

**The Rapid Expansion of the Modern Retail Food Marketing in
Emerging Market Economies: Implications to Foreign Trade and
Structural Change in Agriculture**

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The Rapid Expansion of the Modern Retail Food Marketing in Emerging Market Economies: Implications to Foreign Trade and Structural Change in Agriculture

by

Terry Roe, Mathew Shane and Agapi Somwaru¹

1. Introduction

Supermarkets are commanding a rapidly growing share of the retail food market in many developing countries. These large self-service stores include Wal-Mart, Carrefour, and Ahold and reflect foreign direct investment in physical and organizational capital². Reardon et al (2003) reported that the earliest adopters of supermarkets were in Latin America. This was followed by adoption in Asia and then Africa. The evolving process of supermarket expansion roughly reflected income level and the degree of urbanization. Infrastructure and policies that favor supermarket growth were also factor affecting the emergence of supermarkets in developing countries. The first wave began in the major cities in the larger and wealthier countries of Latin America. In the six Latin American countries of Argentina, Brazil, Chile, Colombia, Costa Rica, and Mexico, Reardon and Berdegue (2002) report that the retail market share commanded by supermarkets has grown from a population-weighted average of 10-20% in 1990 to an average of 50-60% of food retail sales in 2000. By 2001, supermarkets accounted for 57% of Argentina's share of total food retail sales. The corresponding shares for Brazil, Chile, Colombia, Costa Rica, and Mexico are 75%, 50%, 38%, 50%, and 45%, respectively (Reardon and Berdegue, table 1, p. 374). In their overview of supermarket expansion in Africa, Weatherspoon and Reardon (2003) find expansion to be the most rapid in South Africa, followed by Kenya, Nigeria, and the beginnings of expansion in other East African countries.

The rapid adjustment in the food marketing chain associated with the growth of supermarkets has raised concern about the plight of the smaller traditional farmers that cannot meet the more demanding market channel standards. In the case of Mexico, Chavez (2002) notes that as the supermarket structure expanded to the central and northern regions of the country, greater demands for quality, uniformity, and continuity of product supply were placed on suppliers of primary agricultural commodities over time. Berdegue (2001) finds that small-scale farms in Chile, which typically employ more traditional farming technologies, also had difficulty meeting these product standards, (quality, uniformity, on time delivery) of the growing supermarket sector, particularly for perishable foods such as fruits, vegetables, meats, and dairy products.

Morocco is an interesting case since it appears to be at the beginning of supermarket development cycle. Commercial fruit and vegetable producers in the region of Agadir in South

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²The term supermarket is used to mean all large-format modern retail stores including large discount stores and hypermarkets.

Western Morocco employ modern facilities to sort, grade, and attractively package produce for export to Europe and North America with package codes identifying specific producers so that any deviation from product quality can be directly traced to a supplier. These producers also supply the supermarket chain Marjane, of which the foreign company Auchan holds 49% of its equity. In contrast, the small-scale producers employ traditional farming methods and means of transport (often animal traction). They typically supply the local, more traditional retail outlets. These producers tend not to have incentives to supply produce with the product form, time, and spatial attributes that allow them to compete with the larger commercial producers in channels servicing domestic supermarkets or foreign markets.

The many concerns expressed with the expansion of supermarkets and their possible harmful effects on the welfare of traditional farmers have received little analysis beyond description of the basic trends mentioned. Our purpose is to show that differences in the relative capital intensity of the modern marketing channels, in contrast to the traditional channels, can explain part of this expansion as the process of economy-wide economic growth that gives rise to capital deepening even when the food share of total expenditures declines. In this case, the lack of complete markets and policy distortions can further exacerbate the effects of supermarkets on the traditional marketing system and the small farmers that it supports.

The article proceeds by describing the conceptual framework of a Ramsey growth model that we fit to data on the Moroccan economy. Special emphasis is placed on capturing the key features of the vertical linkage of the modern supermarket-marketing channel-commercial farm in contrast to that of the traditional food outlet-marketing channel-traditional farm. The empirical results show how capital deepening in transition growth can encourage the expansion of the supermarket system without the need to appeal to economies of scale or imperfect competition, how this expansion can occur even though the share of total household expenditures on food is declining, and how this process tends to both pull and push labor out of the traditional food system. The article concludes by noting how economic policy and other market imperfections can affect this process.

2. The Modeled Economy

The key features captured by the model are (1) non-homothetic preferences to reflect the change which income growth has on relative household food expenditures from modern versus traditional retail outlets; (2) differences in the farm-gate to retail outlet technology among the modern and traditional sectors; (3) the importance of the rest of the economy in the process of growth both as a producer of capital goods and as a competitor for the employment of the economy-wide resources such as labor and capital; and (4) differences in market structure between the supermarket and traditional food retail outlets.

2.1 The Environment

An informal depiction of the modeled economy is shown in figure 1. The economy is competitive and endowed with labor L , land T_i in commercial, $i = m$, and traditional, $i = t$, farms, and an initial stock of capital $K(0)$ and labor $L(0)$. These resources are used to produce three final goods, food from modern retail establishments, food from traditional establishments, and a rest of the economy good which also includes a capital good. Two intermediate goods are also produced, one each from modern agriculture and another from traditional agriculture. Only two sectors are open to world markets. These are the rest of the economy, and the wholesale market for food imports and exports servicing the modern retail sector and the outputs from the

modern farm sector. Thus, food at the retail level are home goods. The vertical market chain is "segmented" so that only modern farms supply the modern retail outlets, and only traditional farms supply the traditional outlets. Exogenous technological change is presumed to augment the stock of labor at the rate x , the stock of land at rate γ , and the labor force grows at rate n .

At each instant of time, households purchase three categories of goods for consumption C_j , $j = s$ (food purchased from supermarkets), $j = h$ (food purchased in traditional retail markets), and $j = a$ rest of economy goods, at competitive prices p_j out of income earned from providing labor services L in exchange for wages w , interest income at rate r on capital assets K , and rents π_i , $i = m, t$ from agriculture's sector specific resource, land T_i , less savings \dot{K} . In this setup, there is no market for the modern and traditional farmers to supply the others' retail outlet, traditional farmers do not have access to world markets, and there is not a market for land linking the modern and traditional farmers. The implications of these assumptions are discussed below.

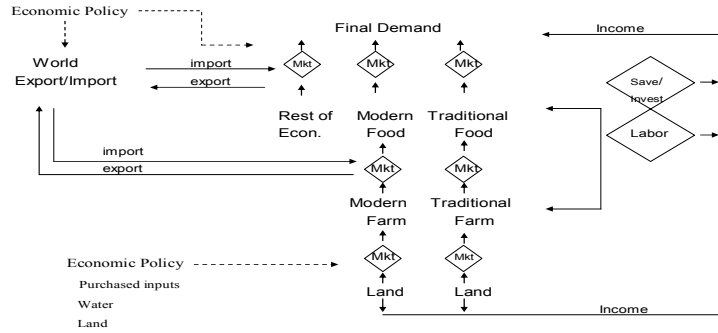


Figure 1: Basic structure of the modeled economy

2.1.1 Firms

The cost function of profit maximizing firms producing the rest of the economy good is

$$c^o(\hat{w}, r) \hat{y}_o \equiv \underset{(l_o, \hat{k}_o)}{\text{Min}} : \{l_o(\hat{w} + r\hat{k}_o) | \hat{y}_o \leq l_o f^o(\hat{k}_o)\}$$

where l_o is the share of the economy's labor employed in the production of output \hat{y}_o , expressed in effective labor units, \hat{k}_o is the capital to effective labor ratio, $f^o(\cdot)$ denotes the technology. The cost function of retail food firms including the market channel costs back to the farm gate is:

$$c^j(w, r, p_i) y_j = \underset{(l, \hat{k}_j)}{\text{Min}} : \{l_j(w + r\hat{k}_j + p_i y_{ij}) | \hat{y}_j \leq l_j f^j(\hat{k}_j, y_{ij})\}, j = s, h; i = m, t$$

where p_i is the price of the intermediate agricultural input \hat{y}_{ij} supplied by the $i = m, t$ farm category to the respective $j = s, h$ category of retail food outlet. The price p_m is also the world price since the intermediate input \hat{y}_m can be supplied from either domestic commercial farms or from the world market. The price p_t is the "home" good price of the agricultural good \hat{y}_t supplied by traditional farms. The "" notation denotes that variables are measured in units of effective labor.

The value added function of all profit maximizing commercial and tradition firms in primary agriculture can be expressed as

$$\hat{\pi}_i = \pi^i(p_i, \hat{w}, r) \hat{T}_i \equiv \text{Max}_{\{l_i, \hat{k}_i\}} : l_i \{p_i f^i(\hat{k}_i, \hat{T}_i) - \hat{w} - r \hat{k}_i\} \quad i = m, t$$

where $\hat{T}_i = e^{\gamma} T_i / e^{x t} L$ and exogenous technological change is presumed to augment land and labor at rates γ and x , respectively. The land rental rate, $\pi^i(p_i, \hat{w}, r)$, is the rate per effective unit of land per effective worker required for the land rental market among farmers to clear within each farm category i . The gradients of $\pi^i(p_i, \hat{w}, r) \hat{T}_i$ yield agricultural supply, and labor and capital demand per effective unit of land per effective worker.

2.1.2 Households

Households are represented by the typical infinitely-lived Ramsey household that receives utility from the sequence $\{\hat{c}_s, \hat{c}_h, \hat{c}_o\}_{t=0}^{t=\infty}$ expressed as a weighted sum of all future flows of utility

$$\int_{t=0}^{t=\infty} \frac{u(\hat{c}_s, \hat{c}_h, \hat{c}_o)^{1-\theta} - 1}{1-\theta} e^{(n-\rho)t} dt$$

where goods, $\hat{c}_j = C_j / e^{x t} L(t)$, are expressed in units per effective worker. The number of members are assumed to be proportional to the number of workers, to grow according to,

$$L(t) = e^{n t} L(0)$$

and to discount future consumption at the rate $\rho > 0$. The elasticity of inter temporal substitution is given by $1/\theta$, where, for the analysis here, we presume $\theta \cong 1$. The felicity function $u(\hat{c}_s, \hat{c}_h, \hat{c}_o)$ is presumed to be of the Stone-Geary form.

Household's flow budget constraint expresses savings \dot{K} at an instant in time as the difference between income from labor wL , assets, rK including land $\pi_i T_i$ and expenditure E on goods. Since the ownership of assets is restricted to local residents, the stock of capital assets equals the country's stock of capital K . In terms of effective units, the constraint is

$$\dot{k} = \hat{w} + \hat{k}(r - x - n) + \pi^m(p_m, \hat{w}, r) \hat{T}_m + \pi^t(p_t, \hat{w}, r) \hat{T}_t - \hat{E} \quad (1)$$

where total expenditure on final goods is given by:

$$\hat{E} = \mu(p_s, p_h, p_o) \hat{\mathbf{c}} \equiv \underset{\{\hat{c}_j \geq 0\}}{\text{Min}} \left\{ \sum_j p_j \hat{c}_j \mid \hat{\mathbf{c}} \leq u(\hat{c}_s, \hat{c}_h, \hat{c}_o) \right\}$$

The implied no-arbitrage condition between capital and land for each farm category must hold at each instant in time. This condition is

$$r = \frac{\pi_i}{P_{L_i}} + \frac{\dot{P}_{L_i}}{P_{L_i}}, \quad i = m, t$$

where P_{L_i} is the price of land. The first order conditions obtained from the present-value Hamiltonian yield the following Euler equation

$$\frac{\dot{\hat{E}}}{\hat{E}} = (r - x - \rho) \quad (2)$$

The transversality condition (TVC)

$$\lim_{t \rightarrow \infty} [v(t)_i \hat{k}_i(t)] = 0 \quad (3)$$

places a limit on borrowing (i.e., it prevents a Ponzi game).

2.2 Characterization of equilibrium

At each instant of time, firms must earn zero profits,

$$\begin{aligned} c^o(\hat{w}, r) &= 1; \\ c^h(\hat{w}, r, p_t) - p_h &= 0 \\ c^s(\hat{w}, r, p_m) - p_s &= 0; \end{aligned}$$

labor demand of all five categories of firms must cause the labor market to clear at a non-negative \hat{w}

$$c_w^s(\hat{w}, r, p_m) y_s + c_w^h(\hat{w}, r, p_t) y_h + c_w^o(\hat{w}, r) y_o - \pi_w^m(p_m, \hat{w}, r) \hat{T}_m - \pi_w^t(p_t, \hat{w}, r) \hat{T}_t = 1$$

the demand for capital services must clear at a non-negative rate r

$$c_r^s(\hat{w}, r, p_m) y_s + c_r^h(\hat{w}, r, p_t) y_h + c_r^o(\hat{w}, r) y_o - \pi_r^m(p_m, \hat{w}, r) \hat{T}_m - \pi_r^t(p_t, \hat{w}, r) \hat{T}_t = \hat{k}$$

and the supply of the agricultural good produced on traditional farms must equal intermediate demand

$$\pi_{p_t}^t(p_m, w, r) \hat{T}_m - \pi_r^t(p_t, w, r) \hat{T}_t = \hat{k}$$

where, for example $c_w^s(\hat{w}, r, p_m)$ denotes the partial derivative $\partial c^w(\hat{w}, r, p_m) / \partial w$.

Supermarket and traditional retail food markets must also clear at non-negative prices p_s and p_h
 $\partial \hat{E} / \partial p_s = \hat{y}_s$; $\partial \hat{E} / \partial p_h = \hat{y}_h$

This is a system of eight equations in ten unknowns $\Omega = (\hat{w}, r, p_s, p_h, p_t, \hat{y}_s, \hat{y}_h, \hat{y}_o, \hat{E}, \hat{k})$
 The "inter-temporal" conditions are the Euler equation, (2), the budget, (1) and the TVC constraint (3). This system permits the derivation of the three autonomous differential equations

$$\dot{p}_s = P^s(p_s, p_h, \hat{k}) ; \quad \dot{p}_h = P^h(p_s, p_h, \hat{k}) ; \quad \dot{\hat{k}} = K(p_s, p_h, \hat{k})$$

Given initial conditions, we use the time elimination method to solve this system as a function of time which, in turn, permits the solution $\Omega_{t=0}^{t=\infty}$ from which all remaining endogenous variables can be calculated.

2.3 Calibration

We presume that all technologies are Cobb-Douglas, and calibrate this system to early 1990s data drawn from the social accounting matrix used by Diao and Roe for the case of Morocco. Key parameter estimates are shown in table 1.

Table 1: Key features of the modeled economy

| | Production Elasticities | | | | |
|---------------------------|-------------------------|------------------------|-------------------------|-----------------------------------|--|
| | Rest of the Economy | Commercial Agriculture | Traditional Agriculture | Supermarket and Marketing Channel | Traditional Market and Marketing Channel |
| Labor | 0.645 | 0.4 | 0.47 | 0.15 | 0.61 |
| Capital | 0.355 | 0.48 | 0.4 | 0.65 | 0.13 |
| Land | | 0.12 | 0.13 | | |
| Intermediate Inputs | | | | 0.2 | 0.26 |
| Household Characteristics | | | | | |
| | Expenditure Shares | | | | |
| | Observed | Estimated Long-run | | | |
| Non-ag Goods | 0.664 | 0.89 | | | |
| Supermarket | 0.073 | 0.1 | | | |
| Traditional Retail | 0.263 | 0.01 | | | |
| Savings Rate Base period | | | 0.227 | | |
| Time Discount | | | 0.042 | | |

Source: Diao and Roe

The major features of the economy affecting the results are the relative capital intensity of the supermarket and its accompanying marketing channel relative to the traditional channel (table 1).

Commercial agriculture is slightly more capital intensive than is traditional agriculture while the rest of the economy is relatively labor intensive by comparison. Since capital goods are produced and imported by the economy, those sectors that are relatively capital intensive can experience a decline in unit costs as capital accumulates and rates of return to capital fall, $\dot{r}/r < 0$. As capital accumulates the productivity of labor rises, thus causing nominal wages to rise, $\dot{w}/w > 0$. Change in the economy's capital stock will have Rybczynski like effects on output supply. Sectors that depend relatively more on labor, all else constant, will tend not to experience the equivalent decline in their unit costs. Food purchased in supermarkets is not a perfect substitute for food purchased in traditional markets. As incomes grow, the total share of income spent on food will decline, but the share spent in traditional markets will decline more rapidly than the share spent in supermarkets.

This evolution of the economy will cause the price of retail food to change. Of particular importance will be the price transmission from the traditional retail outlets back to traditional farms. The price received by commercial farmers is determined by the world price, so they are "protected" from the vagaries of the domestic market. Traditional farmers are dependent on the domestic market.

3. Results

At the end of the 30-th period, the economy's stock of capital almost doubles, causing GDP per capita to increase by about 30% (figure 4), while the savings rate falls from 23% of disposable income (table 1) to about 8.8%. Capital deepening causes the share of GDP traded to almost double over the period (figure 4), thus permitting the economy to increase its imports of capital goods. The share of total expenditures on food falls from about 34% (table 1) to 26%, while the share spent on the rest of the economy goods rises from 66% in the base period to about 74% in the 30-th period³. However, of the expenditures on food only, the share spent at supermarket outlets increase from 22% to 37% while the share spent at traditional outlets declines from 78 to 63%.

The evolution of prices received by farmers and prices paid in food retail outlets, all relative to the base period, are shown in figure 2. As capital deepening occurs and real income per capita rise, the price of food in supermarkets falls, while the price received by commercial farmers that supply some or all of the primary agricultural goods to these markets remains at the world market price. Commercial farmers are thus not caught in a cost-price squeeze. For reasons discussed below, the price paid in traditional food retail outlets rises relative to its base level, while the price received by traditional farmers decline. The percent increase in the traditional food retail price is slightly larger than the percent decline in the traditional farm level price.

The economic forces causing prices to evolve in this manner are both supply and demand side factors. Since the supermarket and its accompanying channels are capital intensive relative to traditional outlets, capital deepening is more extensive than in the latter, as shown in figure 3. The supermarket outlets thus experience Rybczynski-like output increasing effects relative to traditional outlets. As capital accumulates and the cost of capital falls and labor payments rise (figure 3), the effect is to cause the unit costs of supermarkets to fall relative to traditional markets. This decline in supermarket unit cost is shown by the decline in the supermarket price, figure 2.

³The share of expenditures on supermarket and traditional retail outlets could reach the limit of 10 percent and 1 percent, respectively (table 1), depending upon the economy's level of long-run growth in real income per worker.

Since the traditional outlet - marketing channel system is labor intensive, rising wages induced by capital deepening causes upward pressures on unit cost. The rise in wages is due to capital deepening in the entire economy which cause the traditional retail outlet price to increase. This increase occurs because the negative Rybczynski like effects on supply cause the growth in supply, at constant output prices, to be less than the growth of the positive income effects on demand. For the market to clear, the price of food in traditional outlets must rise.

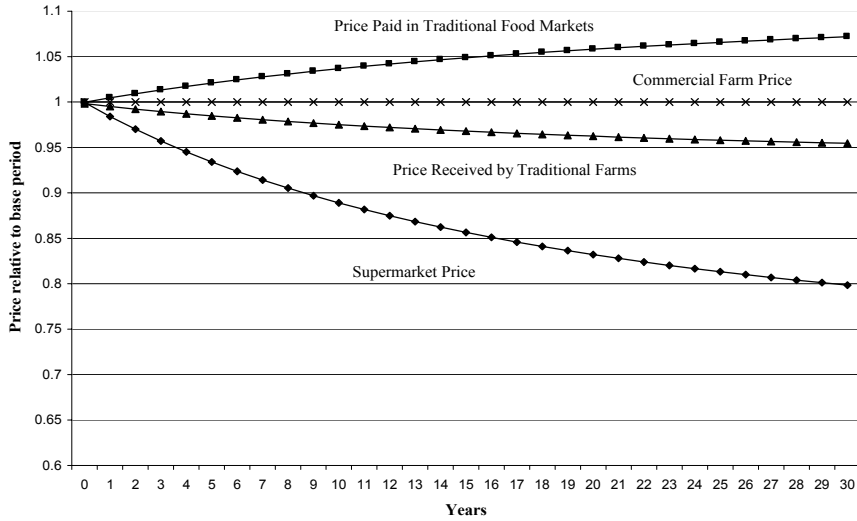


Figure 2. Evolution of farm and retail food prices in modern and traditional markets relative to the base period

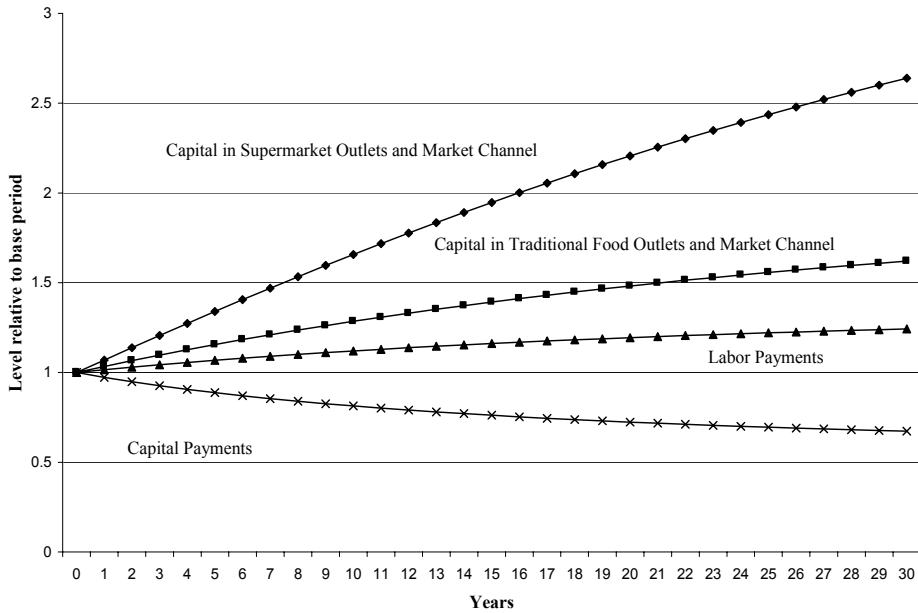


Figure 3. Evolution of capital in retail food and factor rental rates

This rise in the cost of the traditional outlets is lessened by the transmission of costs "back to" traditional farmers in terms of a decline in the price received by the traditional farms. Since these farms do not have access to world markets for their produce, their prices are not supported by the world market as is the case for the commercial farm sector. As can be shown from the zero profit conditions, the price received by traditional farmers is affected positively by the price of retail food, p_h , and p_s , and negatively by the world price p_m . Since capital accumulation in supermarkets causes an increase in output in excess of the increase in demand, the resulting effect of the decline in the price of supermarket food p_s on the traditional farm price p_t dominates the upward pressures on p_t from the increase in food price p_h at traditional outlets.

Thus, the evolution of this economy causes traditional farmers to be both "pulled" and "pushed" out of farming. They are "pulled" out by the rise in wage payments (figure 3) due to the increased productivity of labor from capital deepening in the economy, and they are "pushed" out by the decline in the farm level price. The labor employed in the traditional farm - food retail outlet system decreased by about 12%, while the labor employed in the supermarket and market channel system increased by about 44%.

Nevertheless, farm profits (value added to agriculture's sector specific resources such as land) increased for both the commercial and traditional farms (figure 4). Since commercial farms are somewhat more capital intensive than are traditional farms (table 1), the effect of capital deepening on commercial profits is much larger than for traditional farms. The largest negative effect on traditional farm profits is the decline in output price, as shown in figure 2.

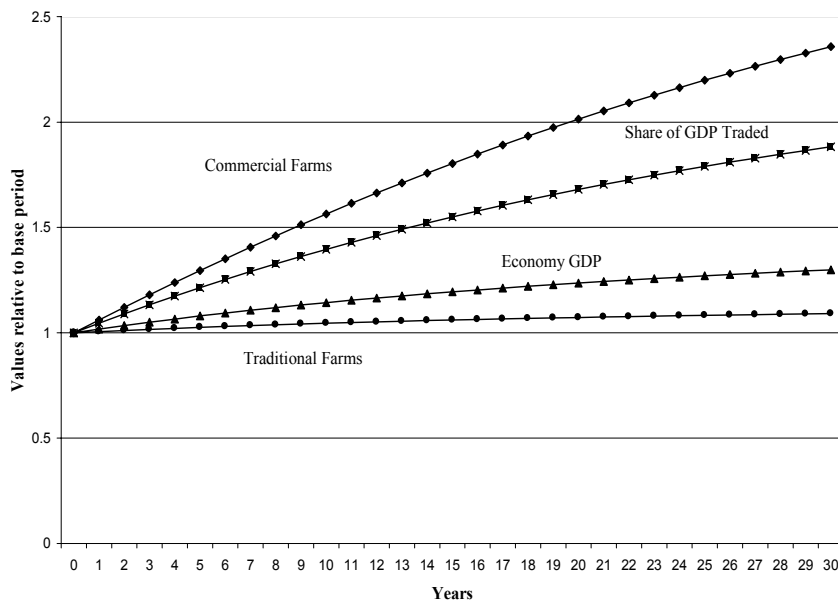


Figure 4. Evolution of value added and share of GDP traded, relative to base period

4. Concluding remarks

This paper shows that differences in the relative capital intensity of the modern marketing channels in contrast to the traditional channels explain the plight faced by traditional farmers. The rest of the economy also plays an important role because growth there raises the price of economy-wide resources, other than capital, for which agriculture must compete. Since the traditional food production - marketing - retail outlets are relatively labor intensive, and since traditional farms tend not to have access to world markets to the extent of commercial farmers, capital deepening leads to an expansion of the commercial food production - marketing - supermarket outlet while the traditional system experiences a departure of labor, and little growth in an expanding economy. This departure of labor is important because it contributes to the growth of the other sectors.

In the modeled economy, the no-arbitrage condition (3) together with a higher land rental rate for modern relative to traditional farms implies the price of land P_{L_m} farmed by commercial farmers is higher than the value of land P_{L_t} farmed by traditional farmers. A land market would cause at least some land, but not all land, in traditional farms to be either farmed or purchased by commercial farmers. The economy's GDP would increase, and more labor would depart traditional farms. Since foreign direct investment is not permitted in the modeled economy, the growth in the modeled economy's capital stock is due to the willingness of domestic households to forego consumption. Opening the economy to foreign investment when the rest of the world is in long-run equilibrium, would cause the modeled economy to instantly adjust to its long-run equilibrium, thus forcing a more rapid adjustment in the traditional food sector. In a real economy, the adjustment would not be instantaneous, but likely more rapid than suggested by the economy modeled here. All of these issues are worthy of future investigation.

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