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Institutional Adjustment and Transaction Costs: Product and Inputs Markets in the Tanzanian Coffee System

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Summary. — Commodity market liberalization can improve incentives for production of export crops by reducing the total costs of transforming products through space, form and time, or by reducing the costs of arranging and completing transactions. While liberalization often leads to reduced costs in output exchange, it can remove opportunities for linked input–output transactions that sometimes lowered the costs of providing finance in state-controlled markets. Assessments of liberalization that focus on output exchange alone obscure the impact of rising transaction costs in finance. This study of liberalization in the Tanzanian coffee market documents declining costs in output marketing, rising transaction costs for financing farm activities, and differential, but generally positive, net impacts on growers. © 2002 Elsevier Science Ltd. All rights reserved.

Key words — Africa, Tanzania, agricultural markets, institutions, liberalization, transaction costs

1. INTRODUCTION

By the late 1980s, most observers agreed that agricultural development in Africa was suffering due to policy interventions that had failed to "get the prices right." While this diagnosis was based on neoclassical analysis, the prescriptions were institutional. Starting in the early 1990s, countries adopted economic policy reforms aimed at correcting price distortions by changing the institutional framework in which transactions were completed (Meerman, 1997). Liberalization programs to replace state-controlled trading systems with competitive commodity markets were expected to result in lower marketing margins, higher producer prices, and increased productivity.

Marketing margins may be high because poor physical infrastructure or mismanagement result in high costs to transforming products through space, form and time, or because poor institutional infrastructure implies high costs to gathering information and negotiating, monitoring or enforcing contracts. These latter costs are often referred to as transaction costs (Bardhan, 1989; Sadoulet & de Janvry, 1995; Williamson, 1985) while the former can be termed transformation costs (Wallis & North, 1986). [1] Liberalization can bring a decline in the transformation costs of marketing if a competitive environment stimulates improved management or increased investment. For transaction costs to fall, organizations must establish contracts that reduce the costs of making exchanges in the new institutional setting. The costs of storage, transportation and processing are more

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readily quantified than the transaction costs, but Minten and Kyle (2000) demonstrate that search and negotiating costs can dominate the transformation expenses in agricultural markets. Recent work by Fafchamps and Minten (2001) suggests the importance of networks and institutions in reducing these costs.

Market liberalization and the emergence of competitive trade could simultaneously reduce transformation costs and increase transaction costs if, for example, competition led to lower assembly and transportation expenses, but higher costs of negotiating and enforcing contracts. Moreover, because there are often many transactions in a commodity system, institutional changes that reduce the margins in one exchange may lead to higher transaction costs in related contracts and have an ambiguous impact on the system as a whole. Replacing a controlled system of interlinked credit, inputs and output exchange with distinct, competitive transactions could result in greater efficiency in output marketing, but higher transaction costs to financing the production. The need for policy reforms to generate lower transactions and transformation costs throughout the marketing chain is now recognized (Jayne & Jones, 1997; Poulton, Dorward, & Kydd, 1998; World Bank, 2000a), but empirical assessments of liberalization tend to focus on its impact on output marketing margins, output prices, or the structure of output markets (Badiene & Shively, 1998; Barrett, 1997; Jayne & Jones, 1997; Meerman, 1997; World Bank, 1994, 2000a). Less attention is given to costs in the inputs and financial markets, if they are assessed at all (Kherallah, Delgado, Gabre-Madhin, Minot, & Johnson, 2000; World Bank, 2000b). This paper provides a more complete view of the impact of liberalization on incentives by considering the costs of each exchange that farmers make when they engage in commercial production.

Focusing on transaction costs, this paper examines developments in the Tanzanian coffee system since the market was liberalized in 1994. According to the New Institutional Economics, changes in an institutional framework should stimulate changes in contracts to minimize costs (Bardhan, 1989; Hubbard, 1997; North, 1990). After liberalization in Tanzania, organizations did develop new contracts to lower transaction costs in the new institutional environment. Moreover, the initial change in institutions stimulated further endogenous institutional innovations as private and public sector participants sought rules and guidelines to structure the market. The analysis reveals that the costs of marketing output fell substantially with liberalization, but the transaction costs associated with financing production rose. These shifting transaction costs resulted in differential impacts across producers. While the great majority of coffee growers appear to have benefited on balance, a minority of growers may have lost more from increasing costs of finance than they gained from reduced costs in product marketing.

2. COFFEE MARKETING IN TANZANIA

This study is based on a survey of 159 farmers, eight private coffee traders and eight exporters in Arusha Region of Tanzania in 1998. Arusha and neighboring Kilimanjaro Region account for more than half of Tanzania's Arabica coffee, which constitutes about a third of the country's foreign exchange earnings. Smallholder farmers produce over 90% of Tanzania's coffee. Before marketing their crop, farmers pulp away the fleshy exterior of the coffee "cherry" and dry it into "parchment" coffee. The parchment must then be milled in a curing factory to reveal the "clean" coffee beans, which are graded based on international standards and auctioned for export.

In this system, farmers face multiple transactions, which may or may not be linked into bundled exchanges. First, they may require finance to purchase inputs for production. In this market the farmer will pay some discount rate plus the transaction costs associated with the exchange (e.g., screening, monitoring, and enforcement). Second, farmers will make some transactions to purchase inputs, paying the import price of inputs plus the costs of internal marketing, including transportation and various transaction costs. Labor might be hired or household labor allocated to production. Finally, the producers sell parchment coffee, receiving the export price, minus the transformation and transaction costs in the market. Marketing the output may involve multiple exchanges as coffee is assembled at the village, transported to a factory, processed, and transported to auction or export. Since Tanzania is a price taker in the coffee market, policy reform cannot influence the export price. Instead, to improve the returns to production, liberalization must reduce the net transformation and transaction costs throughout the domestic coffee system.

Prior to 1994, the market for coffee was completely controlled by state organizations. [2] Farmers delivered parchment coffee to primary cooperative societies and received an initial payment based on a state-mandated price. Farmers also secured inputs at their primary cooperative societies. Parchment coffee was taken from cooperative societies to a coffee-curing factory by the state-supported cooperative union, which controlled the factory. Once it had been milled and graded, the "clean" coffee was then delivered to the Tanzania Coffee Marketing Board (TCMB), where private exporters were allowed to purchase the coffee through an open auction. The TCMB was the only organization that could legally sell coffee or coffee inputs. The TCMB distributed inputs through the cooperative unions, which extended them on credit to the cooperative societies at a negligible real rate of interest. Auction realizations were remitted to the cooperative unions, which deducted processing costs and charges for input credit and transferred remaining funds to cooperative societies. The cooperative societies then made final payments to farmers to cover the difference between their initial payments and the auction realization minus costs.

In this system, the credit, input, and output transactions were linked. Because farmers had only one outlet for coffee, the cooperative unions could extend crop-secured loans through the primary cooperative societies. Moreover, volumes flowing through each society were large enough to allow identity preservation during curing, grading and sale. By delaying the final payment until the actual quality and export price of the coffee delivered were determined, the controlled system offered premiums to primary cooperative societies that delivered higher quality coffee. But, the multipart payment system also meant that payments were delayed well after delivery. In the 1980s, there was typically a second payment after nine months and a final payment a year to 15 months after delivery (Temu, 1999).

While the multipart payment system removed uncertainty regarding the quality of the coffee exchanged between the grower and the marketer, it also exposed the cooperative union to considerable international market risk. If the initial price offered to farmers at delivery exceeded the auction realizations minus the union's costs, the union operated at a loss. In fact, cooperative unions suffered consistent losses during 1989–93, which resulted in delayed or denied payments to farmers and heavy borrowing from the state-controlled financial system. Over this period, the cooperative system had no funds for payments beyond the initial payment made at delivery. Over 1989–92, the multipart payment system in Arusha operated as a spot market, with a government mandated price. During 1992–94, cooperative unions set the initial price and only rarely made additional payments (Ministry of Agriculture & Cooperatives, 1997).

In addition to their financial losses related to pricing, the cooperative unions were affected by a number of macro-policy reforms that Tanzania adopted in the late 1980s and 1990s. First, as part of structural adjustment packages the Tanzanian shilling was substantially devalued and currency markets deregulated. This led to depreciation of currency from Tsh 15.29/US$ in 1985 to Tsh 140.33/US$ in 1989 and Tsh 509.63/US$ in 1994. The precipitous decline in the Tanzanian shilling implied proportionate increases in the shilling value of coffee exports and the local price of imported chemical inputs. Over the same period, financial market controls were loosened, leading to substantial increases in interest rates and greater restrictions in access to finance for public enterprises. The nominal lending rates rose from 12.25% in 1985 to 31% in 1989 and 40% in 1994.

By 1994, the cooperative unions lacked liquidity to make initial payments to farmers, were indebted to farmers for past deliveries, and could not access credit through the recently liberalized financial market. To avoid complete collapse of domestic marketing, the government allowed private traders to engage in trade starting in the 1994–95 marketing season. The TCMB was replaced with the Tanzania Coffee Board (TCB), which continued to operate the export auction, to issue export permits and licenses for domestic trade, and to monitor the industry. Private traders, most of whom had been coffee exporters prior to liberalization, quickly entered the domestic market, accounting for 13% of auction deliveries in 1994, 41% in 1995, and 69% in 1996. By 1996–97, private buyers of parchment coffee were responsible for 45% of coffee curing and 84% of coffee exporting (Tanzania Coffee Board, various issues).

3. CONTRACTS AND TRANSACTION COSTS IN THE LIBERALIZED MARKET

After liberalization, organizations would be expected to develop new contracts to minimize

transaction costs given the new institutional arrangements. In fact, new contracts quickly emerged to reduce the marketing costs of moving output from the farm gate onward. But, the innovations that lowered the costs of output marketing, raised the transaction costs in the credit market. This shift in costs from one part of the crop system to another suggests an ambiguous impact on farmers.

(a) *Contracts and costs in output markets*

At liberalization, exporters who purchased clean coffee at the auction had to develop contracts to ensure that coffee continued to move from the farm gate to the export market. The contract they arrived at was to vertically integrate, directly assembling parchment, curing it, and transporting and storing the clean coffee (Temu, Winter-Nelson, & Garcia, 2001). Vertical integration tends to reduce transaction costs in the presence of uncertainty, concentration, or asset specificity (Frank & Henderson, 1992; Williamson, 1985). Since each of these factors exists in the coffee marketing system, vertical integration was a natural response by coffee exporters.

Through the early 1990s, exporters faced increasing uncertainty about the ability of existing domestic traders (cooperative unions) to supply coffee to the auction. Although coffee is not highly perishable, there is a premium for freshness and exporters' contracts typically stipulate a delivery date. Consequently, timely supply has a value and uncertainty in supply is costly. The incentive to integrate was reinforced by concerns over concentration. The presence of few parchment traders exposed the exporters to risk that they would face exploitive or unreliable suppliers if they did not enter into domestic trade. Finally, upon entry into any aspect of domestic marketing, private agents had to make substantial investments that were highly industry-specific. These investments included, licenses, parchment buying stations in villages, warehouses, and curing factories. [3] Exporters who incurred the fixed costs of investing in any element of domestic trade, had an increased incentive to enter other stages of the marketing chain to secure a flow of coffee.

After liberalization in 1994, private trade expanded rapidly at the expense of the cooperative system. By 1997, there were 54 licensed exporters and 27 private parchment coffee buyers operating in Arusha and Kilimanjaro Districts. Five of the private buyers also owned coffee curing and grading factories and held export licenses. According to the TCB auction catalogues, these five vertically integrated firms accounted for 57% of deliveries to the auction and over 65% of exports in 1997. Just over 20% of production was channeled through the vertically integrated public cooperative system. The remainder was handled either by private assemblers and estates that did not export or by exporters, who assembled parchment and contracted with the cooperative or private curing factories for processing prior to exporting the clean coffee.

Liberalization and vertical integration came with a significant drop in costs of marketing coffee. Vertically integrated exporters established factories that proved to be far more efficient than the cooperative union's outmoded plant. With improved machinery, the new factories yielded a higher-grade cured coffee from similar parchment coffee inputs. Better quality preservation raised the value of the output by Tsh 26 per kilogram on average at 1997 prices. These factories yielded 4% more processed coffee per unit input, implying a gain of Tsh 53 per kilogram of parchment, and they operated at a lower unit cost, leading to a savings of Tsh 21 per kilogram of parchment. Combined, these improvements implied a reduction of Tsh 100 per kilogram, about 10% of the 1996 producer price. In addition, control over processing allowed vertically integrated exporters to accelerate the movement of coffee through the system. Prior to liberalization only 15% of coffee was exported in the first three months of the season. After liberalization, 35% of the deliveries were completed in this time (Tanzania Coffee Board, various issues). Faster delivery allowed exporters to save capital expenses and to access premiums for early delivery on the international market.

Whereas private traders could reduce processing costs relative to the cooperative union, they faced higher assembly costs than the primary cooperative societies. Cooperative societies had staff and facilities in place in villages, while the private buyers required new staff and physical structures. In many cases, private coffee buyers contracted with primary cooperative societies, hiring them as assembly agents. Interviews with private traders indicated that where primary cooperative societies acted as agents for a private coffee buyer, assembly costs decreased to one third their previous level. When a primary cooperative society contracts with a private trader, individual members may

still sell to alternative traders. Nonetheless, the contracts offer private traders low-cost assembly and access to farmers who have strong loyalties to their primary cooperative society.

As Table 1 shows, the average marketing margins for coffee dropped substantially after liberalization, with a large impact on producer prices. The average real margin to marketers dropped from Tsh 450/kg over 1985–93 to Tsh 100/kg after liberalization (1994–97). Thus, over 1994–97, declining costs in output marketing led to a reduction in marketing margins of Tsh 350/kg. Given the average export price for the period of Tsh 1020/kg (constant 1995 values), the commensurate increase in producer prices therefore amounted to over a third of the average export price.

The prices shown in Table 1 represent an average of the prices offered by the cooperative and private buyers, based on data collected by the Ministry of Agriculture and Cooperatives (1996). But, the 1998 survey of 159 coffee growers found that producer prices varied significantly depending on location and whether growers sold to private traders or through the cooperative union. As Table 2 indicates, 44% of the respondents marketed through the cooperative system in 1997–98 and received an average of Tsh 1,089/kg. Another 42% of the growers marketed through private coffee buyers and received on average Tsh 1,327/kg. The remaining farmers split deliveries between the two outlets. Of the 104 surveyed growers who sold coffee in 1997–98, reductions in the imputed margins ranged from about Tsh 100/kg to over Tsh 400/kg (Table 3). Two-thirds of the sample experienced declines of Tsh 350/kg or more compared to the average margins prior to liberalization.

Surveyed farmers reported that in 1995–96, 1996–97, and 1997–98 they received Tsh 212, Tsh 339, and Tsh 225 more per kilogram parchment from the private buyers than from the cooperative system. All the growers interviewed had access to both types of buyers at similar distances from their farms. Some farmers still sold coffee to the cooperative union with expectations that the union would make further payments based coffee quality realizations. Farmers also expressed a desire to support cooperatives based on some perceived long-term benefits of marketing through cooperative unions. Still other farmers chose to sell to the unions in hopes that deliveries would enable the union to pay them arrears from previous coffee deliveries. Whatever the reasons for continuing to support the cooperative unions, the reduction in margins shown in Table 1 was not enjoyed equally by all growers.

(b) *Contracts and costs in input markets*

Because farmers selling to private coffee buyers could not access inputs from the cooperative union, private coffee buyers had to develop a new system of distributing inputs to ensure that supplies of parchment would be available. The initial strategies for private coffee buyers included providing input delivery

Table 1. *Producer prices and marketing margins for Tanzanian coffee (constant, 1995, Tanzanian Shillings, except where noted)*

	1985–90	1992–93	1993–94	1994–95[a]	1995–96	1996–97	1997–98
Export price (US$/kgclean coffee[b])	2.40	1.38	1.25	2.80	1.90	2.80	3.00
Export price (Tsh/kg parchment coffee[c])	1,025	1,064	848	1,578	836	1,111	1,063
Producer price (Tsh/kg parchment coffee)	589	495	424	1,410	750	992	1,000
Marketing margin (Tsh/kg parchment coffee)	436	569	424	168	86	119[d]	63

Note: Producer price data for 1991–92 not reported due to unreliability of actual payment.
Source: Based on Ministry of Agriculture and Cooperatives (1997) and Tanzania Coffee Board (various issues).
[a] Year markets were liberalized.
[b] Current dollars.
[c] Conversion factor of 0.80 was used to convert clean coffee into parchment. Tanzanian Shilling values were converted at official exchange rates and deflated using the consumer price index to constant (1995) values.
[d] High marketing costs in this season are attributable to widespread flooding and mudslides caused by El Niño rains.

Table 2. *Parchment coffee marketing channels*[a]

Year	Share of growers marketing through:			Average price received from:	
	Cooperative system (%)	Private buyers (%)	Both (%)	Cooperative system	Private buyers
1995–96	90	3	7	725	946
1996–97	60	30	10	670	997
1997–98	44	42	14	1,089	1,327

Source: Survey results, $n = 155$.

[a] Prices are in current Tsh/kg parchment coffee.

Table 3. *Distribution of growers by 1997 producer price (constant, 1995, Tsh/kg)*

	Top 50%	Next 25%	Lowest 25%	Lowest 10%	Mean for sample	Median for sample
Producer price[a] (Tsh/kg)	1,033	921	840	750	955	1,000
Imputed margin[a,b] (Tsh/kg)	30	142	223	313	108	63
Decline in margin[a,c] (Tsh/kg)	420	308	227	137	342	387
Minimum decline in margin[c] (Tsh/kg)	387	280	101	101		

Source: Survey data, $n = 104$.

[a] Mean value for group.

[b] Imputed margins are based on an export price of Tsh 1,063/kg.

[c] Declines in margins are calculated from a base margin of Tsh 450/kg.

services as a way of attracting farmers. By 1996, the four largest coffee exporters had become both parchment buyers and input importers and distributors. Other private coffee buyers contracted with input suppliers to distribute inputs from their coffee buying posts. Consequently, inputs remained available to farmers at the points of output sale, as had been the case prior to liberalization. This suggests that transaction costs in purchasing inputs remained roughly constant after liberalization. [4]

When questioned about the availability of coffee inputs, 31% of respondents indicated that there had been no changes since liberalization. Thirty-nine percent indicated that inputs availability had improved and 30% felt that availability had declined. Dissatisfaction with inputs distribution was related to problems of quality control in the inputs themselves, suggesting rising costs in transactions through asymmetric information. Issues of quality control seem to have been resolved as distributors developed reputations (World Bank, 2000b). Therefore, it is reasonable to treat the marketing costs for inputs as unchanged with liberalization. This conclusion is consistent with farmers' attitudes revealed in the survey and the continued use of output assembly stations for input distribution.

(c) *Contracts and costs in seasonal finance*

Liberalization of the coffee marketing system reduced costs in the output market, but also severed the links between the inputs, finance, and output exchange. Under the monopsony system, the cooperative unions could provide finance for inputs purchases at low screening and monitoring costs. Inputs were distributed to producers and the costs were deducted from the value of the crop. Since most inputs were useful only on coffee and all coffee was sold through the cooperative system, there was little possibility for strategic default. Once private traders created new outlets for coffee, the cooperative unions could no longer cheaply enforce repayment of loans. The system of crop-secured lending ended after the first season of liberalized trade, with heavy losses for the cooperative unions, the Tanzania Coffee Marketing Board and ultimately the central government, which paid off Tsh 3.4 billion (US$6.75 million) in outstanding debt in 1998.

Since liberalization, no large-scale system for financing inputs has emerged. In the presence of multiple outlets for coffee, the screening, monitoring and enforcement costs for coffee finance have grown too large to allow widespread provision of seasonal finance. While all coffee growers received inputs finance prior to

liberalization, only 15% of growers interviewed in 1998 indicated that they had had access to inputs credit in 1995, 1996 or 1997. The competitive forces that served to reduce marketing costs for coffee output, drove the transaction costs for financing coffee production so high that the market for targeted coffee finance has largely disappeared. In principle, growers could finance coffee inputs from other sources, but in practice many growers may have no opportunity to do so. Of the growers surveyed, 49% reported that they had had some access to funds through nonfarm income, income transfers, or credit from formal institutions, shopkeepers, friends or relatives in 1995 or 1996. Fifty-one percent of the growers reported no access to funds from any of these sources in either year. The loss of targeted coffee finance could therefore be significant for many growers.

4. ASSESSING CHANGES IN TRANSACTION COSTS

A simple cost–benefit calculation can be used to assess the net impact on coffee growers of the losses they suffer through reduced access to finance and the gains they experience through reduced marketing margins for their output. In the state-controlled system, coffee growers received cash income equal to: $Q(P_e - M_s) - I$, where Q represents the quantity sold, P_e is the export price, M_s is the marketing margin charged under the state controlled system, and I is the charge made for inputs when coffee is delivered. Under liberalized markets, growers using similar levels of inputs receive $Q(P_e - M_l)$ at delivery, where M_l represents marketing margins in the liberalized system, but they incur the cost (I) earlier in the year. In the absence of low-interest credit many farmers must forego consumption or other investments to purchase inputs. Hence, the cost (I) must be inflated by the subjective discount rate (δ) to capture the cost of delayed consumption and investment. Net cash returns for the farmer in the liberalized setting are therefore: $Q(P_e - M_l) - I(1 + \delta)$. Assuming margins and credit terms obtaining prior to 1994 could have been sustained in the absence of liberalization, $Q(P_e - M_l) - I(1 + \delta)$ must exceed $Q(P_e - M_s) - I$ for the reduced output marketing margins attributable to the policy change to compensate for the loss of inputs finance. Rearranging, the benefits of reduced marketing costs exceed the value of the lost finance if: [5]

$$Q(M_s - M_l)/I > \delta. \quad (1)$$

Eqn. (1) indicates a critical value for the subjective rate of discount, below which a grower who uses inputs before and after liberalization will be a net loser from the policy change.

A second set of growers could consist of farmers who used inputs when they had access to targeted finance, but stopped using inputs after liberalization. Devaluations just prior to market liberalization may have raised the costs of imported agro-chemicals and fertilizers to levels that were prohibitive for many households with little or no nonfarm sources of working capital. In these households, a fixed constraint on spending bars purchase of farm inputs prior to the sale of the output, and makes the discount rate irrelevant. These growers will experience a reduction in revenue through reduced yields, which could outweigh the gains they experience due to reduced marketing margins and inputs expenses. Prior to liberalization, these households would have earned cash income from coffee equal to a relatively high yield (Q_h) times the export price (P_e) minus inputs costs and the margins charged in the state system (M_s). Thus, their cash income prior to reform was: $Q_h(P_e - M_s) - I$. Under liberalization, these households can be assumed to have lower yields (Q_l) because of reduced input use, but to receive a larger share of the export price because of the lower marketing margins (M_l). Their cash revenues under liberalization can be modeled as: $(Q_l)(P_e - M_l)$. Reduced yields after liberalization would imply a reduction of revenues equal to $P_e(Q_h - Q_l)$ and a reduction of costs equal to $I + Q_h M_s - Q_l M_l$. The loss in revenue through reduced yields will be outweighed by reduced input costs and marketing margins as long as:

$$P_e < (I + Q_h M_s - Q_l M_l)/(Q_h - Q_l). \quad (2)$$

Eqn. (2) provides a critical value, below which the export price must fall if farmers who stop using inputs after liberalization are to have benefited from the reform. Data for a representative farm as described by the Tanzanian Ministry of Agriculture, Coffee Management Unit (1996) and data from surveyed farmers can be used in Eqns. (1) and (2) to indicate the net impact of reduced access to finance and reduced marketing margins on growers' returns.

According to Ministry of Agriculture (1996), inputs required for one hectare of coffee (1,000

trees) in Arusha yielding 450 kg of parchment were valued at Tsh 126,000. Assuming that the margins existing in the decade prior to liberalization would have been maintained in the absence of the institutional reform, $M_s - M_l$ is set at Tsh 350 per kilogram, commensurate with the decline in margins from about Tsh 450 to Tsh 100 following liberalization (Tables 1 and 3). Based on a yield of 450 kg per 1,000 trees and these prices, Eqn. (1) suggests that the reduced marketing margins outweigh the value of lost finance as long as farmers' subjective discount rate is less than 125% (157,500/126,000 = 1.25). Applying the median yields from the sample of growers (462 kg/1,000 trees for 1995–96 and 1996–97 combined), the median decline in margins (Tsh 380/kg) and recommended inputs expenditure yields a critical value of the discount rate of 139%. [6] It is unlikely that many individuals would exhibit rates of time preference of these magnitudes, implying that the benefits of reduced output marketing costs exceed the losses through increased transaction costs in farm finance for a "typical" farm.

While average yields for the sample were close to the level suggested in official crop production budgets, there was a wide range of yields across the sampled farms and over the three years for which data were collected. [7] As Table 4 indicates, the sample average yields were close to the regional model level of 450 kg/1,000 trees in 1995–96 and 1996–97, but were much lower in 1997–98 due to the effects of unusual weather patterns. Figure 1 presents the distribution of yields in the two more typical years. Compared to median yields of 521 kg/1,000 trees in 1995–96 and 400 in 1996–97 a quarter of the growers in the first year and a third in the second experienced yields of less than 300 kg/1,000 trees. Ten percent of harvesting growers reported yields of less than 150 kg/1,000 trees. The wide range in yields combined with the disparity in the impact of liberalization on margins (Table 3) implies that the net benefits of the policy change could vary considerably.

Table 5 presents the distribution of the critical values of the discount rate (δ) based on each surveyed grower's average yields over 1995–96 and 1996–97 and their imputed margins in 1997. For the majority of farmers (61%) the discount rate would have to exceed 100% for the value of lost finance to outweigh improved output prices. But, for 15% of the growers, subjective discount rates of less than 50% would imply a net loss through liberalization. Since this is within the range of estimated discount rates for smallholders in less developed countries, [8] it is possible that these growers are net losers from the reforms. Applying a discount rate of 50% to all growers would suggest that 15% of the sample suffered net losses averaging Tsh 20,000/1,000 trees while 85% gained an average of Tsh 160,000/1,000 trees against average revenues of Tsh 375,000/1,000 trees.

As Table 5 suggests, most of those at risk of suffering net losses experienced low yields, on average less than half of the sample median. They also experienced lower than average reductions in marketing margins. As Table 6 shows, either relatively slight improvements in marketing margins or poor yields would be sufficient to place the critical value of δ in the range of likely discount rates. About 10% of growers experienced declines in marketing margins of between Tsh 150 and Tsh 100/kg. Even if these growers achieved above average yields (500 kg/1,000 trees) the critical values in Table 6 suggest that lost finance could be more valuable to them than increased revenues. Assuming they applied recommended inputs, growers who experienced yields of under 200 kg/

Table 4. *Growers characteristics*

	Median	Mean	Standard deviation	Minimum	Maximum	N[a]
Farm size (ha)	1.22	2.22	4.03	0.10	38.07	155
Coffee tress (#)	50	835	808	8	4,000	155
1995–96 Yield (kg/1,000 trees)	521	567	390	28	2,400	141
1996–97 Yield (kg/1,000 trees)	400	471	337	8	1,801	139
1997–98 Yield (kg/1,000 trees)	128	242	265	3	1,247	104

Source: Survey results.

[a] Growers who harvested no coffee are not included in yield figures.

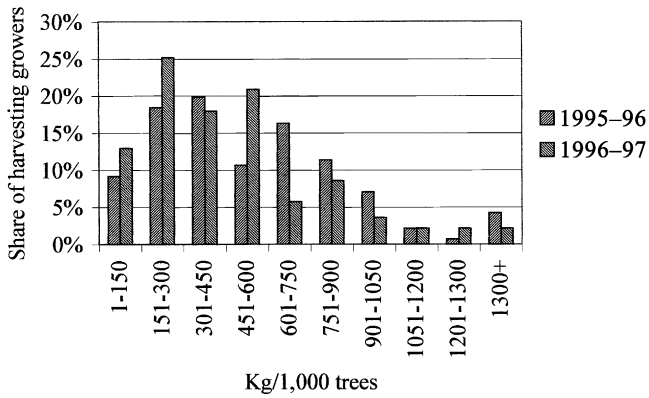

Figure 1. *Distribution of coffee yields. (Source: Survey data, $n = 109$.)*

1,000 trees (as did 14% of the sample) could suffer losses even if they enjoyed the large reductions in marketing margins.

The counterfactual employed above assumes farmers would continue to pay a real interest rate of zero on inputs finance if liberalization had not occurred, that the multipart payment system would not have reemerged in the absence of liberalization, and that inputs are purchased a full year prior to coffee sales. If a positive real interest rate were charged in a controlled system, it is the difference between the farmers' subjective rate of discount and the real interest rate that must exceed $Q(M_s - M_l)/I$ for the policy change to be beneficial. Hence, rates of time preference would have to be even higher than critical values indicated above for the policy reform to be detrimental. Similarly, if the multipart payment system were reinstated, the present value of revenues under the controlled system would fall and the threshold rate of discount would rise. Finally, if inputs were purchased less than a year prior to coffee sales, the discount rate calculated applies to a fraction of a year. Hence the annualized critical value for the discount rate would be higher than is suggested above. Relaxation of these three assumptions would tend to reinforce the conclusion above.

The calculations above overstate the gains from liberalization if the parameters used exaggerate the impact on marketing margins. Using the average 1985–93 margin as the counterfactual to compare with the actual margins after liberalization probably underestimates the reduction in costs attributable to liberalization. Since the cooperative unions were operating at deficits in the early 1990s, one could reasonably project the margins increasing to cover costs, had liberalization not been adopted. Hence, the critical values calculated above may be underestimates.

Table 5. *Distribution of sampled growers by critical value of discount rate*

Critical value of discount rate (δ)[a]	Share of growers (%)	Mean yield of group	Mean decline in margins of group	Maximum yield of group
Less than 0.25	2	121	208	212
0.26–0.50	13	184	287	279
0.51–0.75	12	296	279	666
0.76–1.00	12	417	309	970
1.01–1.50	22	459	373	1,027
1.50 or greater	39	790	379	1,700
Total	100	513	345	1,700

Source: Survey data.

[a] Discount rate below which value of lost finance will exceed gains from reduced marketing margin. Calculated using mean yield over 1995–96 and 1996–97 and margins in 1997 by grower.

Table 6. *Sensitivity analysis: critical values of subjective discount rate* (δ)[a]

Yield[b]	Decline in marketing margin[c]					
	350	300	250	200	150	100
500	1.39	1.19	0.99	0.79	0.60	0.40
450	1.25	1.07	0.89	0.71	0.53	0.36
400	1.11	0.95	0.79	0.63	0.47	0.32
350	0.97	0.83	0.69	0.56	0.42	0.28
300	0.83	0.71	0.60	0.48	0.36	0.24
250	0.69	0.60	0.50	0.40	0.30	0.20
200	0.56	0.48	0.40	0.32	0.24	0.16

[a] Subjective rate of discount below which benefits from reduced marketing margin exceed costs of reduced input finance, assuming input costs of Tsh 126,000 (1995 prices).
[b] Kg/1,000 trees.
[c] From base of Tsh 450/kg.

The critical values of δ in Table 5 suggest that some 15% of the growers sampled may have been left worse off by liberalization. This calculation is only relevant, however, for growers who used inputs before and after the policy change. The generally low yields these farmers achieved suggest that they were not using inputs in 1995–98. If these growers did not use inputs prior to liberalization, reduced access to inputs finance represents no loss to them and they therefore benefited from liberalization. If, however, they used inputs prior to the policy change and have not used them since, Eqn. (2) can be used to suggest whether they have gained or lost on balance.

The impact of reduced inputs use and reduced marketing margins on a representative farm is calculated by taking margins without liberalization as the regional average over 1985–93 (Tsh 450 per kilogram) and margins under liberalization are set at the average level over 1994–97 (Tsh 100 per kilogram). Ministry of Agriculture (1996) data suggest that reducing input use lowers yields in Arusha from 450 kg per 1,000 trees to less than 250 kg, while saving farmers Tsh 126,000. Applying these values to Eqn. (2) suggests that as long as export prices remained below Tsh 1,518/kg, the value of lost yields would be compensated for by the producer price improvements through reduced marketing margins. Export prices only reached this threshold twice during 1970–99. [9] Given the prices that have obtained since liberalization, a representative farmer who stopped applying inputs in 1995 has gained through the policy reforms.

Actual yields achieved prior to liberalization for the surveyed farmers are not known. But, assuming that inputs were used and that they achieved the median yields for the group (about 450 kg/1,000 trees), yield declines would range from 400 to zero in the sample. Those growers with $\delta < 0.5$ in Table 5 reported average yields of 150 kg/1,000 trees (implying a yield loss of 300) and declines in margins of under Tsh 300/kg. For such growers, the export price would have to be less than Tsh 1,000/kg for them to gain from liberalization. Until recently, prices typically exceeded this critical value. Table 7 suggests that the 15% of growers in the sample with yields below 200 kg/1,000 trees and low reductions in margins would be net losers through liberalization if their low yields represented a decline from the median level attributable to reduced use of inputs finance after liberalization. Growers with low yields who never used inputs are net winners. [10] The other 85% of the sample appear to have benefited on balance.

Given the specific prices that have obtained since 1994, most smallholders have probably gained from reduced crop marketing margins, despite increased transaction costs for finance. Increasing inputs prices due to devaluations and reduced access to farm finance are probably responsible for some decline in inputs use. While the immediate aggregate impact of reduced inputs use on coffee yields is probably outweighed by the increases in producer prices, inadequate agro-chemical applications could have a negative and persistent impact on coffee quality that would only emerge after a lag. If liberalization has resulted in a sufficiently large reduction in aggregate input usage to negatively influence the quality of Tanzanian coffee, export prices would be negatively affected and the

Table 7. *Sensitivity analysis: breakeven values for export prices (1995 Tsh/kg parchment equivalent)*[a]

Decline in yield (kg/1,000 trees)[b]	Decline in marketing margins[c]					
	350	300	250	200	150	100
150	1,990	1,890	1,790	1,690	1,590	1,490
200	1,518	1,455	1,393	1,330	1,268	1,205
250	1,234	1,194	1,154	1,114	1,074	1,034
300	1,045	1,020	995	970	945	920

[a] Values represent the export price, below which the losses through reduced inputs use and yield with liberalization are less than the gains through reduced marketing margins, assuming input cost of Tsh 126,000 without liberalization and no input use with liberalization.
[b] From a base of 450 kg/1,000 trees.
[c] From a base of Tsh 450/kg.

net impact of the policy change could be negative. Data limitations preclude measurement of the actual change in inputs use or the degree to which any reduction in use is attributable to changes in price, as opposed to changes in market institutions. Although analysis of the impact of liberalization on input use and coffee quality are beyond the scope of this paper, it is clear that the average quality of Tanzanian coffee has been declining since well before market liberalization.

5. SECONDARY INSTITUTIONAL INNOVATIONS

Since the costs of arranging exchange can deter otherwise profitable transactions from occurring, economic development requires that institutions and contracts emerge to diminish transaction costs. The apparent success in reducing marketing costs in the Tanzanian coffee system is partly attributable to the effectiveness of organizations in developing new contracts to work in the new institutional environment. These contracts were often only available because the Government of Tanzania supported the development of mechanisms to allow continued institutional and contractual development after the initial liberalization in 1994.

One mechanism for reducing marketing margins has been the contracting of primary cooperative societies as assembly agents for private traders. These agreements can reduce the costs of assembling parchment, but have led to conflicts between and among cooperative societies, cooperative unions, and private coffee buyers. In many instances cooperative unions challenged the rights of primary cooperative societies to market coffee outside of the cooperative system. The contracts between the cooperative societies and the private coffee buyers have also generated disputes among private buyers, as societies have entered multiple, sometimes contradictory, agreements involving different traders. To facilitate resolution of these conflicts, the government has allowed the development of the Tanzanian Coffee Association (TCA) as a forum for dispute resolution and other functions. The Tanzania Coffee Association consists of licensed parchment traders, parchment processors, cooperative unions and exporters. It represents an institutional innovation in legal support for transactions in the liberalized market because it is used for arbitration of conflicts between members of the association. The government's recognition of the TCA's right to rule on these matters has lowered costs that would arise if traders resolved such conflicts through the civil courts.

The Government of Tanzania has also supported the emergence of the Annual Coffee Conference in which the cooperative unions, private traders, growers, exporters, and various government ministries with interests in coffee discuss and attempt to resolve problems in the evolving market. Indicators of the importance of the coffee conference and the public-private partnerships that it facilitates include the emergence of research and extension programs funded by its members and the development of the National Inputs Voucher Scheme to facilitate purchase of inputs by farmers (Temu, 1999).

6. CONCLUSIONS

Market liberalization can enhance agriculture if it reduces the costs associated with

producing output and moving it from farm to final market. Whereas most attention has been focused on reducing margins associated with output exchange, marketing costs must be reduced through the entire commodity system if liberalization is to yield benefits. When credit, input and output markets have been linked under a controlled system, market liberalization is likely to lower costs of output exchange while raising transaction costs in the financial market. Increases in the share of world prices accruing to African farmers readily confirm reduced costs in output markets (Kherallah *et al*., 2000; World Bank, 1994), but changes in transaction costs in the exchanges for inputs and finance remain difficult to quantify.

After liberalization of the Tanzanian coffee market, organizations formed new contracts to reduce costs in the new institutional setting. These contracts included vertical integration of exporters into assembly and processing which generated reductions in the marketing costs for output, but increases in the transaction costs for financing production. The combination of prices, costs, and yields that obtained in Tanzania during 1994–2000 implied that most farmers gained from the mix of lower output marketing margins and reduced access to finance. Only those growers who simultaneously experienced exceptionally low yields, remained in relatively high-cost marketing channels, and had no access to finance or had finance only at a exceptionally high opportunity cost could have been net losers from the change. In this survey, the potential losses of the relatively small number of disadvantaged growers appear small compared to the gains enjoyed by the majority of growers. But, increased costs of securing farm finance have placed a drag on the returns to liberalization for all growers and indicate an area for further policy attention.

Policy reform that affects the rules by which prices are determined is simultaneously price and institutional reform. Its success often depends on the capacity for organizations to reduce their transformation and transaction costs given the new institutional setting. Competitive pressures in a liberalized system are likely to reduce the costs of output marketing, but when liberalization separates linked inputs, finance, and output exchanges it may increase transaction costs at other points in the commodity chain. To assess the impact of liberalization, the transaction costs through the entire system must be measured. Conclusions based on reduced costs at any one exchange can misrepresent the actual impact of reforms and obscure the need for further institutional change or policy intervention.

NOTES

1. Some authors have termed all these expenses transaction costs (Staal, Delgado, & Nicholson, 1997). As in Wallis and North (1986) and Minten and Kyle (2000) this paper uses the term transaction costs for the costs of arranging an exchange that do not relate to physical treatment of the commodity. Marketing costs will refer to the combined transaction and transformation costs of marketing.

2. The exact mechanisms through which the state controlled the domestic marketing of coffee have varied over time, but state control has been constant. The system described here operated over 1962–76 and 1984–92.

3. In 1996, license regulations required parchment buyers to be registered companies that have a paid-up capital of not less than Tsh 30 million (US$46,000). Applicants needed regional trading licenses costing some Tsh 6.2 million (US$10,000) per region. Machinery for the curing factory costs US$500,000.

4. The prices for inputs rose considerably with currency devaluations during 1985–95. Later the currency and the input prices stabilized somewhat.

5. This calculation takes the perspective of a producer paying a real interest rate of zero under the controlled system. From a national perspective it would be appropriate to charge the social rate of return to capital (r) to the loan of I in the controlled system. In this case, liberalization would be beneficial as long as $Q(M_s - M_l)/I > \delta - r$.

6. Use of the mean values for yield (513 kg/1,000 trees) and reduction of margin (Tsh 345/kg) results in a critical value for the discount rate of 140%.

7. While all interviews were conducted in 1998, respondents referred to receipts for deliveries in 1997 and 1996 to establish yields in those years.

8. Experimental estimates of small-scale farmers' rates of time preference suggest discount rates of over 50%,

and imply that rates are higher for poorer farmers than for wealthier ones (Holden, Shiferaw, & Wik, 1998; Pender, 1996). Pender notes that the experimental design used to estimate rates of time preference was susceptible to an upward bias, but it remains plausible that some growers would have discount rates of over 40%.

9. The Tanzania shilling value of exports in the in the 1970s and 1980s was depressed through the overvaluation of the currency. Had the exhange rate been at its equilibrium, the price would have consistently exceeded Tsh 1,500/kg from 1976 to 1988.

10. The presence of farmers who have never applied agro-chemicals suggests three more scenarios for the benefit–cost calculation: (a) those who never used inputs, but paid for them through cooperative society deductions must be better off after liberalization; (b) those who previously used inputs but did not pay the full price for them because of contributions from cooperative members who did not use did not collect the inputs, may be made worse off by facing the full input price after liberalization; and (c) farmers who previously did not apply inputs, but began to adopt them after liberalization must have improved their status at least as much as those who did not adopt after the policy change.

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