a given industrial output. But the ambiguity still remains. Fig 7.1 and Fig 7.2 shows the two possible cases.

Figure 7.1

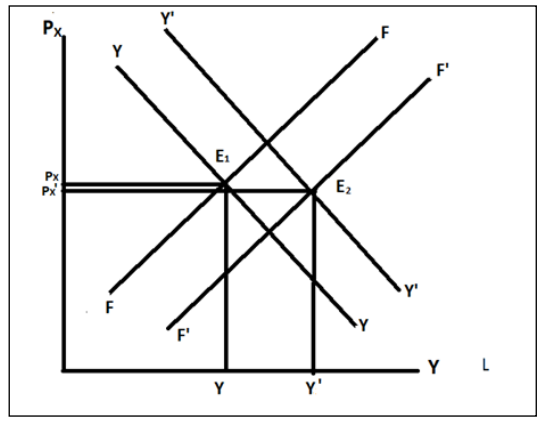
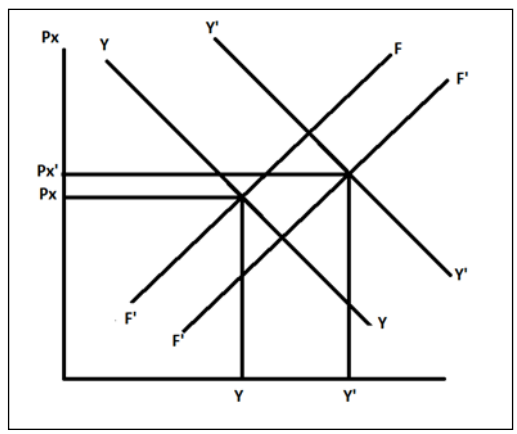


Figure 7.2



Here, as the ambiguity with respect to the effect on food price is still prevalent and we have considered the case exactly opposite to *Case I*, the implications for the welfare of the agricultural and the industrial workers would just be the reverse of that presented in *Case I*.

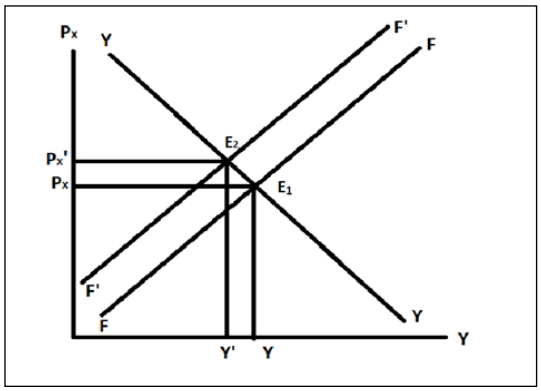
Case 3:

If we relax the solvency constraint of the Government, an increase in G_2 need not be followed by a fall in G_1 or vice versa. Hence, we get a new set of economic implications.

As food price P_X increases, industrial production falls due to the partial wage indexation in the industrial sector, higher food prices lead to higher wages, and hence capitalist consumption falls resulting in industrial Stagnation.

Hence in Fig 8, our new equilibrium E_2 corresponds to both increase in food price and fall in industrial output.

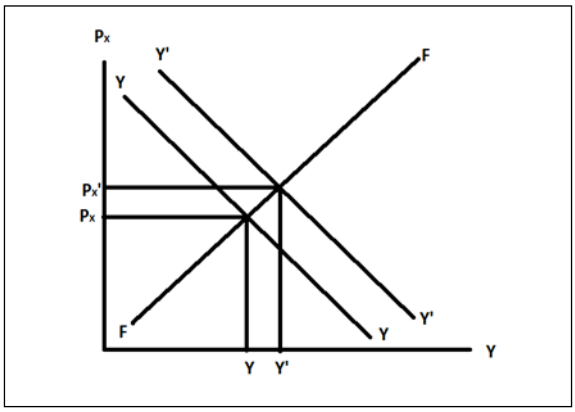
Figure 8



Case IV:

Lastly, we consider a balanced budget fiscal expansion, which implies that an increase in Government expenditure is accompanied by a rise in taxes (Z), in such a way that the initial budgetary position remains unchanged. The taxes reduce the profits of the capitalists as they are the only taxpayers. However, since the capitalists actually spend a fraction of their profit on industrial output, the rise in G_2 outweighs the fall in capitalist consumption, ultimately leading to a rise in industrial output as evident from Fig 9.

Figure 9

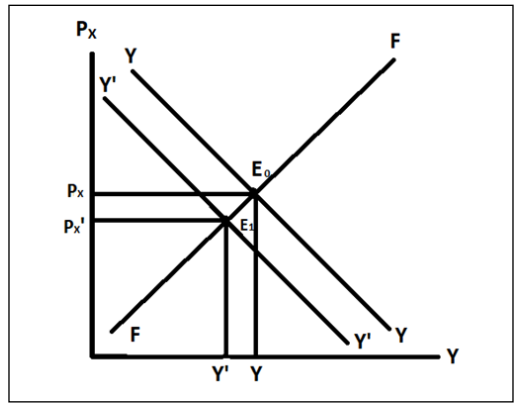


4.3. Increase In Imports:

We have already assumed that a proportion of the investment expenditure is on domestically produced capital goods. As a result of import penetration due to globalisation, γI falls which in turn raises $(1-\gamma)I$. The resultant effect is the leftward shift of the YY curve denoting a fall in the output level. Here the new equilibrium is E_1, Fig 10. Industrial output falls implying industrial stagnation.

Now, an increase in the volume of imports in the industrial sectors reduces the capitalist's profits which in turn reduces the demand for the industrial output. The food market is also affected as it leads to a decrease in demand for the agricultural output and thus P_X falls and thereby we can directly conclude that the real wage of the agricultural workers falls while that of their industrial counterparts $\left(\frac{\omega}{P_Y}\right)$ rises.

Figure 10



5. CONCLUSION

The paper shows how the economy of a developing country can be explained with the help of a static dualistic framework, which is open at the same time. The agricultural sector is of utmost importance in any developing economy given the fact that it has strong interlinkages with all the sectors including the industrial sector. In our model, we have shown how better performance of the agricultural sector can result in better performance of the economy as a whole in the light of globalisation.

Thus, in a nutshell, the basic findings of the paper are the following: Increased food supply through technological progress has led to an expansion in the industrial sector and results in a positive macroeconomic outcome which includes generation of employment. When the solvency condition of the government is binding, a higher government expenditure in the agricultural sector may not help as it leads to industrial stagnation and the effect on food price remains ambiguous. On the flip side, a higher government expenditure in the industrial sector leads to output expansion but the effect on food price remains ambiguous. Relaxing the solvency conditions, a rise in government expenditure in the agricultural sector leads to unambiguous fall in industrial output and unambiguous rise in price. A balanced budget fiscal expansion leads to rise in output and food price. As a result of globalisation, more import penetration has led to less industrial output, hence an import surge may trigger an economic slowdown.

Finally, we can conclude that agricultural development paves the way for inclusive growth. As in our model, an agricultural sector expansion has led to industrial sector expansion accelerating the trickle-down effect by generating employment, reducing poverty and regional inequality. Hence agricultural development has significant potential in achieving inclusive growth and propagating social and economic inclusion.

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