CHAPTER II

A Model of Industrial Output Determination with Agricultural Supply-Constraint and Endogenous Domestic Exports

The issue of analysis in this chapter is the dependence of the levels of industrial output and employment on the behaviour of agricultural output and that of government expenditure on industry. In the context of industrial expansion, Kalecki's concepts of agricultural supply-constraint and of domestic exports constitute our points of departure. While Kalecki treated the two concepts separately, here we try to unite the two in a single framework. In the following analysis we try to show, how the problem of effective demand faced by industry is mitigated by the government while agriculture simultaneously provides the crucial supply-side support. The complementariness of these two types of support is also an important issue of analysis.

2.1. Basic Features of Our Model–Economy and Notations

2.1.1. The Basic Features of Our Model–Economy are assumed as follows:

(a) There are three sectors of a closed economy: a vertically integrated capitalistic industrial sector, an agricultural or ‘food sector’ and the government sector.

(b) The industrial sector is characterized by excess capacity – unemployment and mark-up pricing. Price is cost determined and output is demand-determined.
(c) All profits in the industrial sector are saved whereas all wages are consumed. A part of wage-income is spent on food so that there is the possibility of industry facing an agricultural supply-constraint.

(d) A fixed marketable surplus of food-grain represents the agricultural supply-constraint for industry. Consequently, we have demand-determined equilibrium price for food.

(e) Income earned from the sale of food to the industrial sector is the sole income of the farmers. It is spent entirely on the purchase of industrial good. In other words, there is balanced trade between agriculture and industry.²⁵

(f) The government purchases industrial goods by money creation. It provides home market for industry and relaxes the demand-constraint.

(g) The distribution of income among different classes is determined exogenously and there is social resistance to any change in this pattern.

2.1.2. The Important Notations to be used in Our Basic Model are as Follows:

- (i) $Y$: Level of industrial output.
- (ii) $p_i$: Price of industrial good.
- (iii) $\tau$: Fixed mark-up over prime (wage) cost.
- (iv) $w_m$: Money wage rate in the industrial sector.
- (v) $L$: Total industrial employment.
- (vi) $l$: Labour-output ratio in the industrial sector.

²⁵ The assumption of balanced agriculture-industry trade is a simplifying one. As discussed in chapter I, export surplus of industry vis-à-vis agricultural is, in general, unsustainable. However, unbalanced trade in favour of agriculture is a possibility. We will explore this possibility later in the chapter.
(vii) \( I \) : Real industrial investment measured in terms of industrial output.

(viii) \( g \) : Real government expenditure on industry measured in terms of industrial output.

(ix) \( G \) : Nominal government expenditure on industrial output.

(x) \( F \) : Aggregate supply of marketable surplus of food to industry.

(xi) \( a_r \) : Demand for food per worker employed in the industrial sector.

(xii) \( p_r \) : Food price.

(xiii) \( D_f \) : Aggregate food-demand from the industrial sector.

(xiv) \( W \) : Total wage-bill of industry measured in terms of industrial output.

### 2.2. Working of the Model

Excess capacity implies a given \( I \), and we take \( I = 1 \) by appropriate choice of units.

Hence, \( L = Y \) ... ... ... (1)

Using equation (1), mark-up pricing on unit wage-cost in the industrial sector can be represented as:

\[ p_r = (1+ \tau) w_m \] ... ... ... (2)
Where $t$ is a positive constant\textsuperscript{26}.

Workers' demand for a targeted real-wage is given by:

\[ \frac{w_m}{p_f} = \beta \] .............(3)

Where $\beta$ is a positive constant\textsuperscript{27}.

Equations (2) and (3) clearly bring out the exogenous nature of income distribution in the model. Change in distribution of income between agricultural and industry is governed by variation in terms of trade whereas that between capitalists and workers within the industrial sector is governed by variation in wage-share. Both the wage share and terms of trade are exogenously determined by equations (2) and (3). Such exogenous distribution is assumed to be acceptable to all the classes in the economy. There is social resistance to any change in this mutually settled (or historically evolved) distribution-pattern, at least in the short-run. From equations (2) and (3), we write the following:

Real wage in terms of industrial output or wage-share in industry is,

\[ \left( \frac{w_m}{p_i} \right) = \frac{1}{1+t} = \alpha \] .............(3.1)

Terms of trade between agriculture and industry is,

\[ \left( \frac{p_f}{p_i} \right) = \frac{\beta}{1+t} = \theta \] .............(3.2)

Both $\alpha$ and $\theta$ are exogenously determined.

The basic income-expenditure accounting equation for the industrial sector using the features (c), (e) and (f) of 2.1.1 can be written as:

\textsuperscript{26} The value of $t$ depends on the extent of market imperfection in the industrial sector (Kalecki, 1971c).

\textsuperscript{27} "Real wage resistance" could also be found in Hicks. Thus "the `desired real wage' is mainly governed by the attained standards of living of the working population and is not much affected, if at all, by the level of unemployment."
Total industrial output =

(Total industrial wage–bill in terms of industrial output) \(^ {28}\) + (Total industrial investment in terms of industrial output) + (Total government expenditure on industry in terms of industrial output) ... ... ...\(^{(4)}\)

We take real industrial investment in terms of industrial output and nominal government expenditure on industrial output as exogenously given\(^{29}\), i.e.,

\[ I = \bar{I} \] ... ... \(^{(5)}\)

\[ G = \bar{G} \] ... ... \(^{(6)}\)

Substituting equations (5) and (6) in equation (4) and using relevant notations (i), (ii), (iv), (v), (xii) and (xiv) of section 2.1.2, we obtain the following expressions:

\[ Y = W + \bar{I} + \bar{G}/\bar{p}_t \]

\[ = \frac{w_0}{p_1} \cdot L + \bar{I}_0 + \frac{p_0}{p_1} \cdot \bar{G}/\bar{p}_t \] ... ... ...(7)

Using equations (1), (3.1) and (3.2), equation (7) can be rewritten as:

\[ Y = \alpha \cdot Y + \bar{I}_0 + \theta \cdot (\bar{G}/\bar{p}_t) \] ... ... ...(7.1)

Using equations (3.1) and (3.2) equation (7) can also be written as:

\[ L = \alpha \cdot L + \bar{I}_0 + \theta \cdot (\bar{G}/\bar{p}_t) \] ... ... ...(7.2)

Solution of (7.2) gives,

\[ L^* = \frac{[\bar{I}_0 + \theta \cdot (\bar{G}/\bar{p}_t)] / (1-\alpha)} \] ... ... ...(8)

\(^{28}\) Assumption (c) of section 2.1.1 implies that workers' food-expenditure is spent indirectly on industrial good. Since workers do not save by assumption (c) of 2.1.1, the other part of the wage bill is directly spent on industrial good itself. Thus, the industrial workers' total wage bill is spent fully on industrial commodity.

\(^{29}\) Investment is governed by “long-run profit expectations, which are completely inelastic with respect to current changes in production” and hence, “the assumption of autonomous investment is eminently suitable for a model which abstracts from monetary complications” (Rakshit, 1982, 122).
The inverse relation between demand-determined industrial employment or output and food-price is easy to explain. An increase in food-price increases the money-wage rate equiproportionately due to real-wage resistance. Increase in money wage, in turn, increases price of industrial output equiproportionately due to mark-up pricing. Since, the nominal government expenditure is fixed there is a fall in the real government expenditure or a contraction of 'home market' for industry. Contraction of home market reduces aggregate demand leading to a contraction of industrial output and employment.

Food-demand per worker employed in the industrial sector depends positively on real-wage in terms of industrial output and negatively on terms of trade between agriculture and industry:

\[ a_f = a_f \left( \frac{w_m}{p_1}, \frac{p_r}{p_1} \right) \quad \ldots \ldots \quad (9) \]

with, \( a_{n1} > 0, \quad a_{n2} < 0 \)

Both the real-wage rate in terms of industrial output and terms of trade are exogenously determined by equations (2) and (3), i.e., mark-up pricing and real-wage resistance. Such exogenous determination has been made explicit in conditions (3.1) and (3.2).

Hence,

\[ a_f \left( \frac{w_m}{p_1}, \frac{p_r}{p_1} \right) = a_f^0 \quad \ldots \ldots \quad (10) \]

where \( a_f^0 \) is a positive constant.

Aggregate food-demand from the industrial sector:

\[ D_f = a_f^0 \cdot L \quad \ldots \ldots \quad (10.1) \]

Substituting from equation (8):

\[ D_f = a_f^0 \cdot \left[ \Gamma^0 + \theta \cdot \left( \frac{G^0}{p_0} \right) \right] / (1 - \alpha) \quad \ldots \ldots \quad (10.2) \]
It is evident that there is inverse relation between food-price and aggregate food-demand from the industrial sector.

The assumption of a fixed marketable surplus\textsuperscript{30}, i.e., assumption (d) of section 2.1.1 can be written as:

\[ F = F^0 \]

...(11)

where \( F^0 \) is a positive constant.

Using equations (10.2) and (11), food market equilibrium is given by:

\[ F^0 = D_f = a_f \left( I^0 + \theta \cdot \left( G^0 / p_g \right) \right) / (1 - \alpha) \]

...(12)

Equation (12) determines the equilibrium food-price \( p_f^* \). Determination of \( p_f^* \) can be represented in a simple food market demand-supply diagram (figure 1):

\[ \text{Figure 1: Food-market equilibrium in the context of agriculture-industry interaction.} \]

\textsuperscript{30} Since in our analysis we have assumed a fixed terms of trade, we can safely take food-supply as perfectly inelastic due to short-run natural, technical and institutional rigidities in agriculture (see, Desai, 2002 and Krishnamurty, 2002).
The equilibrium food price, \( p_f^* \) determines the equilibrium money-wage in industrial sector, i.e., \( w_m^* \) given the targeted real-wage in equation (3). This \( w_m^* \), in turn, determines equilibrium price of industrial output, i.e. \( p_i^* \) given mark-up pricing in equation (2). Thus, the equilibrium level of real government expenditure or the size of the real domestic exports will be endogenously determined as:

\[ g^* = G^0 / p_i^* \quad \ldots \ldots (12A) \]

We can, therefore, state our first basic proposition as follows:

**Proposition 1:** Given an exogenous food-supply-constraint and exogenous pattern of income distribution, the size of the real domestic exports or that of the 'home market' for industrial sector will be endogenously determined.

Before going into further analysis we should specify few additional observations which are very important for the general analysis on agriculture-industry inter-linkage. Given formal presentation of our model, we are in a position to express the relation between food-constraint and real domestic exports in more simple terms.

There is a capacity-level employment in the industrial sector, which we denote as \( L^0 \). On the other hand, given the fixity of per capita food consumption for industrial population, food-supply-constraint becomes binding on industrial employment potential. Thus, using equations (10) and (11) the level of potential employment in industry can be expressed as, \( [F^0 / a_f^0] \). The implicit assumption in our model is that \( [r^0 / a_f^0] \) is less than \( L^0 \), so that the food-constraint is effective or binding. Finally, modifying equation (8), the level of demand-determined
industrial employment in absence of government intervention can be expressed as, 
\[ \frac{I^0}{(1 - \alpha)} \]^{31}. Again, the implicit assumption here, is that \[ \frac{I^0}{(1-\alpha)} \] is less than \[ \frac{I^0}{a_i^0} \], so that the potential employment in industry permitted by the food-supply-constraint (given the level of per capita food consumption) is not realized due to demand-shortage. Hence, a proper size of the real domestic exports (i.e., a proper size of \[ \theta \cdot \frac{G^0}{p_d} \]) is required to realize the potential level of employment (or output) in industry. Given a nominal government expenditure on the industrial sector \( G^0 \), real domestic exports or home market of a proper size emerges from the working of the model. This is derived through the solution of equation (12) as the expression (12A).

Furthermore, as an extension of this analysis we can also say that the domestic exports for industry not only mitigate the problem of effective demand for the industrial sector but also that of agriculture. In absence of appropriate government intervention, industry fails to realize the potential level of employment due to demand-shortage. Consequently, agricultural surplus also remains unsold because of lack of demand from industry\textsuperscript{32, 33}. Thus in our model, domestic exports are solving both these problems given – of course – the agricultural supply-constraint.

\textsuperscript{31} A very important result follows from this: under the condition of unchanging distribution, agriculture cannot at all influence the level of industrial output and employment, when investment is fixed in real terms. The result is also the same when real government expenditure on industry is exogenously given along with real investment.

\textsuperscript{32} See in this regard, Rakshit, 1982 and 1989; Bhaduri and Skarstein, 2001; Chakrabarti, 2001; Sarkar, 2002. These analyses provide us with an explanation for the recent problem of ‘excess supply’ of food in India.
Corollary:

Now as a corollary to proposition I, we can analyse the effect of an expansionary fiscal policy without any change in agricultural production. Such a policy can be represented in our model by considering an increase in nominal government expenditure on industrial sector. The effect of this policy can be visualized through the following diagram (figure 2) of food-market demand-supply equilibria. Essentially, figure 2 is an extension of figure 1 derived with the particular policy change under consideration.

\[\text{Corollary:}\]

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\[\text{33 In our case, essentially, both agricultural sector and industry suffer simultaneously from surplus productions that remain unrealized in absence of appropriate government intervention. Thus, both suffer from the 'realization crises'. This 'problem of realization is how to find for each part of the (aggregate) product, in terms of value.............and in its material form (means of production, and articles of consumption.........), that other part of the product which replaces it on the market' (Lenin, 1899, 46). In the present case where we have realization crises for both agriculture and industry it is rather this non-concurrence of 'material forms' originating in the two lines of production that is creating the problem for exchange. Even if there is concurrence in terms of value there is failure of exchange. This is because the industrial capitalists' motive of production is accumulation of surplus value through sale of their products at profitable prices and not the simple exchange of the whole of their real surplus with that of food. Food is nothing but one of the inputs that can only generate still higher amount of unsold stock of industrial output, if used in production. See, Rakshit (1982), for a slightly different analysis of the same phenomenon. Furthermore, even if we introduce capitalists' consumption of food, agriculture fails to act as the demand-generating sector (through exchange) for industry. This is again because of the specific motive of production in the latter, i.e., accumulation and hence capitalists' aggregate consumption of food remains more or less constant.}\]
Figure 2: Expansionary fiscal policy.

We start with the food-market equilibrium position $E_1$ (figure 2) with equilibrium food-price $p_r^*$. Now we introduce an increase in $G$ from $G^0$ to say, $G'$, with $F = F^0$ as before. Given $p_r^*$, an increase in nominal government expenditure initially raises the level of real government expenditure on industry and thus induces an expansion of industrial employment. Industrial expansion creates excess demand in the food-market leading to an increase in food price. This, in turn, raises industrial money-wage given the targeted real-wage in equation (3). It leads to a rise in the price of industrial output given the mark-up in equation (2). Consequently, government expenditure in real terms shrinks. The process continues until one arrives at $p_r^{*'}$ (figure 2) such that the home market or the size of the real domestic exports shrinks back to its original value, i.e., $g^* = \theta \cdot G^0/p_r^*$ as in equation (12A). The ultimate effect is price-wage increase without any real effect on industry. We can, therefore, state the following proposition:
Proposition II: Any attempt to expand real domestic exports beyond the endogenously determined equilibrium level can initiate an increase in prices and wage with only stagnation in the industrial sector\textsuperscript{34}.

2.3. Rise in Agricultural Productivity

Next we consider a rise in agricultural productivity leading to an increase in the marketable surplus of food. This relaxes the supply-constraint on industry. It clearly follows that given the amount of per capita food consumption in industry, growth of agricultural productivity creates a potential for industrial expansion. However, realization of this potential requires an appropriate government expenditure policy vis-à-vis the industry, so that the domestic exports in real terms or the size of the home market is adequately expanded. The precise mechanisms for such expansion will be different depending on whether there exists downward rigidity of money-wage or downward flexibility of that in the industrial sector. Both these cases can be presented in terms of the following diagram (figure 3) of demand–supply equilibria in the food-market. Figure 3 is an extension of figure 1, derived with particular parametric changes and corresponding effects on equilibrium values.

\textsuperscript{34} This case is similar to that of an expansionary (government) policy with completely inelastic aggregate supply curve. As an extension we can propose a case where government goes on raising continuously the nominal expenditure on industrial commodities. However, such an effort will only trigger off 'stagflation' in the industrial sector.
Consider the case of downward flexibility of industrial money-wage. We start with the food-market equilibrium position $E_1$ (figure 3) that represents the solution of equation (12). Let us now assume that there is a growth of agricultural productivity raising the level of marketable surplus of food from $F^0$ (as in equation 11) to say, $F'^0$. As a result, ceteris paribus, there arises a situation of excess supply in the food-market that causes the food-price to fall from $p_f^*$ to $p_f'^*$. Given the distributive factor $\beta$ from equation (3) the fall in equilibrium food-price reduces money-wage in industry. Consequently, the price of industrial output also falls given the wage-share, $\alpha$ in equation (3.1). This, in turn, expands the size of real domestic exports,
given $G = G^0$ from equation (6). The process continues until one arrives at $p_f^*$ such that an adequate home market expansion is achieved by price-wage fall\textsuperscript{35}. Thus we get the equilibrium position $E_2$.

However, with downward rigidigy of industrial money-wage a fall in food-price due to a rise in agricultural productivity does not automatically increase the real domestic exports given the nominal government expenditure. Fall in food-price fails to reduce industrial money-wage due to its downward rigidity. Consequently, industrial commodity price remains unchanged given the equation (3.1). Hence, given nominal government expenditure on industrial output from equation (6), real domestic exports for industry do not at all change\textsuperscript{36}. In that case adequate expansion of home market can only be achieved by a proper expansion of nominal government expenditure itself\textsuperscript{37}. The expansion in nominal government expenditure on industrial output from $G^0$ to $G'$ shifts up the aggregate food-demand curve. This new aggregate food-demand curve and the new aggregate food-supply curve at $F_0^*$ intersect at $E_3$, the new equilibrium position. The required expansion is such that the food-market clears at an unchanged food-price even after the increase of marketable surplus and thereby keeps the income distribution intact. We can sum up our discussion of this section in the following proposition:

\textsuperscript{35}This result, in a way, is similar to the 'real balance effect'.

\textsuperscript{36}Fall in food-price without any change in industrial money-wage redistributes income from farmers to industrial workers. However, as we have balanced trade between industry and agriculture, redistribution between these two sectors does not influence the level of demand for industrial output. Even if industrial real-wage measured in terms of food rises in this case, industrial output remains unchanged, though additional food-supply is absorbed due to this redistribution (refer equation 9).

\textsuperscript{37}The Keynesian counterpart of this situation is the 'liquidity trap'.
**Proposition III:** Growth of agricultural productivity creates the potential for industrial expansion from the supply-side. However, on the demand-side, realization of this potential requires an adequate expansion of real domestic exports. Such an expansion can be achieved by price-wage fall in case of downward flexibility of money-wage. A proper expansion of nominal government expenditure, on the other hand, is required in case of downward rigidity of money-wage.

As an extension of the above analysis we can discuss a case of fall in agricultural productivity delivering a ‘supply-shock’ for industry. Consequently, given the value of nominal domestic exports for industry, there is a general increase in prices and wage following the course discussed earlier. The result is the downsizing of real domestic exports. Thus, with simultaneous fall in the levels of demand and supply necessary for industrial production, industry experiences contraction of output and employment.

Before going to the next section, we summarize our preceding analysis:

In our above discussion, we have dealt with both the issues of creation of potential (output and employment) in industry and of realization of this potential. Stated otherwise, our analysis tries to locate distinctly the sources of demand and supply-side contributions for industrial expansion. We also establish the need for generating complementariness between these two types of contributions for industrial expansion. Thus, dealing with these two sources distinctly and simultaneously bridging them together into one aggregative framework is a crucial
departure from a vast literature that deals with such issues rather separately and in an unrelated manner \(^{38}\).

### 2.4. Unbalanced Trade between Agriculture and Industry

So far, we have worked under the assumption of balanced trade between agriculture and industry as mentioned in the assumption 2.1.1 (e). What we now try to show is that our basic propositions obtained under the assumption of balanced trade are substantively unaffected even if we allow for unbalanced trade in the form of farmers' savings \(^{39}\). As farmers save a fraction of their income earned through the sale of food to industry, in fact, agriculture registers an 'export surplus' vis-à-vis the industrial sector.

The change in the employment-determination equation (7.2) on account of farmers' savings will be as follows:

\[
L = \alpha \cdot L + 1^0 + \theta \cdot \left( \frac{G^0}{p_r} \right) - s \cdot \theta \cdot a_r^0 \cdot L \quad \ldots \ldots (7.2)'
\]

where 's' is the saving-income ratio of the farmers. \([\theta \cdot a_r^0 \cdot L]\) is the purchasing power measured in terms of industrial output that flows from industry to agriculture on account of industrial workers' spending on food. This is also the farmers' income. Only a part of it, i.e., \([(1 - s) \cdot \theta \cdot a_r^0 \cdot L]\) flows back to industry on account of farmers' purchase of industrial output. The other part of agricultural income, i.e., \([s \cdot \theta \cdot a_r^0 \cdot L]\) is saved by the farmers. Though this part of purchasing

\(^{38}\) The importance of our proposed complementariness is clear from the observation that the "(s)udies on the industrialisation experience of developing countries focus on the supply side, or on the demand side, and do not pay adequate attention to the interaction between the forces of demand and supply in a macroeconomic perspective" (Nayyar, 1994, 11). See also, Bhaduri, 1985 and Krishnamurty 2002.

\(^{39}\) Earlier aggregate M.P.C. of farmers was equal to one, but now it is less than one.
power flows out of industry to agriculture it is not spent back on industrial output. Thus this leakage of purchasing power creates a contractionary demand-effect on industry of the magnitude of \([s \cdot \theta \cdot a_r^\theta \cdot L]\). Such contractionary demand-effect was absent in case of zero savings by the farmers or under the assumption of balanced agriculture-industry trade.

Now we turn to the solution of (7.2)' as:

\[
L^* = \left[ I_0^\theta + \theta \cdot \frac{G^\theta}{P_f} \right] / (1 - \alpha + s \cdot \theta \cdot a_r^\theta) \quad \ldots \ldots \ldots (8)'
\]

Comparison between equations (8) and (8)' reveals that industrial employment for each level of food-price will be less under the assumption of unbalanced trade. The difference is due to the contractionary demand-effect on industry on account of unbalanced trade between agriculture and industry. Consequently, the food-demand curve will now lie below that obtained in the case of balanced trade. Equilibrium food-price will now be lower than \(p_{r*}\) (of figure 1). Moreover, equilibrium size of real domestic exports required to realize fully the potential output of industry will be larger than \(g^*\) (of equation, 12A), the value that was derived from figure 1, given the specific amounts of food-supply \(I_0^\theta\) and nominal government expenditure \(G^\theta\). There is, thus, no basic change of proposition I obtained under the assumption of balanced trade. In the presence of an exogenous supply of food and social resistance to change in the pattern of income distribution, the size of the real domestic exports is still endogenously determined. The only difference is that the required size is larger under the assumption of unbalanced trade to counter the contractionary demand-effect of ‘import surplus’ of the industrial sector vis-à-vis agriculture. One can easily verify that propositions II and III obtained under the assumption of balanced trade will also hold in case of
unbalanced trade between agriculture and industry given the basic logical rooted-
ness of such propositions in proposition I.

In fact, the distinction between balanced and unbalanced trade between agriculture
and industry does matter in certain models (as reviewed earlier) where both the
supply of food and the real domestic exports (if any) are exogenous with
endogenous determination of the pattern of income distribution. We can convert
our basic-model into a model of endogenous determination of income distribution
by assuming a constant industrial money-wage rate instead of constant real-wage
as was assumed in equation (3). Mark-up pricing\(^{40}\) (from equation 2) will then,
give a constant price of industrial output\(^{41}\). Hence, given the nominal government
expenditure the corresponding real value will also be fixed. Now with these
modifications, under the assumption of balanced trade between agriculture and
industry, employment-determination equation for the industrial sector is derived
through alteration of equation (7.2)\(^{4}\) as:

\[
L = \alpha \cdot L + I^0 + G^0 / p_i
\]

Now setting the constant price of industrial output as equal to unity, i.e. setting \(p_i = 1\),

\[
L = \alpha \cdot L + I^0 + G^0
\]

Solving the last equation (8)\(^{4}\) we get:

\[
L^* = [I^0 + G^0] / [(1 - \alpha)]
\]

\(^{40}\) Intra-industrial-sector distribution of income, captured by \(\alpha\) of equation (3.1), is still frozen.

\(^{41}\) As \(p_i\) changes industrial real-wage measured in terms of food varies, given the money-wage. Hence, \(\beta\) in equation (3) is no more a constant. Moreover, with invariant money-wage as \(p_i\) remains unchanged, the terms of trade between industry and agriculture also varies with changes in \(p_i\). Thus, \(\theta\) of equation (3.2) is endogenously determined with \(\beta\) as a variable.
Thus, the equilibrium level of industrial employment will be totally independent of the level of food-supply under the assumption of balanced trade between agriculture and industry even if we allow for variable terms of trade. The food-market equilibrium will only determine the food-price and the distributive variables like the real-wage rate in terms of food and the terms of trade between industry and agriculture.

Under such condition, a growth of agricultural productivity reduces food-price and hence increases real-wage in terms of food given the money-wage. This, on the other hand, generates a terms of trade deterioration against agriculture given the industrial commodity price. Consequently, a redistribution of income takes place. However, such redistribution of income cannot affect the equilibrium level of employment in the industrial sector as, in this case, we have only a transfer of purchasing power from one group to another without any change in its level. Stated otherwise, this redistribution is ineffective in influencing industrial production as the trade between industry and agriculture remains balanced even after redistribution. On the other hand, surplus agricultural output is absorbed in the industrial sector through increase in the level of per capita food consumption due to increase in real-wage and deterioration in the terms of trade between agriculture and industry. This is evident from equation (9) above.

However, the conclusion changes substantively if one assumes the possibility of redistribution in a situation of unbalanced trade between agriculture and industry by allowing for farmers' savings. Redistribution of income, specifically that of savings, from farmers to industrial workers increases the demand for industrial
output. Such a mechanism can be explained through a modification of the employment-determination equation (7.2) in the following way:

First of all, let us assume that though \( p_f \) is a variable \( w_m \) remains rigid making \( p_i \) a constant given equation (2). Hence, distributive factor \( \theta \) of equation (3.2) becomes a variable. This, in turn, makes ‘\( a_f \)’ also a variable following equation (9). Given these conditions, equation (7.2) is modified as:

\[
L = a \cdot L + 1^0 + G^0/p_i - s \cdot p_f/p_i \cdot a_f \cdot L
\]

Now setting \( p_i = 1 \) as before, we have:

\[
L = a \cdot L + 1^0 + G^0 - s \cdot p_r \cdot a_r \cdot L
\]

Growth in agricultural productivity reduces food-price leading to a fall in agricultural income\(^{42}\). This fall in agricultural income reduces farmers’ savings which is transferred to industrial workers raising aggregate demand for industrial commodity\(^{43}\). Thus, because of this redistribution the leaked out purchasing power in the form of farmers’ savings is driven back to the circular flow, which raises the level of demand for industry.

### 2.5. Observations

We have analyzed in this chapter the linkages between the industrial sector and other sectors of a less developed economy, specifically the agricultural sector and the government. On the demand-side, our basic position is that the problem of

\(^{42}\) Assuming price-inelastic food-demand, \( [p_f, a_f] \) falls even if \( a_r \) rises due to redistribution with fall in \( p_r \).

\(^{43}\) As agricultural production rises, this sector’s drag on industry is relaxed due to the fall in its ‘export surplus’ vis-à-vis industry. Stated otherwise, industry’s ‘import surplus’ vis-à-vis agriculture falls inducing demand for industrial output.
effective demand faced by the industrial sector could be mitigated by active government intervention through the generation of real domestic exports. Industrial output and employment increase if there is a rise in its ‘export surplus’ vis-à-vis the government. Here government ‘imports’ industrial commodity and ‘exports’ money to this domestic industrial sector. On the other hand, growth in agriculture can also raise the level of demand-determined industrial output through redistribution. But in that case, unlike the first one, there is rather a fall in the ‘import surplus’ of industry vis-à-vis agriculture.

Nonetheless, the precise question we ask is: how can growth of agricultural productivity lead to industrial expansion in the presence of social resistance to a historically evolved pattern of income distribution? Growth of agricultural productivity creates a potential for industrial expansion from the supply-side. Realization of this potential without involving distributional conflict requires – on the demand-side – an appropriate adjustment of real government expenditure on industrial output, i.e., of the real domestic exports.

While discussing above the comparative static analyses, we have shown two processes through which real domestic exports rise due to a rise in agricultural productivity. Now both these channels could be shown to have similarities with the foreign trade interactions between two countries.

In the first case, when agriculture expands we have a general fall of prices and wage. This, in turn, increases real domestic exports as nominal government expenditure on industry, i.e., the flow of money from the former to the latter is kept constant. In fact, real ‘net exports’ of industry to the government rises as we have a
shift of the exchange rate or the terms of trade between these two sectors. This phenomenon has similarity with a process of devaluation of domestic currency that makes exportables cheaper and hence more competitive raising their level of demand.

In the second case, on the other hand, we have explicit complementariness between the demand-side and supply-side policies for industrial expansion. When nominal government expenditure on industry rises, there has to be an adequate expansion of food-supply as well to raise the level of industrial output and employment without affecting the prices at all. Stated otherwise, when 'net exports' of industry to government rises, there has to be a rise in the food production so that industry's increased demand for 'imported' wage-good is adequately met. If agriculture fails to expand it acts just like the 'forex' constraint in an open economy that restricts the supply of imported inputs required for the expanding domestic industry.

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44 Even if redistribution is not possible between agriculture and industry here we have redistribution between the industrial sector and the government.