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Structural Changes in the Sri Lankan Tea Industry:

Family Farms vs. Plantations

Deepananda HERATH

Alfons WEERSINK

Contributed
paper prepared for presentation at the
International Association of Agricultural Economists Conference,
Gold Coast, Australia, August 12-18, 2006

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INTRODUCTION

The shift from large, vertically integrated plantations to small farms growing the crop and selling it to independent processors is a striking evolution of the organizational arrangements for many tropical export crops, such as tea and coffee in Kenya, rubber in India and sugarcane in Guyana (Lele and Agarwal, 1989; Tharian et al 1988; Thomas, 1979). This disintegration also occurred in the Sri Lankan tea sector. Vertically integrated plantations dominated the growing of green leaf tea and its production into black tea until the 1970s in Sri Lanka, which is the world's largest black tea exporter. However, independent black tea processors who outsource their green leaf tea mainly from small-scale farms have tripled their production in the last two decades while total output from processors who grow their own green leaf has fallen and number of these vertically integrated black tea processors dropped sharply (Report of the Presidential Commission on the tea industry and trade, 1995). The purpose of this paper is to determine the reasons for the structural shifts in the Sri Lankan tea sector.

Different organizational arrangements such as plantations and family farms enjoy different degrees of competencies in mitigating coordination frictions, management shortfalls, and agency problems such as shirking. Commodities that pose inherent problems of quality control together with economies of scale in production and/or processing are more suited to vertically integrated systems or contract-based systems while crops with less demanding technical characteristics and lower investment requirements are more likely to have decentralized, small scale trading and processing

operations (Hayami, 2002; Hayami, 1996; Binswanger and Rosenweig, 1986). A plantation production system may also be inefficient due to its centralized management and the associated high cost of labor supervision and shirking (Roumasset, 2004; De Silva, 1982; Etherington, 1971). However, it is unlikely that a given organizational arrangement would become predominant solely on the basis of the superiority in one of these competencies. Since all the organizational arrangements have different degrees of each competency, relative rather than absolute differences of these competencies among organizational arrangements are vital to understanding their comparative advantage. The relative importance of each of these competencies is likely to be decided by the socio-economic, political, and technological milieu of the period under investigation.

We argue, following Demsetz (1988), that the relative changes in management costs (cost of organizing production within the firm), transaction costs (cost of organizing production through the market) and production costs (technologically determined firm specific costs) taken together determine the most efficient organizational arrangement. This study develops a conceptual framework to consider changes in all of these potential costs associated with the changes in vertical coordination arrangements in the Sri Lankan tea industry. We empirically test the validity of these theoretical arguments on the make versus buy decision using 40 years data from 1960 to 2000 from Sri Lankan tea sector. We find that transaction costs of market exchange have been reduced through government intervention while production costs for large plantations have increased resulting in the movement away from plantations.

CONCEPTUAL FRAMEWORK

Transaction costs

Higher transaction costs in the green leaf market for family farms and lower transaction costs for vertically integrated operations from 1960 to 1980 conferred a comparative advantage to the plantation mode of production. A major impediment to an efficient market functioning was the threat of hold-up faced by independent growers of green leaf tea when selling their perishable crop to black tea processors with spatially-oriented monopsony (Ramachandran, 1963; Forrest, 1967; De Silva, 1982; Fernando, 1982). Finding alternative green leaf buyers was difficult due to poor transportation infrastructure.

The existence of a hold up problem hinges on the costs of switching or diverting the investment in green leaf production to alternative uses. The cost of establishing green leaf tea fields is the largest among the perennial crops, yet the revenue from tea is comparable to other perennial crops in Sri Lanka. Tea takes approximately seven years from its initial field establishment to reach a harvestable age, which is the second longest waiting period among perennial alternatives for Sri Lankan farmers. The nature of the farmer's investment, production related sunk costs and large switching cost are the reasons for green leaf producers preference for contractual arrangements to a spot market (Grosh, 1994).

Spontaneous *ex ante* contractual agreement on green leaf price is also highly unlikely because this leaves the processor bearing the whole risk of black tea price fluctuation in the Colombo black tea auctions (the tea processor is a price taker and black tea prices are determined at the Colombo tea auction). To overcome this difficulty, contracts could be written based on the realized price at the tea auction if parties could

agree on green leaf to black tea conversion efficiency. The conversion efficiency is influenced by factors under the control of green leaf supplier such as the quality of the green leaf (moisture content, maturity of the leaves etc.,) and factors under the control of processor such as efficiency of the black tea manufacturing process. Thus, both the producer and processor have the ability to influence the conversion efficiency to their favor by their actions (i.e. adding moisture to the leaves or withholding information on the production process), which increases the cost of negotiating a spot price.

The existence of relationship-specific investment and the large transactional frictions associated with bargaining and reaching an agreement on price in an unregulated green leaf tea market favored vertically integrated plantations as the coordination mechanism. However, these transactional frictions were somewhat alleviated by the first green leaf tea pricing formula implemented in 1968¹ which stipulated the green leaf to black tea conversion factor along with processing costs and profit share for the black tea processor. This formula ensured profits to processors but did not necessarily ensure profits for green leaf tea producers. It was modified in 1978 to include a guaranteed minimum price but inflation in Sri Lanka since 1978 negated the effectiveness of the minimum price as the consumer price index almost tripled from 1975 to 1984. Hence, minimum prices were proportionately increased with the inflation level. Finally, in 1984, the guaranteed minimum price was eliminated and replaced by the “Reasonable Pricing Formula” which split the black tea price with 25% going to the processor and 75% to the green leaf supplier. In 1985, the shares changed to 30% and 70% and in 1987 to 32% and 68%. This formula price for green leaf tea remains still in effect. We argue that the

¹ Price of green leaf= {black tea price –(cost of processing +processor’s profit)}/4.5. (units are of Rupees per kg). The denominator of 4.5 is the weight of green leaf required to make a unit weight of black tea.

green leaf market intervention through various pricing arrangements lowered transactional frictions and reduced potential hold up threats. The comparative disadvantage of higher transaction costs for family farms has been substantially reduced with the de-facto contractual arrangements devised through the pricing formulas.

Production costs

Differences in cost of green leaf production between plantations and independent, family farms affects the internal transfer price by vertically integrated processors or the purchase price for independent processors respectively, and consequently the relative advantage of either organizational structure. Size economies are not present in the production of green leaf tea, which remains a labor-intensive activity. Over 70% of the cost of green leaf production is labor related and both vertically integrated plantations and small farms continue to use the same labor intensive production technology to grow and harvest green leaf tea (Fernando, 1981; Roberts, 1989; Mendis, 1992). Thus, relative wage rates are the major factor affecting the difference in cost of green leaf production.

Wage rates for south Indian laborers, who have been the predominance labor force in the plantation sector since its establishment, had been abysmally low up until the 1980s (Dawood, 1980; Rote, 1986). Thus, plantations were able to exploit low wage labor and had lower production costs than family farms. Wage rates have increased in the vertically integrated sector due to a unionized labor force relative to the opportunity cost of labor for the independent growers who tend to rely on family workers. Thus, the comparative advantage in production costs between plantations and independent family

farms has changed over time due to the substantial wage increases realized by the plantation labor force.

Management costs

Management costs are the costs of organizing resources within the firm and are often higher within vertically integrated units due to the presence of agency and influence costs and the reduction of competitive pressures. Bringing what was formerly a market transaction in-house increases the size of an organization. As firms get bigger, with additional hierarchical levels and greater distances between superiors and subordinates, agency costs likely increase. Markets also promote high-powered incentives and restrain bureaucratic distortions more effectively than internal organizations.

The relative difference in management costs between the vertically integrated and independent systems in the Sri Lankan tea industry substantially changed with the nationalization of plantations in the mid 1970s. Through nationalization and land reform policies in 1972 and 1975, the state acquired 377,000 acres of privately owned tea lands that represented about 63% of the country's total tea area. The acquired lands were larger than 50 acres in size and so were mostly vertically integrated operations. About 96% of these state-owned tea lands were assigned to two state corporations for management: State Plantation Corporation and Peoples Estate Development Board. The two state corporations, which were devoid of any market incentives in any of its operations, ended up in a bureaucratic gridlock and by 1992, management of these two entities were transferred to private management companies.

Between 1978 and 1992, black tea production in these two corporations declined by 19% and there were five years with negative profit margins. The average cost of producing black tea for privately-owned, large tea farms for the five-year period before state ownership (1972-76) was 3.00 (1952 constant Rs/kg) and this doubled to 5.86 in the last five year period (1986-91) under the state ownership. While the management costs of vertically integrated sector seems to have increased under the state ownership and management, there were no specific changes which took place in the vertically independent small holders or black tea processors that led to an increase in their relative management costs. All else equal, an increase in management costs of vertically integrated production system during the period of state ownership relative to the management cost of vertically independent sector would lead to an increase in the competitiveness of independent units.

EMPIRICAL AND ECONOMETRIC MODEL

The dependent variable capturing the changes in organizational arrangements within the Sri Lankan tea industry is proxied by the ratio of black tea produced from market-procured green leaf (vertically independent production) to total black tea production. An increase in the ratio implies a shift towards the “buy” decision relative to the “make” decision in the black tea production (Table 1).

Changes in the transaction costs are captured by two dummy variables. During the period from 1960 to 1968, there was no intervention in the green leaf market. The first dummy variable is *Price Inter I*, which is set equal to one for the period of 1969 to 1984 and equal to zero otherwise. From 1969 to 1978, there was a pricing formula for

black tea but it did not guarantee a minimum price for the growers. A minimum price was set in 1978 but it did not account for inflationary pressures. The Reasonable Price Formula was put into effect in 1984 and it specified a sharing rule of the auction prices for black tea between the growers and the processors. The second dummy variable, *Price Inter II*, is equal to one for the period 1985 to 2000 and zero otherwise. The intervention by the government into the pricing of tea is expected to decrease the hold up threats and increase the amount of black tea processed with purchased green leaf thus independent sector share of black tea production.

Changes in relative production costs between vertically independent and integrated sectors are captured by opportunity costs of labor. Labor costs for the vertically integrated sector is taken as the plantation sector daily (real) wage rate while that of vertically independent sector is assumed to be the industrial sector daily (real) wage rate. The ratio between industrial sector wages and plantation sector wages (*Wages*) represents the relative cost of production for the make and buy processes. All else equal, as the cost of unionized labor increases relative to other wages the profitability of the plantation production system decreases relative to the vertically independent sector and the share of the total black tea production for that system falls.

Relative changes in management costs were assumed to be associated only with the vertically integrated operations. Overhead costs include salaries to the non-labor workforce (i.e. estate superintendents, clerks, store keepers), incentive payments to management (i.e. traveling allowances, furlough allowance, bonuses), infrastructure maintenance (i.e. repairs to roads, buildings and vehicle fleets), and other contingencies. These costs were about 25% of the total cost of production for vertically integrated units

during the period of 1960 to 1975 but recently the share of these costs has risen to 34%. The increase in the share of management costs for vertically integrated production due to agency problems from ownership changes was not present in the vertically independent sector. Therefore, we have used the percentage of overhead costs from the total costs of production of the vertically integrated plantations (*Mgmt Costs*) from 1960 to 2000 to capture the relative changes in management costs between organizational arrangements.

The three time series variables (fraction of black tea production from bought green leaf (*Buy*), ratio of plantation/industrial sector labor wages (*Wage*), and plantation sector percentage overhead costs (*Mgmt Costs*)) were tested for unit root with an Augmented Dickey Fuller test. All three variables are I(1) processes. In order to determine whether the time series variables are co-integrated, the residuals of the OLS regression of *Buy* on *Wage* and *Mgmt Costs* were tested for unit root with Augmented Dickey-Fuller test. The results indicated that the residuals are stationary (or I(0) process) implying the variables are associated in a long term equilibrium relationship.

RESULTS

The estimated model explains the variability in the changes of vertical coordination arrangements well. The adjusted R^2 is 0.94 and the F -value is significant at the 1% level. The signs of all estimated coefficients are consistent with theory and are statistically significant (Table 2). The average share of vertically independent production increased with government intervention into the green leaf tea pricing relative to the period without price intervention. In addition, the mean value for *Buy* was higher during the regime of the reasonable pricing formula (*PriceInterII*) relative to the period of

government-determined prices (*PriceInterI*). The reasonable pricing formula was expected to reduce the potential holdup problem faced by farmers of green leaf tea and thus increase the likelihood of their involvement in exchange with independent processors. The coefficient on the relative opportunity cost of labor for independent farms and vertically integrated plantations (*Wages*) is also consistent with expectations. Thus, increases in labour costs for plantations due to union pressures decreased the relative profitability of the make decision and thereby increased the production share of independent processors. Increases in management costs for the vertically integrated sector (*Mgmt Costs*) also lower the relative profitability of the make decision. It was argued that, all else equal, state ownership of vertically integrated plantations would increase management costs relative to the independent sector due to agency and influence costs. Thus, the relative profitability of the buy decision expands the share of independent production.

CONCLUSIONS

The Sri Lankan tea sector has changed from one dominated by vertically integrated plantations to one where independent processors of black tea purchase their input (green leaf tea) from small, independent growers. The shift can be explained by changes in transaction, production, and management costs that have altered the relative benefits of the make versus buy decision for green leaf tea. State intervention into the price for green leaf tea has significantly reduced the threat of hold up associated with the perishability of green leaf and the large, sunk investment costs to the farmer of establishing a tea garden. Not only have the returns to independent green leaf production

been raised and stabilized, the costs of growing have not increased relative to the production of green leaf on plantations. The technology for green leaf continues to be labor intensive regardless of the size of operation. Union pressures have forced wage rates up for workers on plantations relative to the expenses for the family labor used by most independent growers. The result is a shift in the profitability toward separated growing of green leaf and its processing into black leaf tea and away from vertically integrated plantations.

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Table 1. Empirical specifications of the vertical coordination changes in the Sri Lankan Tea Industry

| Variable | Description | Data source | Expected sign |
|---|--|---|---------------|
| Dependent variable (<i>Buy</i>) | Ratio of black tea production from vertically independent sector with bought green leaf to the total black tea production. (Annual values from 1960 to 2000) | Annual Reports of Sri Lanka Tea Commissioner's Department and Sri Lanka Ministry of Plantations Industries (various issues) | |
| Independent variables | | | |
| Changes in transaction costs (<i>Price Int I</i>) (<i>Price Int II</i>) | Two dummy variables for the three periods of green leaf market interventions 1960-1968: No intervention in green leaf market 1969-1978: Profit sharing without guaranteed minimum price 1979-1984: Profit sharing with guaranteed minimum price 1985-2000: Reasonable price formula with 4.5 conversion factor and 32% to the processor and 68% to the green leaf producer of the price received <i>Price Int I</i> (Dummy 1): Years 1969-1984 =1 otherwise zero <i>Price Int II</i> (Dummy 2): Years 1985-2000 =1 otherwise zero (base period is 1960-1968 when no interventions in green leaf market) | Presidential Report on Tea Industry and Trade, 1995 | +ve |
| Changes in production costs (<i>Wage</i>) | Ratio of opportunity cost of labor for plantation sector (real wage of plantation labor) to the opportunity cost of family labor (real wage of industrial labor). | Annual Reports of Central Bank of Sri Lanka | -ve |
| Changes in management costs (<i>Mgmt Costs</i>) | Percentage of overhead costs from the total costs of production in the vertically integrated operations. These costs are all monthly paid salaries to the non-labor workforce, incentive payments to management, and maintenance of infrastructure such as roads, buildings and vehicle fleets Communications, furlough allowance, bungalow maintenance etc., (Real Rs/kg of black tea, 1960- 2000) | Statistical Abstract of Sri Lanka Department of Census and Statistics (various Issues) | +ve |

All nominal values are converted to real values using Consumer Price Index (1952 base period)

Table 2. OLS Estimates of the Factors Affecting Vertical Coordination Changes

| Variable | Estimated Coefficient | T-Ratio | p-Value |
|---|-----------------------|---------|---------|
| Constant | 0.815 | 8.47 | 0.000 |
| <u>Transaction Costs</u> | | | |
| <i>Price Inter I</i> | 0.112 | 6.02 | 0.000 |
| <i>Price Inter II</i> | 0.194 | 6.20 | 0.000 |
| <u>Production Costs</u> | | | |
| <i>Wage</i> | -0.275 | -8.22 | 0.000 |
| <u>Management Costs</u> | | | |
| <i>Mgmt Costs</i> | 0.942 | 4.33 | 0.000 |
| Adj R^2 = 0.94, Model F value = 187.27*** | | | |