Agro-industry, Inequality and Sectoral growth

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Abstract:

This paper attempts to explore the long debated issue of the impact of agricultural development on industrialization in the presence of a third sector namely, agro-industry which directly interfaces with both agriculture and industry and thereby provides a link between the two sectors. We find that in a closed economy where the demand structure reflects hierarchical preference, a producttivity surge in agriculture adversely affects industrialization. But in a small open economy, agricultural development may boost industrialization. The findings are in opposition with theoritical priors but are empirically more relevent. This paper also examines the impact of sectoral growth on income inequality in the presence of this hybrid sector.

1 Introduction

The role of agriculture in economic development is a long debated issue. Starting from Rosenstein-Rodan (1943), Nurks (1953) and Lewis (1955) to Murphy, Shleifer and Vishny (1989) and beyond, there is an emphasis in the literature, on the positive linkages between agriculture and industrialization. Three channels are recognized. First, the income elasticity of demand for the agricultural good being less than one, an increase in the agricultural productivity in a closed economy releases labor for manufacturing employment and thus contributes towards modernization and growth of the manufacturing sector. Second, a higher income raises the demand for manufacturing products. Third, aggregate savings increase and finance industrialization.

Central to this result is the assumption that either the economy is closed where prices and demand pattern play a role so that an agricultural productivity gain provides a larger market for manufactures after meeting the minimum requirement for food (Murphy, Shleifer, Vishny, 1989) or it is a large open economy. But such a productivity surge may not be conducive to industrialization in a price-taking small open economy.

Moreover these theoritical analyses of the process of development have viewed agriculture and industry as two separate sectors in terms of their characteristics. Apart from the demand side, two sectors are linked only through a labor market. There is a common pool of labor which is allocated between two sectors. However in more recent decades another prominent sector in a developing economy has emerged, namely the agro-industry, which directly interfaces with both the agriculture and industry and thereby provides a link between the two sectors. This industry, as the name suggests, refers to the subset of manufacturing that processes raw materials and intermediate products derived from the agricultural sector. For instance it transforms products originating from agriculture, forestry and fisheries, and process them into canned food, beverages, fruit juice, meet and dairy products, marine products, textile and clothing, leather, wood and rubber products, animal feed etc.

Tables 1 and table 2 show the relative importance of the agro-industry sector compared to manufacturing as well as the overall GDP for some selected countries. It contributes to on average, 37.6% of the total manufacturing value added (FAO,1997) and 30-40% of GDP of the developing countries (WB, FAO, and UNIDO , see Tables 1 and 2). For instance, agro-industries in Asia and pacific account for 36% of the total manufacturing value added (FAO,1997), while the corresponding figure for the Sub Saharan Africa is around50% (world bank, 2003). Data from the annual survey of industries show that 46% of all factories in India are agro-industrial and they contribute 22% of the manufacturing value added (Gandhi, Kumar, Marsh, 2001).

Table 3 shows employment in this sector relative to the overall manufacturing sector. For instance in India, 22.8% of the total manufacturing work force is employed in agro-processing industries. The corresponding figures for Indonesia and Philippines are 20.2% and 20.9% respectively. Among the African countries Senegal has the highest figure of 59.3% where as among the Latin American countries, Brazil's, 33% of the total manufacturing workforce is employed in the agro-industrial sector.

Being such an important sector in terms of its share in GDP, manufacturing value added and employment, the general question is: what role does it play in the development process in terms of linking manufacturing and agriculture? The aim of the paper is to understand the impact of agricultural productivity on the industrial development in the presence of such a hybrid sector.

A three sector model is developed in this paper, having agriculture, manufacturing and agro-industry. Manufacturing employs two primary inputs—

unskilled and skilled workes. This is a generalization of Murphy, Sleipher and Vishney(1989), Matsuyama (1993) and Eswaran and Kotwal (1993) this sector is assumed to use only one primary input, homogeneous labor. Apart from using agricultural good as raw material agro-industry also uses unskilled and skilled workers. By nature, it involves large number of steps, which requires multiple skills (for product innovation, quality control, packaging, maintainance of equipments etc.) at different stages of the production process. However in general, it seems natural that it is a less skill-intensive sector than manufacturing. Agriculture, (the traditional sector) uses land (fixed factor) and unskilled labor. Land is owned by a seperate class of people, namely the landlords.

In the demand side of the economy, a hierarchical preference structure is assumed. Only after meeting a certain minimum level of food consumption, will an individual be inclined to spend on agro and manufacturing goods. Unlike agricultural goods, the income elasticity of agro-products is assumed to be greater than one (Food and Nutrition Bulletin, The United Nations University Press, 1986). Such a preference structure explicitly links demand to the income distribution.

Given the above structure of a developing economy, this paper finds an overturn of the recieved wisdom. It is seen that an agricultural productivity gain promotes industrialization in a small open economy while it may not promote industrialization in a closed economy. We also find that in the presence of agro-industry, a small primary-exporting country can develop comparative advantage in manufacturing through agricultural productivity increase. These are more empirically plausible results for developing countries which are indeed small open economies.

2 Model

2.1 Small Open Economy

A small open economy is composed of three sectors, agriculture (F), agro-processing industry (G) and manufacturing (M). All goods are homogeneous. Good G and good M are used for consumption only, whereas good (F) is consumed, as well as used as an intermediate input in the agro-industry.

Good F is produced by labour and land, good M is produced by skilled and unskilled labor. Apart from using good F as an intermediate input, good G uses labor of both types. It uses good F at a constant ratio. Good

M is relatively skill-intensive than good G. The total supplies of labor, both skilled and unskilled and land are fixed. The production functions are linearly homogeneous and each factor is subject to positive and diminishing returns.

Now given constant returns to scale and the absence of joint production, we can express the cost functions in each sector as following:

$$c_f(w_n, R) = A_f \tag{1}$$

where w_n is the unskilled wage and R is the rental on land in terms of agriculural good. Here A_f is the productivity level in agriculture.

$$c_g(w_s, w_n) = p_g A_g \tag{2}$$

where w_s is the skilled wage. p_m and p_g are the relative prices of manufacturing and agro-products respectively in terms of agricultural good, determined in the world market and A_g is the productivity level in the agro sector.

Unit cost function in the manufacturing is given by:

$$c_m(w_s, w_n) = p_m A_m \tag{3}$$

The factor market equilibrium conditions and demand for food in the agro-industry are given by

$$a_{gs}Q_g + a_{ms}Q_m = \overline{S} \tag{4}$$

$$a_{gn}Q_g + a_{mn}Q_m + a_{fn}Q_f = \overline{N} \tag{5}$$

$$a_{fT}Q_f = \overline{T} \tag{6}$$

$$\overline{a_{gf}}Q_g = F_g \tag{7}$$

We also have

$$a_{ij} = c^i_x, \quad i = g, m, f \quad x = w_n, w_s, R \tag{8}$$

where $a_{ij}, \quad i = g, m, f, \quad j = s, n, T, f$ is the amount of jth input required to produce one unit of ith good. $\overline{S}$, $\overline{N}$ and $\overline{T}$ are the endowments of skilled, unskilled labor and land respectively. F_g is the amount of agricultural good used in the agro-industry.

Now the relative commodity prices being determined in the world market, the system of equations from (1) to (8)represent thirteen equations in thirteen variables $w_n, w_s, R, a_{gs}, a_{gn}, a_{mn}, a_{ms}, a_{fn}, a_{fT}, Q_g, Q_m, Q_f, F_g$.

The economy consists of three classes, unskilled and skilled workers and the landlords. Both types of workers earn wages in terms of agricultural good. Each landlord owns one unit of land and their earning is only the rental from land. The preference pattern is hierarchical. This means only after meeting a certain minimum level of food consumption ($\overline{F}$), will an individual be inclined to spend on agro and manufacturing goods at fixed proportions. In addition to this, unskilled wage is so low that it can not meet the level of minimum food consumption, ie $w_n < \overline{F}$. Thus skilled workers and landlords are the only source of demand for manufacturing and agro-products. After meeting the minimum requirement of food, skilled workers and landlords spend δ proportion of the rest of their income on agro-industrial products, while $(1-\delta)$ proportion of it is spent on manufactures. The important thing to notice is that unlike agricultural good, the income elasticity of agro-products is greater than unity.

2.1.1 Comparative Statics

We now explore the impact of a productivity surge in agriculture on earnings of different income classes, resource allocation and sectoral outputs.

Impact on earnings:

Totally differentiating equations (1), (2) and (3),

$$\theta_{gs}\hat{w_s} + \theta_{gn}\hat{w_n} = 0, \tag{9}$$

$$\theta_{ms}\hat{w_s} + \theta_{mn}\hat{w_n} = 0 \tag{10}$$

and,

$$\theta_{fn}\hat{w_n} + \theta_{fT}\hat{R} = \hat{A}_f \tag{11}$$

where θ_{gs} and θ_{gn} are the share of skilled and unskilled labor in agro-industry, respectively. θ_{ms} and θ_{mn} are the share of skilled and unskilled labor in industry, respectively. Here we assume that unskilled labor has a higher share in agro-industry than in manufacrueing, while the opposite holds for the skilled workers, which is a relevant assumption for a developing economy. Thus,

$$\theta_{gn} > \theta_{mn}, \quad \theta_{ms} > \theta_{gs}. \tag{12}$$

The equations (9), (10) and (11) solve for,

$$\frac{\hat{w_s}}{\hat{A}_f} = 0, \quad \frac{\hat{w_n}}{\hat{A}_f} = 0, \quad \frac{\hat{R}}{\hat{A}_f} = \frac{1}{\theta_{fT}} > 0. \tag{13}$$

Thus,

Proposition 1 *Due to an increase in agricultural productivity, both skilled and unskilled wages remain unchanged, while rent increases.*

A productivity gain in agriculture raises return to unskilled labor in that sector, causing an inflow of it in that sector. Thus, endowment of unskilled worker left for agro-industry and manufacturing falls. Being an unskilled labor-intensive sector, agro-industry contracts releasing both unskilled and skilled labor. In order to maintain full employment, manufacturing output expands. Since agro-industry is unskilled labor-intensive sector, amount of that factor released from it is higher than what is demanded in manufacturing. This puts a downward pressure on unskilled wage causing unskilled wage to remain unchanged. Zero profit condition in manufacturing requires skilled wage to be unchanged also. In agricultural sector, productivity gain coupled with unchanged wage of unskilled workers leads to a rise in the rentals on land.

Impact on sectoral outputs:

Totally differentiating equations (4), (5), (6) and using (8) and (13),

$$\frac{\hat{Q_m}}{\hat{A_f}} = -\frac{\lambda_{gs}\lambda_{fn}}{\lambda\theta_{fT}} > 0; \quad \frac{\hat{Q_g}}{\hat{A_f}} = \frac{\lambda_{ms}\lambda_{fn}}{\lambda\theta_{fT}} < 0; \quad \frac{\hat{Q_f}}{\hat{A_f}} = \frac{1}{\theta_{fT}} > 0. \tag{14}$$

where

$$\lambda = \lambda_{gs}\lambda_{mn} - \lambda_{ms}\lambda_{gn} < 0,$$

given the higher skill intensity in manufacturing relative to agro-industry.

$$\lambda_{gs} = \frac{S_g}{\overline{S}}, \quad \lambda_{ms} = \frac{S_m}{\overline{S}},$$

and

$$\lambda_{gn} = \frac{N_g}{\overline{N}}, \quad \lambda_{mn} = \frac{N_m}{\overline{N}}, \quad \lambda_{fn} = \frac{N_f}{\overline{N}}.$$

here S_g and S_m are the skilled labor employments in agro-industry and manufacturing respectively. N_g, N_m and N_f are the unskilled labor employments in agro-industry, manufacturing and agriculture respectively.[1] Thus,

Proposition 2 *An increase in agricultural productivity leads to a rise in agricultural and industrial output, while agro-industrial output falls.*

[1] Here we consider the Cobb-Douglas case where elasticity of substitutions between factors are unity.

The proof is in the Appendix.

A productivity gain in agriculture raises return to unskilled labor in that sector, causing an inflow of it in that sector. Thus, endowment of unskilled worker left for agro-industry and manufacturing falls. As a result we observe Rybczynski effect. Being an unskilled labor-intensive sector, agro-industry contracts releasing both unskilled and skilled labor. In order to maintain full employment, manufacturing output expands. Since agro-industry is unskilled labor-intensive sector, amount of that factor released from it is higher than what is demanded in manufacturing. The extra unskilled labor moves to agriculture to expand it further.

2.2 Closed Economy

In the closed economy, the relative prices of agro-products and manufacturing are determined endogenously from the market clearing condition of these two markets. Equilibrium condition being satisfied in these two markets, food market will also be in equilibrium by the Walras Law.

The market clearing conditions for manufacturing and agro-industrial products are the following:

$$(1-\delta)\overline{S}(w_s - \overline{F}) + (1-\delta)\overline{T}(R - \overline{F}) = p_m Q_m \tag{15}$$

$$\delta\overline{S}(w_s - \overline{F}) + \delta\overline{T}(R - \overline{F}) = p_g Q_g \tag{16}$$

These two equations represents two upward sloping curves in the p_m and p_g space. In the closed economy hierarchical preference raises the issue of stability. Under the assumption (12), the system is stable given the following condition:

$$\lambda_{gn} < \lambda_{gs} < \delta, \quad \theta_{gn} > (1-\delta)(\theta_{ms} - \theta_{gs}) \tag{17}$$

and as long as $\overline{F}$ is not too large.

Now given the relative commodity prices, the system of equations from (1) to (8)represent thirteen equations in thirteen variables w_n, w_s, R, a_{gs}, a_{gn}, a_{mn}, a_{ms}, a_{fn}, a_{fT}, Q_g, Q_m, Q_f, F_g. Theses variables are solved as function of $p_m, p_g, A_g and A_m$.

Again the product market equilibrium conditions (15) and (16) determines prices as functions of A_f, A_m and A_g. Therefore, finally we have,

$$w_n = w_n(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$

$$w_s = w_s(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$

$$R = R(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$
$$F_g = F_g(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$
$$Q_f = Q_f(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$
$$Q_g = Q_g(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m);$$
$$Q_m = Q_m(p_m(A_f, A_g, A_m), p_g(A_f, A_g, A_m), A_f, A_g, A_m)$$

Now we explore the impact of an agricultural productivity surge on the performance of the manufacturing sector in a closed economy.

Proposition 3 *An increase in agricultural productivity reduces industrial output in a closed economy as long as minimum food consumption is not too large and unskilled workers are not sated with food.*

The proof is in the appendix.

A productivity surge in agriculture results in excess supply in the market for manufacturing good (Proposition 1 and 2). Thus with p_g unchanged p_m falls. Hence (15) shifts upward. Again there is excess demand in the market for agro-industries. Thus p_g increases shifting (16) upwards. However in the new equilibrium the directions of change in prices are ambiguous. The total impact on industrial output of an increase in agricultural productivity is:

$$\frac{\partial Q_m}{A_f} = \frac{\partial Q_m}{A_f} + \frac{\partial Q_m}{p_m}\frac{\partial p_m}{A_f} + \frac{\partial Q_m}{p_g}\frac{\partial p_g}{A_f} < 0 \tag{18}$$

Proposition 3 essentially says that the conventional wisdom of positive linkage between manufacturing and agriculture in a closed economy might breakdown if rise in income of all income classes in the economy followed by a productivity gain in agriculture is not sufficient to provide a larger market for manufacturing. Moreover, the magnitude of the impact increases if there exists a third sector (agro-industry) that uses agricultural good as raw materials. Higher the dependence of agro-industry on aqgriculture, more will be the fall in its demand in agro-industry (proposition 2), thus more will be the fall in food price and larger will be the magnitude of changes in p_m and p_g to wipe out the initial Rybczynski effect.

On the other hand proposition 2 says that an agricultural productivity gain promotes industrialization in a small open economy which is empirically more plausible for developing countries which are indeed small open economies. However in a small open economy, agro-industry's dependence on agriculture does not play any role in the direction and magnitude.

One important aspect that this model captures is the dynamic nature of the comparative advantage of the small open economy characterized by the structure described above.

Proposition 4 *Gigen the demand pattern and the stability condition, a primary-export oriented country may develop comparative advantage for manufacturing through agricultural productivity gain if* $(\lambda_{ms}\lambda_{gn} - \lambda_{gs}\lambda_{mn}) > (\lambda_{gs} - \lambda_{gn})$.

The ratio of manufacturing to agricultural output increases followed by an increase in agricultural productivity. The ratio of demand for two goods also increases, but the former outweighes the later. Thus if the agricultural productivity keeps increasing, at one point of time the comparative advantage pattern of the small open economy might get reversed.

3 Conclusion

This paper attempts to explore the long debated issue of the impact of agricultural development on industrialization in the presence of a third sector namely, agro-industry which directly interfaces with both agriculture and industry and thereby provides a link between the two sectors. this paper finds an overturn of the recieved wisdom. It is seen that an agricultural productivity gain promotes industrialization in a small open economy while it may not promote industrialization in a closed economy. We also find that in the presence of agro-industry, a small primary-exporting country can develop comparative advantage in manufacturing through agricultural productivity increase. These are more empirically plausible results for developing countries which are indeed small open economies.

4 Appendix

Proof of Proposition 2:

Totally differentiating the system of equations (4), (5) and (6), we have

$$\lambda_{gs}\hat{Q_g} + \lambda_{ms}\hat{Q_m} = -\lambda_{gs}\hat{a_{gs}} - \lambda_{ms}\hat{a_{ms}}, \tag{19}$$

$$\lambda_{gn}\hat{Q_g} + \lambda_{mn}\hat{Q_m}\lambda_{fn}\hat{Q_f} = -\lambda_{gn}\hat{a_{gn}} - \lambda_{mn}\hat{a_{mn}} - \lambda_{fn}\hat{a_{fn}}, \tag{20}$$

$$\hat{Q_f} = -\hat{a_{fT}}. \tag{21}$$

Now recalling equatin (8) and diffrerentiating, we have,

$$\hat{a_{ij}} = \frac{r_j c^i_{jj}}{c^i_j}\hat{r_j} + \frac{r_k c^i_{jk}}{c^i_j}\hat{r_k}, \qquad i = g, m, \quad j, k = s, n \tag{22}$$

and $r_j \quad j = s, n, T$, is the return to jth input.

Since c^i is linear homogeneous, c^i_j is homogeneous of degree zero in its arguments. Therefore we have,

$$r_j c^i_{jj} + r_k c^i_{jk} = 0 \tag{23}$$

Again the elasticity of substitutin between j and k in the ith sector is

$$\sigma_i = \frac{c^i c^i_{jk}}{c^i_j c^i_k}. \tag{24}$$

Making use of (22), (23) and (24) and recalling that $\theta_{ik} = \frac{r_k a_{ik}}{p_i}$ and assuming $\sigma_i = 1$, we have,

$$\hat{a_{ij}} = -\theta_{ik}(\hat{r_j} - \hat{r_k}) \tag{25}$$

Now, in the sector f, there is a Hicks-neutral technical change. Then the minimization of $r_j a_{fj} + r_k a_{fk}, \quad j, k = n, T$ with respect to $a_{fj}, \quad a_{fk}$ subject to the production function is equivalent to minimization of $\overline{r_j a_{fj}} + \overline{r_k a_{fk}}$, with respect to $\overline{a_{fj}}, \quad \overline{a_{fk}}$, where

$$\overline{r_j} = \frac{r_j}{A_f}, \quad \overline{a_{fj}} = A_f a_{fj} \quad j = n, T$$

It follows that the solution to the problem can be represented by a cost function $c_f = c_f(\overline{r_j}, \quad \overline{r_k}), \quad j, k = n, T$, with partial derivatioves, $c^f_j = \overline{a_{fj}}, \quad j = n, T$.

Then

$$\hat{a_{fj}} = -\theta_{fk}(\hat{r_j} - \hat{r_k}) - \hat{A_f}, \quad j, k = n, T \tag{26}$$

Subsrituting (25) and (26) into (19), (20) and (21) and making use of (13), we solve for

$$\frac{\hat{Q_m}}{\hat{A_f}} = -\frac{\lambda_{gs}\lambda_{fn}}{\lambda\theta_{fT}} > 0; \quad \frac{\hat{Q_g}}{\hat{A_f}} = \frac{\lambda_{ms}\lambda_{fn}}{\lambda\theta_{fT}} < 0; \quad \frac{\hat{Q_f}}{\hat{A_f}} = \frac{1}{\theta_{fT}} > 0.$$

Proof of Proposition 3: Totally differentiating equations (1), (2) and (3), with respect to p_m, we solve for,

$$\frac{\hat{w_s}}{\hat{p_m}} = -\frac{\theta_{gn}}{\theta} > 0, \quad \frac{\hat{w_n}}{\hat{p_m}} = \frac{\theta_{gs}}{\theta} < 0, \quad \frac{\hat{R}}{\hat{p_m}} = -\frac{\theta_{fn}\theta_{gs}}{\theta\theta_{fT}} > 0. \tag{27}$$

where $\theta = \theta_{gs}\theta_{mn} - \theta_{ms}\theta_{gn} < 0$, given the assumption of relative skill-intensity in manufacturing and agro-industry.

Totally differentiating equations (4), (5) and (6), substituting (25), $i = g, m, f, \quad j, k = n, s, T$ and making use of (29) we have,

$$\frac{\hat{Q_m}}{\hat{p_m}} = \frac{(\theta_{gn} + \theta_{gs})(\lambda_{gn}a + \lambda_{gs}b}{\lambda\theta} + \frac{\lambda_{gs}\lambda_{fn}\theta_{gs}}{\lambda\theta\theta_{fT}} > 0 \tag{28}$$

where $a = \lambda_{gs}\theta_{gn} + \lambda_{ms}\theta_{mn}$ and $b = \lambda_{gn}\theta_{gs} + \lambda_{mn}\theta_{ms}$

Similarly for p_g, we have,

$$\frac{\hat{w_s}}{\hat{p_g}} = \frac{\theta_{mn}}{\theta} < 0, \quad \frac{\hat{w_n}}{\hat{p_g}} = -\frac{\theta_{ms}}{\theta} > 0, \quad \frac{\hat{R}}{\hat{p_g}} = \frac{\theta_{fn}\theta_{ms}}{\theta\theta_{fT}} < 0. \tag{29}$$

And,

$$\frac{\hat{Q_m}}{\hat{p_g}} = -\frac{(\lambda_{gn}a + \lambda_{gs}b)}{\lambda\theta} - \frac{\lambda_{gs}\lambda_{fn}\theta_{ms}}{\lambda\theta\theta_{fT}} < 0 \tag{30}$$

Now

$$\frac{\partial Q_m}{A_f} = \frac{\partial Q_m}{A_f} + \frac{\partial Q_m}{p_m}\frac{\partial p_m}{A_f} + \frac{\partial Q_m}{p_g}\frac{\partial p_g}{A_f}$$

$$= -\frac{(\lambda_{gn}a + \lambda_{gs}b)}{\lambda\theta}\frac{(1-\delta)\overline{T}Rp_gQ_gQ_m}{A_fp_gp_m\theta_{fT}}\frac{\overline{a_{fg}}}{p_g}$$

$$-\frac{\lambda_{gs}\lambda_{fn}}{\lambda\theta}\frac{(1-\delta)\overline{T}Rp_gQ_gQ_m}{A_fp_gp_m\theta_{fT}}\frac{\theta_{ms}\overline{a_{fg}}}{p_g}$$

$$+\frac{\lambda_{gs}\lambda_{fn}}{\lambda\theta}\frac{(1-\delta)\overline{T}Rp_gQ_gQ_m}{A_fp_gp_m\theta_{fT}}\frac{\theta_{mn}\overline{a_{fg}}}{p_g} < 0,$$

given the stability conditions.

Table1: Share of agro-industries in total manufacturing value added[2] in selected country groups, 1980 and 1994[3]

Country groups	3.1		3.2		3.3		3.4		3.5.5		3.1-3.4,3.5.5	
	1980	1994	1980	1994	1980	1994	1980	1994	1980	1994	1980	1994
Industrialized countries	13.3	12.6	8.3	5.7	3.6	3.1	7.9	8.9	1.2	1.1	34.3	31.4
EC	11.9	13.5	8.5	6.0	3.7	3.4	6.8	7.6	1.3	1.1	32.2	31.6
Japan	11.3	9.4	7.2	4.3	4.4	2.3	8.8	9.2	1.4	1.2	33.1	26.4
North America	13.7	11.9	6.4	4.8	2.8	3.0	11.4	11.3	1.0	1.1	35.3	32.1
Eastern Europe and CIS	20.8	20.5	14.4	13.7	2.7	3.2	2.2	1.8	1.4	1.1	41.5	40.3
Developing countries	18.2	17.7	15.2	11.4	2.8	2.2	4.3	4.6	1.5	1.7	42.0	37.6
NIEs	15.1	14.5	15.0	10.8	2.4	1.6	4.5	5.0	1.6	1.8	38.6	33.7
Second-generation NIEs	23.5	19.7	16.2	13.0	3.2	3.8	3.3	3.8	2.0	2.2	48.2	42.5

Note: According to the ISIC classifications ,
3.1: Food, beverages, tobacco.
3.2: Textiles, clothing, leather, footwear.
3.3: Wood products, furniture.
3.4: Paper and products, printing.
3.5.5: Rubber products.
3.1-3.4,3.5.5: All agro-industry.
NIEs: Argentina, Brazil, Mexico, former Yugoslavia, Hong Kong, India, the Republic of Korea, Singapore and Taiwan Province of China.
Second-generation NIEs: Morocco, Tunisia, Chile, Turkey, Indonesia, Malaysia, the Philippines and Thailand.
Source: UNIDO. 1997. International Yearbook of Industrial Statistics 1997. Vienna.

[2] At constant 1990 prices

[3] 1993 for developing countries.

Table 2: Share of Agribusiness in National GDP, Selected Countries

Country	Agribusiness'share of GDP*
United States	13
Brazil	30
Argentina	29
Mexico	27
Indonesia	33
Thailand	43
Chile	34
SSA	21

Note:* Combines the value added for agro-related industries and that of agricultural trade and distribution services. Based on WB, FAO, and UNIDO databases. Source: Africa Region Working Paper Series No. 44 February 2003

Table 3: Share of agroprocessing employees* in total employees in manufacturing, 1992

Countries	Agroprocessing employees out of total employees in manufacturing
Developed	Percentage
United States	9.1
Finland	13.0
Germany	7.2
Canada	13.6
Sweden	9.8
Transition	
Bulgaria	11.7
Croatia	15.3
Kyrgyzstan	12.5
Russian Federation	11.2
Lithuania	18.7
Hungary	20.1

Table3: (continued)

Countries	Agroprocessing employees out of total employees in manufacturing
Developing	Percentage
Africa	
Cameroon	35.9
Kenya	32.4
Botswana	26.1
Senegal	59.3
Zimbabwe	17.7
Asia and the Pacific	
India	22.8
Indonesia	20.2
Korea, Rep.	7.2
Malaysia	8.4
Philippines	20.9
Sri Lanka	20.5
Latin America and the Caribbean	
Argentina	27.6
Brazil	33.0
Colombia	22.1
Ecuador	36.1
Mexico	20.9
Peru	23.5

Source: UNIDO. 1997. Handbook of Industrial Statistics 1997. Vienna.

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