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BARBARA HARRISS*

THERE IS METHOD IN MY MADNESS:
OR IS IT VICE VERSA?
MEASURING AGRICULTURAL MARKET
PERFORMANCE

The mid and late 1960s were an era of pioneering research in the economics of agricultural marketing in underdeveloped countries. In Africa teams from several American and African universities studied the systems of Sierra Leone (Illinois and Njala), Nigeria (Michigan State, Stanford, Stanford Research Institute, Ife, and Nigeria), Kenya (West Virginia and Nairobi), and Ethiopia (Cornell and Stanford Research Institute) resulting in, for example, studies by Elon Gilbert (1969), Christopher Ilori (1968), Alan Thodey (1968, 1969b), and Anita Whitney (1968). See also Q.B.O. Anthonio (1968).

The application of a practical methodology for analyzing market performance took place simultaneously in India (see the studies by Ralph Cummings, Jr., 1967; Uma Lele, 1967 and 1971 from Cornell; A.S. Holmes, 1969; Z.V. Jasdanwalla, 1966; and R.C. Gupta, 1973) and Bangladesh (see Muhammad O. Farruk, 1970 from Cornell). Essentially the same methodology is being used a decade later as identified by my studies of rice marketing in Southern India (1977, 1979), H.N. Hays, Jr.'s studies of cereals marketing (1975, 1976, 1977), N.O.O. Ejiga's study of cowpea marketing in Northern Nigeria (1977 from Cornell), and the studies for Niger and Upper Volta of the CILSS/Club du Sahel (1977) "étude diagnostique" from the University of Michigan (see D. Kohlers, 1977; Elliott Berg, 1977a, b).

STRUCTURE, CONDUCT, PERFORMANCE METHODOLOGY

The methodology used is an adaptation of "structure, conduct, performance" analysis. This is an attempt to compromise between formal structures of economic theory and empirical observations of organizational experience in imperfect markets. It is a standard tool for market analysis in the United States and the United Kingdom (Bain, 1959; Bateman, 1976).

Market structure consists of "characteristics of the organization of a market which seem to influence strategically the nature of competition and pricing

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within the market" (Bain, 1959, p. 7). In particular, these are the degree of seller and buyer concentration, entry conditions, and the extent of agent and product differentiation. R.L. Clodius and W.F. Mueller add the distribution of market information and its adequacy in sharpening price and quality comparisons and in reducing risk (1967, pp. 345-50).

Market conduct is the "pattern of behavior which enterprises follow in adapting or adjusting to the markets in which they sell (or buy)" (Bain, 1959, p. 9), in particular methods employed to determine price, sales promotion, and coordination policies and the extent of predatory or exclusionary tactics directed against established rivals or potential entrants.

Market performance represents the economic results of structure and conduct (Bain, 1959, pp. 10-12), in particular the relationship between distributive margins and the costs of production of marketing services. In particular, time series price data are used to throw light on the degree of competition in marketing systems:

1. through intermarket price correlation to indicate the degree of market integration;
2. through the relationships between transport costs and intermarket price differences (via graphical plots, regression analysis, and the analysis of average margins) to indicate the competitiveness of interrelational trade; and
3. through the relationships between seasonal price fluctuations and storage costs to indicate market competitiveness through time, as well as the calculations of annual and longer term moving averages to investigate longer period cyclical changes in the price level.

About this methodology, which has achieved the status of orthodoxy, William Jones, whose responsibility it was to organize and coordinate the pioneering African research and to synthesize the results, asserts: "Primary emphasis in evaluating efficiency was placed on the determinants of price." The investigations were formulated in terms of commodities. "The desirability of pursuing a commodity approach became increasingly clear as price analysis and the field studies progressed" (Jones, 1968, p. 96), and "In some ways the measurement of market performance as manifested by the behavior of prices was more satisfactory than that based on identifying imperfections" (Jones, 1974, p. 17). In 1974 in a review of the studies of the 1960s, Jones writes, "I have never published a formal critique or evaluation of the way in which those studies were conceived and executed. The seriously interested student could extract and reconstruct all of this from the final report, although there I was not primarily interested in reviewing defects and deficiencies in our concepts or performance" (1974, p. 3).

The following critique, though not a reconstruction, is by such a seriously interested student and concerns research in South and Southeast Asia and West Africa. Firstly, the methodology for measuring market performance and data are examined; secondly, the relationships between data and conclusions.

THE CORRELATION COEFFICIENT AS AN INDEX OF MARKET COMPETITIVENESS AND INTEGRATION

In W. W. Cochrane's normative model of economic markets for agricultural products, "The single market does not stand alone as a determiner of either price or quantity . . . the actions of buyers and sellers in a particular market are always influenced to some degree by the price signals and substitutional possibilities in other related markets" (1957, p. 34). The degree to which price formation for agricultural commodities in one market town is related to the process of price formation in other towns can be indicated by the zero order correlation coefficients for wholesale prices in these markets. In India Cummings, for instance, states that high correlation coefficients reflect supply and demand in an interconnected market rather than local responses to local forces, that they indicate "association of prices" (1967, p. 82). The concept implied by the word "integration" and the phrase "association of prices" is easily and often confused with that of (perfect and effective) competition. Yet in the present context integration is a spatial concept (rather than connoting types of linkages as in "vertical and horizontal integration"). We shall see that a spatially integrated market does not have to be competitive and that the concept of integration itself is vague.

Yet, according to the reasoning of Cummings and others, if prices are at perfectly competitive equilibrium levels, then differences in prices between places would reflect only transport and processing costs and $r = +1.00$. Both Cummings and Lele account for real world coefficients in India being less than 1.00 by the fact that temporal and spatial frictions occur as a result of transport costs, bottlenecks, uncertainties, lack of knowledge (though "traders were found to be highly knowledgeable about price movements in various market centers," [Lele, 1971, p. 25], lack of product homogeneity, and uncertainty as to the direction of movement of future prices (Cummings, 1967, p. 83; Lele, 1971, pp. 21-24).

Despite these imperfections, Cummings presents data showing modal coefficients of price series between 27 North Indian wheat markets from 1956 to 1974 of 0.85 during times of free trade and 0.65 in times of government intervention (1967, pp. 88, 95). Lele found all price correlations between Delhi and five Punjab wholesale wheat markets from 1955 to 1965 exceeding 0.90 (1971, p. 89). Gupta found modal correlations of 0.71 for wheat, 0.79 for rice, 0.85 for *jowar* (sorghum), and 0.91 for peanuts in selected markets of Uttar Pradesh (1973, pp. 118-25). D. S. Thakur found 71 percent of all correlations among seven Gujarat wheat markets from 1965 to 1971 to exceed 0.75 (1974).

Paddy and rice markets do not appear to give such striking results. From her correlation analysis of Tamil Nadu paddy and rice wholesale prices, Lele concludes, "Because patterns of market flow are so diverse the correlations in Tamil Nadu are slightly lower than obtained in Bengal." She quotes only three cases of correlations exceeding 0.8 (out of an inadequately explained but likely total of 507). This is a lower result than would have been obtained randomly. She also notes "correlations between Madras and the primary markets are high although

there was little flow of rice to Madras (from them)" (1971, pp. 96-98, 245-46). Cummings, during the course of a study of transport margins, finds "on the average spatial price differences tended to be less than transport costs," while correlation coefficients were high (1967).

Thus high correlation coefficients may characterize a situation of physical disconnection, and low coefficients characterize regions with complex trading patterns. Such results call into question the equation of high correlation coefficients with the action of regulating flows of commodities within systems of interconnected markets.

Results of "bivariate correlation analyses of synchronous data" for West Africa are much more problematical even than those of Lele. Jones confesses that "When we first undertook to calculate the intermarket price correlations it was not entirely clear what we would do with them when we got them" (1974, p. 20). He had earlier reported that of 4,836 coefficients calculated by the Stanford project, only 19 exceeded 0.9 and 424 were zero or negative. He explains such anomalies with reference to poor market information and data defects (1968, p. 114). Anthonio mentions very low price correlations for all staple foodcrops between each of 18 central provincial markets and observes also that the smaller and more decentralized the rural market the lower the coefficient (1968, p. 222). Thodey finds high coefficients for cowpeas (almost all above 0.8), but lower ones for rice and maize (almost all below 0.7), which he attributes to weak, localized, and less integrated marketing systems (1968). In Gilbert's analysis of agricultural marketing in Northern Nigeria, the modal coefficient is 0.65 for cowpeas, 0.55 for rice, 0.45 for sorghum, and 0.35 for millet (1969, p. 249). He explains these results with reference to the dispersed nature of supply and demand linked indirectly through overlapping supply areas characterized by poor information and a slow supply response geographically articulated through Kano. However, there is no evidence presented to support this explanation. Rather, it must be considered as an hypothesis. Ejiga's experiments with time lags show very inconclusive results for his crop, cowpeas. Only 5 percent of his correlation coefficients were statistically significant at the 0.01 level, though it is surely very likely that the Nigerian civil war and its associated disruptions share some of the explanation of this apparently low level of integration. But Ejiga finds some cities which are apparently well connected by transport, but which are insignificantly or negatively correlated. Such results he is inclined to attribute to sampling errors or years of poor production (1977, p. 293).

Hays' results for millet and sorghum in Northern Nigeria show only 1 percent of correlation coefficients exceeding 0.8 and deteriorating sizes and distributions of coefficients between 1958-65 and 1969-71 (1975, p. 72). There is some evidence in his further case study around Zaria that the closer spaced the markets, the higher the coefficients, but this is not generally supported by the other authors' experiments at widely varying geographical scales.

Kohlers, in his case study of Niger for CILSS, analyzed technically small samples of monthly data for the single years 1971, 1973, and 1975 (1977, Vol. 2, pp. 35-44). In 1971 two-thirds of his coefficients were statistically insignificant at 0.05. In 1973 (the year of the drought), most were significant and half exceeded 0.8 (whereupon he concludes that the marketing system was highly

competitive). In 1975, however, only 20 percent were at all significant. He is unable to make any conclusions from this.

Berg for Upper Volta analyzed similar data for the years 1962, 1963, and 1976. In the early periods he found 20 percent of coefficients significant at 0.05 and the highest level of correlation between two towns not connected by trade or indirectly by transport. Berg says that significant negative correlations are "nonsensical" (1977b, p. 97). In 1976, 90 percent of his coefficients exceeded 0.9 and were significant at 0.05 (1977b, pp. 26-27). This signified market integration. His overall conclusion attests ambiguous results, and he feels that "more fieldwork would generate better data for firmer analysis" (1977b, p. 100).

Price Series Data

One very obvious explanation for these interesting results is the data used.

Lele made "a special effort . . . to acquire prices of uniform varieties for the markets studied" (1971, p. 24) and obtained weekly wholesale prices for Sort I and Sort II paddy and Sort I rice in 13 markets in Tamil Nadu from 1955 to 1964 (1971, p. 246). "Sorts" (a category of the Indian Civil Supplies Commission, not of the private market) are much larger classificatory categories than individual varieties. Anthonio used official monthly retail price statistics for seven staple foodstuffs in 18 main markets throughout the country for the period 1959-66. Thodey used Nigerian Federal Office of Statistics average monthly retail prices for eight commodities in ten cities over nine years; Gilbert, monthly price data for three commodities over 50 markets between 1952-65; Ejiga, monthly retail prices for cowpeas in 17 markets over 1959-72; Hays, monthly retail prices for sorghum and millet for 15 markets from 1958-71. Kohlers used monthly millet prices in between 7 and 14 markets for the single years 1971, 1973, and 1975; Berg, monthly millet prices in 5 to 11 markets for 1962, 1963, and 1976.

With respect to Nigerian data Jones quotes Gilbert's memo on data quality to the effect that the monthly prices from the Ministry of Agriculture were "collected by low ranking employees with minimal supervision from above," that conversions from local volumetric to standardized units were at the discretion of the investigators, that there was no necessary standardization of the time of month when the "monthly" data were collected (they are therefore not monthly averages but spot data collected monthly), and that variety and quality for the crops were not specified. Monthly data from the Federal Office of Statistics in Northern Nigeria were subject to the same problems and additionally suffered many gaps and obvious fakings (Jones, 1968, pp. 99-100). Thodey notes among others that even daily prices are a range, and there is such a consensus on the individualization of price formation through haggling as to call into very serious question the analytical value of these monthly data. Berg has subjected the data for the ex-French colonies to considerable scrutiny (see his most thorough paper, 1977a), and concludes in his case study of Upper Volta "the underlying data are so weak that it is difficult to know whether the ambiguities and inconsistencies in the results [of correlations] derive from data unreliability or whether they reflect the realities of grain market functioning" (1977b, p. 26). Hays used monthly data from the Nigerian Crop and Weather Reports, but wisely collected his own price information as well as using "bucket and balance" in local periodic markets

and Kano. His conclusion is that official prices underestimated the real price per pound in dry months and overestimated it in wet months, each by 3.5 to 5 percent. Jones, having quoted Gilbert's very severe reservations at length, immediately describes the Nigerian prices as an "apparently rich body of data" because of the length of the time series and the number of markets (1968, p. 101). In 1974, however, he writes, "I would like to stress that these data were not of high quality and that people who knew about the price series insisted that they were worthless" (1974, p. 18). Hill says in her review of Hays' work, "I regard them as so unreliable as to be unworthy of the detailed analysis they here receive" (1976, p. 85).

Other Problems with the Correlation Coefficient

However, there are other reasons why high correlation coefficients may not indicate integration and perfect competition. *Ceteris paribus* in a time of secularly rising prices due to population growth and increased effective demand relative to supplies, the coefficient will rise because absolute distances from the trend line will be relatively less deviant provided marketing costs remain constant. *Ceteris paribus* the longer the time period for which, and the wider the range of crop varieties over which, price series variates are being averaged for correlation, the higher the coefficient, the lower the significance level, and the greater the likelihood that day-to-day price fluctuations which provide traders with their profits are smoothed away. Lele, for instance, used weekly averages for "sorts" not varieties in India. Cummings used monthly averages, and none of the correlation coefficients computed for West Africa used data collected more frequently than monthly and, as illustrated above, they cannot be considered (as is done by most of the researchers concerned) as averages.

Then local markets, which may trade absolutely or relatively little with each other or indeed anywhere else, may have similar price responses to temporally synchronous local forces of supply and demand. Further, markets may not trade with each other at all, but could be highly correlated via the price and trading relationship of a joint destination market.

Monopoly procurement at fixed prices (as practiced at times in Sri Lanka and India as well as officially in French West Africa) will yield intermarket correlations of 1.0, as will identical time series for two places. We must note a common incidence of tautology in the definition of integrated markets as characterized by high coefficients and the conclusions from their occurrence that markets are therefore integrated and competitive. We must also caution against the use of r^2 to explain the contribution of prices in town x to prices in town y in correlation matrices (see, for example, Kohlers, 1977, p. 41, note to table), since additively the explanations of several towns in the price of any other soon exceed 100 percent, and it is difficult to identify the major price-forming markets or the direction of causality in price formation.

High coefficients indicate stable margins or stable prices and by themselves could just as easily indicate monopoly conditions as perfect competition. Since in India and West Africa they obviously do not indicate stable prices, they must indicate stable margins. Yet at the same time as finding high positive correla-

tions, Lele found considerable variability in the storage margin, transport margin, and milling margin (1971, pp. 142, 110-11, 207-11). Similar inconsistency characterizes the West African material. The result is confusing to say the least.

G. Blyn (1973) makes the point that it is the residuals on long price series, such as those used by Cummings and by Lele, that should be correlated to indicate market integration after time trends (due to rising demand because of population growth acting on a whole region) and seasonal trends (reflecting a common supply pattern) have been controlled. This is, of course, impossibly difficult when the price series are for short periods as are much of the West African prices and if the seasonal trends are not spatially or temporally synchronous. Ideally for short time series, one might correlate the residuals of the polynomials which minimize residual elements, but problems with missing data in the price series would often prevent this exercise. Blyn, using Cummings' long Indian price series data and controlling in the way described above, found greatly reduced levels of integration and concludes, "It does not seem likely that perfectly competitive conditions exist to the extent indicated by 0.90 correlations" (1973). With potential autocorrelation in time and in space, the validity of the technique is further weakened.

But Blyn also makes the point that markets may well be integrated and yet have low correlations because market towns are centers of supply, nonfinal demand, and final demand. It is possible for an equilibrium price in a market to be anywhere between a low value, making it just worthwhile to export grain, to a high value, making it just worthwhile to import. Most market towns are neither primary exporters nor terminal importers, but located along a continuum between the two. Thus price series correlations can be lower than it might seem, simplistically, that they ought to be, and still reflect an integrated situation.¹

Finally it becomes apparent in the discussion of methodology for the analysis of margins that it is perfectly possible in two-way trade between market towns (itself neither necessarily reflective of competitive or monopoly marketing conditions) that the correlation coefficient be zero or negative. It is quite clear that by itself the correlation coefficient is inadequate as a proof of either market integration or competition; it can only serve as an indicator of likelihoods given many assumptions about market structure and conduct. Until the technique is greatly refined, its diagnostic use should be abandoned.

ANALYSIS OF MARKETING MARGINS

The second way in which market performance is partially analyzed uses price spreads between producers and consumers. In turn these have taken two forms. First, there are the simple computations of the share of the consumer's price obtained by the producer and by the traders at each stage in the marketing process. These are used for comparison with the same product at different points in time, or in different regions of a country, or with other commodities in the

¹ Jones has independently developed and has tested for Sokoto and Kano in northern Nigeria a model incorporating similar lines of reasoning which he calls the Gold-point model (1968, pp. 116-17; 1976, pp. 319-21).

same or other regions, or with the same commodity in other countries in order to give general insights into relative positions on a scale of allocative efficiency (Holmes, 1969, ch. 6; Mahalanobis, 1972; Sriraman et al., 1963, p. 207; Wollen and Turner, 1970). But it is difficult to control for interproduct differences in perishability for the number of services either necessary or actually rendered in marketing, for different levels of capital intensity and of factor costs in different countries. Such standardization is necessary for meaningful inferences about efficiency. In addition, margins are often static in time and place, neither accounting for storage nor for intermarket trade. Static margins cannot be used to assess whether the behavior of the distributive margin is independent of raw material prices. In a competitive market changes in the margin should reflect changes in the supply and demand for marketing *services*, the former determined by factor prices and technological change and the latter by consumer income (Wollen and Turner, 1970, p. 67; Shepherd and Futrell, 1969, p. 252).

One way in which the analysis of margins is considerably improved and made dynamic in time or space is by using the hypothesis that markets are efficient in pricing terms if off-season price rises are approximately equal to storage costs, if intermarket price differences are approximately equal to transport costs, and if changes in the form of the product (for example, paddy to rice, millet to *couscous*) are approximately equal to processing costs. Only Harriss in India to date has analyzed all combinations of storage, processing, and transport costs, and their relations to margins in a system of n marketplaces, and very generally time lags have not been incorporated, apart from work explicitly concerned with storage (1977). Frequency distributions of price differences between producer markets, other producer markets, or terminal markets, if compared with the relevant marketing costs determined by case studies or sample surveys of trading firms, have been used to reveal the extent to which the hypotheses are upheld. Problems with this method include value judgments of acceptable levels of return if margins always exceed costs, explanations of loss if margins do not exceed costs, and explanations for the commonest case where margins oscillate between profit and loss.

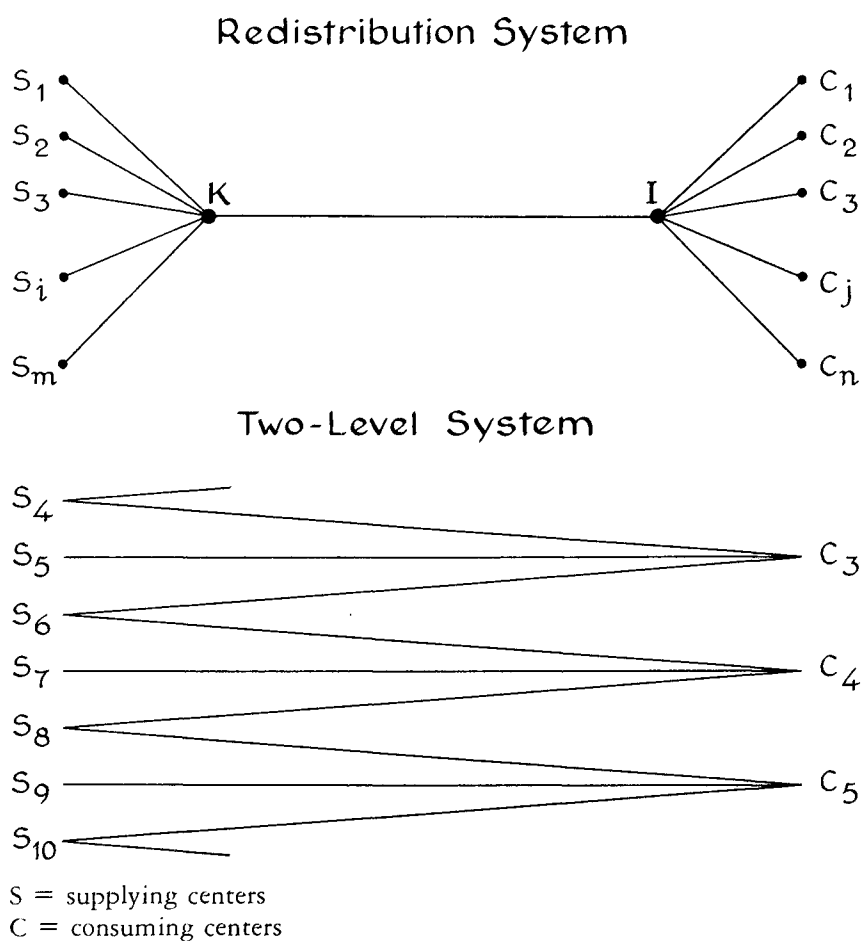
Several economists researching the market behavior of crops grown in West Africa have run into this interpretative difficulty. Hays notes unlagged monthly spatial price spreads frequently in excess of transfer costs for millet and sorghum in Northern Nigeria (1976), and Hays and McCoy presenting plots of the differences between "supplying market place prices" and those of Kano minus transport and handling costs, show both possibilities of high profits and high losses and systematic and sporadic reversals of relationships which they do not satisfactorily explain. They take refuge in the fact that annual average price differences between markets "are closely related to transfer costs" (1977, p. 191). Kohlers for Niger (1977, pp. 45-46) and Berg for Upper Volta (1977b, pp. 102-03) present the results of plots of unlagged monthly spatial price differences minus transport costs. These detailed plots also show possibilities of high profits and losses and highly uncertain reversals of relationships, attributed to poor estimation of transport costs. Kohlers, however, presents annual average intermarket price differences with large standard deviations, but no transport costs data (1977, p. 44). Berg for Upper Volta concludes with unhappy caution: "Price

differentials [are] substantially greater than transport costs which might be interpreted as indicative of market imperfections" (1977b, p. 27).

Two researchers have used regression analysis to determine either the static relationship between retail and wholesale prices (Anthonio, 1968), or the relationship of prices in place *a* with those in place *b* (Ejiga, 1977). The constant is respectively the mark-up or the transport costs. In Anthonio's regressions if the constant approximates zero, a percentage mark-up is assumed whereas if it approximates 1.0, there is a fixed margin. For Ejiga the explanatory power of the independent variable and the statistical significance of the coefficient of variation indicate whether or not spatial price differentials are related as hypothesized. The coefficient of the mileage variable (a transport cost proxy) in the spatial price differentials is then compared with the coefficient of the mileage variables in a known regression of transport costs and mileage. Anthonio's regressions show that wholesale prices explain only 0.15 of retail prices in long distance trade, and fare no better with lagging (1968, p. 182-84). Ejiga's regressions show that "absolute price differentials and mileage are not randomly related," a conclusion reminiscent of sledgehammers and nuts. However, his data show that they are generally related in a weakly significant way, giving rise to the familiar and intractable problem in standard structure, conduct, and performance analysis of value judgments. D.I. Bateman (1976) and H.P. Breimyer (1973) in their methodological critiques conclude that there is no proxy for the analysis of profitability at the level of the firms comprising the market. The procedure generally used as a proxy for the firm is to personify towns and calculate profitability from the price data and survey or official data on costs of transport, storage, handling, and processing. Anthonio shows levels of static mark-up for six foodcrops varying between 8 and 160 percent, but later remarks on the occurrence of negative profits between regional centers for millet (1968, p. 180, Table 5.9, p. 247). Ilori calculates gross profit margins for traders of 12.1-14.6 percent of retail prices for urban traders and 10.2-12 percent for rural ones, but no cost data are given (1968, p. 226). There is no indication of returns for services performed and the period to which these profit margins refer (presumably a month). Since average prices are used and since Ilori has already mentioned high concentration and polarization in the structure of an otherwise competitive market, it is clear that profits can be high, and the research on profitability is too superficial to be at all meaningful or comparable with results elsewhere (1968, p. 193).

Finally, with reference to the analysis of margins over time, three points may be made. Firstly, if seasonal price fluctuations are discussed, it is more useful to calculate the percentage fluctuation of the preharvest maximum over the postharvest low rather than the variation about an average which the highs and lows have helped to create. It is not always clear in the literature which measure of seasonal price variability is used. Secondly, the relationship between postharvest price rises and storage costs is extremely sensitive to the interest rate selected for capital locked up in stock for which careful justification needs to be given; it is also highly sensitive to the quantity and costing of storage losses about which there is generally insufficient knowledge. Thirdly, to use urban prices for such calculations when storage does not take place in urban areas is problematical and needs at least some justification (see, for one example, Ejiga, 1977, p. 282, 219-24).

CHART 1.—REDISTRIBUTIVE AND TWO-LEVEL SYSTEMS*



*Source: William O. Jones (1968), "The Structure of Staple Food Marketing in Nigeria as Revealed by Price Analysis," *Food Research Institute Studies*, Vol. VIII, No. 2, p. 118.

Spatial and Temporal Refinements

The simplifying assumptions made in these analyses of price behavior over space and time are very crude. Jones, amongst other economists, in synthesizing the seminal theoretical work on hierarchies of central place systems of the German geographer, Christaller in 1933 (1966) with the empirical studies of Skinner (1964-65), has advanced our understanding of the likely complexity of the economic process over space. He distinguishes the pricing performance of a redistribution system from that of a two-level system (see Chart 1 and Jones, 1968, p.119):

This model has great appeal because it seems to accord with the qualitative information we have about the behavior of traders. It, too, should be susceptible to statistical test, but such a test must await more precise mathematical formulation of the model than we have been able to achieve.

Though advanced over a decade ago this refined model has only recently been mathematically formulated (Zemanian, 1977, 1979 a, 1979b), and its statistical testing has yet to be carried out. However, one of the major unrealities in Jones's model may be his assumption that centers may simply be classified into supplying and consuming settlements (see above), implying that supplying centers (a) do not consume and (b) only ever *export* the commodities in question. None of these analyses of correlations or of margins either in South Asia or in Africa considers the possibility of changes in the geographical direction of price formation.² All these marketing models assume a unidirectional flow of commodities from rural origin to urban destination as in Chart 2a. Here,

$$M = U_r - \left(\frac{1}{C}\right) R_p,$$

where M is the marketing margin, U_r is the urban price for rice, R_p is the price of rural paddy, and C is the milling conversion ratio.

Timmer in criticizing this assumption in a paper on rice marketing margins in Indonesia suggests firstly that, while retail prices in urban centers may be determined by paddy prices plus marketing costs in the postharvest period, in the preharvest off-season increases in urban retail rice prices may draw paddy from rural areas (1974). According to Timmer it is not correct to regard any one price as always functionally dependent upon another, as is done in all standard neoclassical texts on marketing economics (for example, Shepherd and Futrell, 1969; Kohls and Downey, 1972; and Tomek and Robinson, 1972).

He further suggests that in a model landscape with a rural producer market and an urban consumer market, prices will rise seasonally to reflect the normal costs of storage, as in Chart 2. When the urban price reaches $P_u(t_0)$ in Chart 2b), however, it levels out. This happens in Indonesia because of the government ceiling on retail rice prices (and presumably sufficient authority to control a black market). It may happen in any free or partially controlled market at a point at which it becomes profitable to import supplies from elsewhere. Meanwhile, rural hinterland prices rise to cover storage costs. As long as rural demand is significant, rural prices will rise to a point where M (minus milling costs) is reversed, and it is profitable to ship rice back from urban to rural areas. Until that point, (t_0 to t_i) in Chart 2b, the rural and urban markets will be dissociated. At harvesttime rural prices drop before urban ones. The margin between the rural (paddy) market and the urban (rice) market can be zero or negative or it may simply be less than M as in Chart 2c, (t_0 to t_i), for the simple unidirectional model to be invalidated. The fact that rice may not flow back physically does not alter the principle that the markets are dissociated.

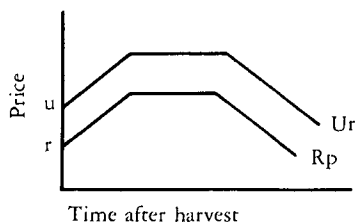
Timmer tested his hypothesis of a two-directional margin by taking for each month,

$$M_m = U_{rm} - \left(\frac{1}{C}\right) R_{pm},$$

² Except Jones's Gold-point model. *Editor*.

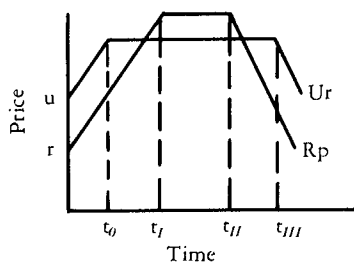
CHART 2.—MODELS OF PRICE FORMATION*

a. Unidirectional trade and price formation



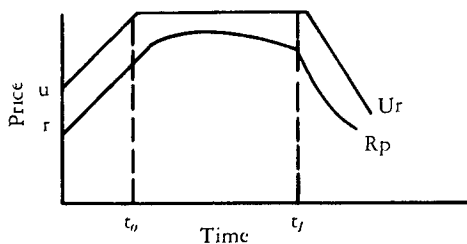
Timmer's model I

b. Two-way trade and price formation



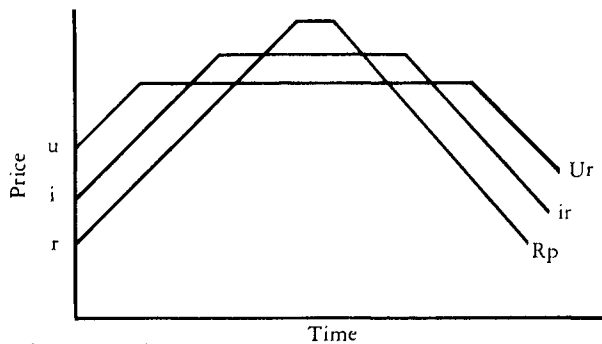
Timmer's model II

c. Unidirectional trade, temporary market dislocation



Timmer's model III

d. Three way trade



u = Urban consuming center
 i = Intermediate market
 r = Rural producer market center

*Source: C. Peter Timmer, "A Model of Rice Marketing Margins in Indonesia," *Food Research Institute Studies*, Vol. XIII, No. 2, 1974.

for rural and urban markets in every province of the Indonesian archipelago. He applied a regression analysis of variance to quarterly subsets of M_{ms} divided according to the agricultural calendar. This showed that every province resembled either Model II or III (Chart 2b and 2c), though he allowed that when a harvest was sufficiently large to depress the urban price at all stages below P_u , Model I (Chart 2a) might exist (1974, pp. 149-59).

The unidirectional model of price formation seems to have been taken for granted in both Southern Asia and Western Africa and is indeed the basis for calculations by parastatals of budgets in foodgrains supply. But Timmer's models in allowing for periods of dissociation and even for reverse price relationships might account for the large number of low or statistically insignificant coefficients found in correlation analyses. Moreover, the models call into question the interpretation of market competitiveness derived from the analysis of long-term average margins which may be self-cancelling.

Very detailed analyses for weekly wholesale prices for five types of paddy and rice in 10 towns over 100 weeks in 1972-74 in South India show that Timmer's hypothesis is likely to be substantially verified, though oversimplified, and unable to explain sudden uncertainties (Harriss, 1977, pp. 163-92, 1979). This South Indian analysis shows that price levels for both rice and paddy in the larger consuming centers of Tamil Nadu can and do fall below those of rural market towns both in a regular way over several weeks at a time and in an uncertain short term way. The mechanism by which the former trend is able to happen here in a free or partially controlled market implies imperfectly competitive performance. Three conditions are important. The first condition is that the urban center keeps its price levels low by importing from areas outside the local system which have lower costs of production or lower paddy purchase prices or have different dates of harvest. The second condition is that the urban price level is sufficiently low to enable rice to be exported to rural areas. The third condition is that these rural areas cannot import directly from the lower cost exporters located outside the rural-urban system. Then the urban commercial sector has a spatial monopoly control of trade.

Plots of price differences between settlements such as those presented by Hays and McCoy (1977, pp. 185-86), by Kohlers (1977, pp. 45-46), and by Berg (1977b, pp. 102-03) have been acknowledged as difficult to interpret. Berg, for instance, attributes this difficulty to unreliable data and suggests that with better data and more leisurely exploration of those data some interesting insights can be obtained (1977b, p. 105).

But these price plots firstly call into question the interpretive value of any calculations of profitability based on annual averages, secondly suggest the extreme likelihood of two-way or multidirectional trade mediated through urban centers with spatial monopoly control (attested using evidence on commodity flows for Ouagadougou by M.M. Ouedraogo, 1974, and L. Wilhelm, 1976, for North Tamil Nadu by Harriss, 1977, for South Tamil Nadu by A. Balasubramaniam, 1978). Thirdly, they suggest that if the price data were considered useful, then the testing of Timmer's hypothesis elsewhere would yield results within the neoclassical paradigm more valuable and interesting both in substance and to the cause of research than what has heretofore been attempted.

THE RELATIONSHIP BETWEEN DATA AND CONCLUSIONS, CONCLUSIONS AND POLICY

At the end of Jones's synthesis on the marketing of staple foodcrops in tropical Africa, having devoted consideration to a number of market imperfections, he states, "Our studies have clearly demonstrated that African traders, operating through freely organized markets, have the capacity to carry out all normal marketing functions in a reasonably adequate fashion" (1968, p. 272). Jones quotes Whitney approvingly to the effect that "The marketing system for foodcrops destined for consumption in Nigeria [actually Southeast Nigeria] was a remarkably well-articulated, self-adjusting mechanism, which certainly had the capacity to react to changes in the external economy" (1968, p. 272). The policy implication is therefore that the state should not intervene to replace or to regulate this system but only to provide improved physical infrastructure.

We shall examine the basis of the conclusion of the "structure, conduct, performance" school: that, in general, agricultural commodity markets are satisfactorily competitive given their environment. In so doing it should be understood that care has been taken to not distort argument by quoting out of context and thus reducing the constructive role of this critique.

Thodey states quite clearly in the summary of his dissertation, "The Western Nigerian staple food marketing system is operating rationally and is quite effective in performing its functions. . . . The return to such scarce factors as capital and entrepreneurship is high while that to labor is low. . . . Even though the marketing system is subject to large and frequent irregular price movements and its pricing efficiency is only moderate at best, it is still very responsive and adaptive" (1969a, p. ii). And, "Prices . . . are primarily the result of an interaction of supply and demand under competitive conditions" (1969a, p. 178). These conclusions follow observations in an earlier publication that "for the majority of producers, the very imperfect market information presently available to them, their need for cash, the small volume of their sales and the costs and effort in carrying unsold goods home from market tend to reduce their bargaining position at the time of sale" (1968, p. 57). "Cheating and deception are practiced to some extent by traders" (confirmed by Ilori, 1968). In some cases violence was threatened (Thodey, 1969a, p. 191).

In local markets Thodey notes some evidence of collusion, and discriminatory individualization of price formation. "Even the same trader has a wide range of (daily) prices according to haggling" (1968, pp. 178-79), a conclusion also supported for Ibadan by Ilori (1968). Thodey also notes evidence for oligopoly: "For all commodities a small number of large traders are influential. They have a profound effect on the price formation process . . . but act more as barometers than monopolists." Thodey mentions trade associations in his case study of Ibadan retail markets as a barrier to entry into trade and as facilitating price fixing in urban markets and elsewhere states "trader competition at producer markets is weak or non-existent" (1968, pp. 28, 55, 61).

As regards long distance interregional trade in Nigeria, he notes "some evidence of monopoly at long distance" (1968, p. 177), that the cowpea exchange system is "long distance, oligopolistic, more stable" (1968, p. 180), that "the

relatively few Yoruba traders involved in assembling and transporting cowpeas to Western Nigeria [from the North] mostly have large businesses and are not typical" (storing six to eight times more in quantity and twice as long as the average Ibadan trader) (1968, pp. 1, 4), but that long distance trade in rice and cowpeas is less concentrated because of fewer large traders than is that of other commodities which are highly polarized. Ilori also shows that in Ibadan the largest 8 percent of traders sell as much as the lowest 70 percent. Thodey's analysis of spatial price differences in Nigeria shows 50 percent exceeding double the costs of transfer and high volatility through time (1968, pp. 183, 185). Thodey's conclusions do not seem to follow logically from his data, and his interpretations seem confused.

Anthonio studying seven basic foodstuffs throughout Nigeria comes to the different conclusion that "markets are highly competitive at the retail and producer level but uncompetitive in the middle" (1968, pp. 156-57). He disregards evidence for oligopolistic practices of trade in retail markets. He identifies "oligopolist-oligopsonist-wholesalers" (5 percent of all intermediaries) dealing with entrepreneurs among whom the circulation of information was highly secret (1968, pp. 52-54, 84, 192-94). In the northern savanna region he says that "most of the middlemen come from the feudalistic wealthy class," with migrants from the south beginning to compete, an historical process analyzed and corroborated by Gana (1978, p. 172). His analysis of spatial price differences show wholesale prices "explaining" 0.15 of retail prices in long distance trade, but he found returns to storage more excessive than returns to transport which he interpreted as "signifying deplorable storage conditions" rather than excess profit-making on storage in trade (1968, pp. 82-84, 192-94). No indication is given of effective competitiveness in interregional trade in this study.

Gilbert's research on sorghum, millet, rice, and cowpea marketing systems for Kano in Northern Nigeria casts doubts on Anthonio's notion of highly competitive retail markets. He reports that in Kano city "there is not . . . any clear relationship between numbers of traders and the degree of competition" and "competition is frequently subdued" (1969, pp. 285-86). Gilbert further states that "large profits . . . which were encountered were associated . . . with such matters as a shortage of lorry transport stemming from . . . unsettled conditions" and "low volume of trade" in marginal areas, but that "marketing margins in the main bulking markets and consuming centers did not appear excessive . . ." (1969, pp. 287-88). He does not mention losses, however. His policy conclusion appears *ex cathedra*, namely, that "the further development of a market oriented agricultural sector in North Nigeria does not depend on improvements in existing marketing systems for staples, but on the scope for increased production of cash crops and for increases in non farm employment" (1969, p. 283). He goes on to suggest research and extension to increase the productivity of staples through high yielding varieties and fertilizers and implies that through this mechanism greater regional specialization and an increase in cash crops will result. (Gilbert, following West African practice, does not consider present staple food crops as cash crops.) The policy decisions are not discussed elsewhere in the thesis.

Hays, similarly to Gilbert, is also concerned with one northern town, Zaria, but he also analyzes the system at the regional level using data from 15 markets from five states. His conclusion is that intermediaries are generally productive and that marketing services are provided at reasonable costs given their technical environment. The income of marketing intermediaries is low relative to the services performed: "Organisation and conduct were typical of those necessary for competitiveness in the marketing system" (1976, p. 139), and "Markets are competitive but not integrated" (1975). The same conclusion appears in Hays and McCoy (1976). It is substantiated by observations that farmers had access to many buyers and that there were many intermediaries (up to seven, although Polly Hill in her review of Hays suggests that seven intermediary-long-chains were rarely used, meaning that the margin taken by each of the usually smaller number of intermediaries was larger than Hays has implied [Hill, 1976, pp. 85-86]). However, although there was a "high degree of competition" in the local subsystem, Hays' analysis suggests a lack of competition between subsystems. Even so, he defends it against charges of being monopsonistic. The "excessive price differences among urban markets did not result from planned manipulation under monopolistic or monopsonistic conditions. They were rather a result of imperfections inherent in the system which are due to certain characteristics of production and marketing making effective response to intermarket price differentials difficult" (1976, p. 139). Such facts are the existence of small sporadic surpluses, and poor price information and risk (Hays and McCoy, 1976). The explanation is "infrastructural." Hays shows that very high rates of return on money invested are possible, but is most unwilling to concede that they are actually made. He suggests that farmers make profits out of storage, but he does not tell us whether such farmers are also traders or whether urban traders finance rural storage. The relationships between producers and traders are neglected. Hill also reminds us that the same neglect applies to the mechanics of the marketing system in rural Hausaland where 90 percent of the Hausa population lives (1976, p. 86).

Finally, in relation to Nigeria, Ejiga's recent thesis on cowpea marketing ends with the expected conclusion that "the cowpea marketing system is performing relatively well given the constraints which are found in all developing countries. All the pricing efficiency analysis showed no evidence of monopolistic or large-scale exploitative practices" (1977, p. 366). However, his data belie his conclusions. He admits that the correlation analysis of price series data "gives inconclusive results" (1977, pp. 153-55), and though he shows in a series of regression analyses that absolute intermarket price differentials and mileage (a transport cost proxy) are not randomly related, they are also not at all strongly related in a statistical sense (1977, p. 309). The transport cost coefficient that emerges from his equation is ₦0.03 per ton mile but the actual rate is ₦0.056 so that it is clear that very large profits are being made over space.³ He tabulates data indicating large average profits on intermarket exchange, and where an average can conceal any distribution of profits, one is perhaps justified to be skeptical about the relationship between his data and his conclusions.

³ One *naira* (₦) equaled U.S. \$1.54 in December 1977.

With regard to cereals marketing in Niger, Kohlers concludes: "The evidence suggests that the general assumptions about the private sector [monopoly assumptions] are probably incorrect" (1977, p. 82). His statement that "the only restrictions on entry are government regulations and there is no evidence for excess profits" (1977, p. 24), does not square with his observation that "spatial price differences are not very conclusive. Quite frequently the price differences exceed the transport costs" (1977, p. 45), which he attributes to inappropriate calculations of transfer costs rather than to excess profit making by those who control the process of transfer. Furthermore, his observations about the profitability of storage and seasonal price fluctuations beg many questions. He claims that fluctuations are not excessive (1977, p. 52); he presents calculations of profitability in Niamey based on November and July prices which show large negative profits from storage for 60 percent of the time, then he presents very partial price data for 1973 and 1975 for the country as a whole (inadequate as a basis for generalization) which show that 40 percent of interseasonal price variations exceed 100-150 percent which is extremely high by Asian standards.

Berg in his summary of agricultural marketing policy and practice in the Sahel states both that there is little evidence for monopsonistic grain markets and that there is an acute lack of knowledge about how grain markets function (CILSS/Club du Sahel, 1977, Vol. 1, pp. 11-12, 14). In the Upper Volta case study he finds price integration over time unexceptionable, stressing lack of high annual price fluctuations while a quarter of his price fluctuations are more than 100 percent (Berg, 1977b). He finds that rural markets fluctuate more than urban ones, a pattern perfectly consistent with two-way rural urban trade via a settlement around which traders hold a spatial monopoly or with an hierarchical system through which urban centers receive their supplies from numerous areas with different harvest dates.⁴ Berg, however, blames bad data collection procedures for this problematical result (1977b, pp. 54-55). On performance through space he says, "A highly tentative analysis comparing millet price differences and transport costs between market towns shows price differentials substantially greater than transport costs, which might be interpreted as indicative of market imperfection" (1977b, p. 27). These results do not square obviously with the carefully phrased but very strong implication made earlier that markets are competitive, and farmers unencumbered by debt and free to participate in a market characterized by large numbers of traders and ease of entry (1977b, pp. 24-25).

CONCLUSIONS

Five general points are worth making at this juncture:

- 1.) The authors of the majority of economic analyses of agricultural marketing for West Africa and South Asia using structure, conduct, performance methodology (or some personalized variation of it) examined here display a serious lack of logical relationship between the data presented and the conclusions derived. In no other branch of economics does it seem possible to elevate so many value judgments to the status of scientific conclusions. There is a serious lack even of simple comparison of the results. To date and to my knowledge there has been no

⁴ Jones, personal communication, 1979.

comparative critique even of the crudity of that presented here.

2.) The conclusions to be drawn from the research are confusing, and attempts to synthesize by unifying consensus seem to be guilty of oversimplification. For one example the reader can refer back to the conclusions of Jones for tropical Africa, mentioned at the beginning of this paper. For another, Berg's attempt to summarize studies of the Sahelian states results in "there is little empirical evidence for monopsonistic grain markets" (CILSS/Club du Sahel, 1977, Vol. 1, p. 11), and he concludes that Hays' and Gilbert's research "indicate reasonably competitive rural grain markets, storage behavior in line with what one would expect from a prudent farmer and no severe rural indebtedness" (a subject actually underresearched by both writers) (CILSS, 1977, Vol. 2, p. 25). More research along structure, conduct, performance lines will only resolve this confusion if it is consistent. The past record reviewed here suggests the probability of this happening as unlikely indeed.

3.) The polar assumption that commodity markets are either perfectly (or effectively) competitive or monopolistic (an assumption reflected in any content analysis of vocabulary) allied to the equilibrium assumption that markets can be judged to be in a state of relative competitiveness for all plannable time, is clearly false. Jones writes skeptically, "the concept of the conditions for a perfectly competitive market is useful in determining how a market is inefficient, but it is not very helpful in determining how inefficient a market is" (1974, p. 16). One would like to add from experience, "where, when, and why." Indeed, evidence is being interpreted on the assumption that the theory is right: evidence must be squared with theory or explained away.

Transactions even using the simplest classification of formalist economic theory may take one of nine forms as shown by Wiles (1961) and then by Gross (1966, p. 63):

<i>Buyers</i>	<i>Sellers</i>		
	<i>One</i>	<i>Few</i>	<i>Many</i>
One	o,o	o,f	o,m
Few	f,o	f,f	f,m
Many	m,o	m,f	m,m

Agricultural marketing economics has been obsessed with the issue of whether markets in both an economic sense and in geographical aggregates of various sizes belong to the top left or bottom right corners of this diagram. Our unwillingness to locate rigorously an analysis of market behavior anywhere than in the boxing ring corners has been nothing short of cowardly. Also, given any one of these nine configurations of buyers and sellers and any distribution of concentration of trades and businesses, any distribution of profitability following from it, the use of aggregate (annual) average returns on money invested in trade tell us very little about the form of the process of resource extraction from agriculture and of its accumulation in trade. Further, the discipline has also very largely assumed the geographical linearity of trade. If the unidirectional assumption about trade is relaxed it follows that evidence on competition based on rates of return to trade,

based in turn on the relationships between annual average price differences between markets and average transport costs, is likely grossly to underestimate the profits made by two-way, or multidirectional, trade, profits which result from the differences which will be cancelled out in annual or in seasonal averages.

4.) A competitive market may be necessary, but it is clearly not sufficient for the maximization of productivity. To concentrate attention on the concepts of competition diverts attention from the structural interrelations between production, exchange, and consumption. To concentrate attention on the behavior of the commodity market (because of the relative ease of access of data on price, however poor) diverts attention from the interrelations between several commodity markets and between the circulation of commodities and that of money. These are essential to an understanding of the role that agricultural markets play in economic development including technological change in agricultural production.

5.) The fetishism of competition, however, is not entirely devoid of purpose, but its *raison d'être* is ideological: related to a *laissez-faire* aversion to the type of state intervention which replaces rather than regulates private commodity markets. The tenor of the policy recommendations following the conclusions in this school of theses is strongly anti-interventionist and pro-infrastructural. The recommendations stress the value of state intervention in sectors of the economy such as transport and communications, physical market sites, and such aspects of marketing as information, grading, standardization, processing, and packaging (see Thodey, 1969a, p. ii; 1968, pp. 64-76; Gilbert, 1969, pp. 276-77; Ejiga, 1977, p. 26; Hays, 1975; Jones, 1968, p. 98; Olatunbosun, 1975, pp. 111-20; and Helleiner, 1974, p. 69). More controversial reformist proposals include the creation of storage facilities and subsidized credit to larger traders or entrepreneurs for them to expand operations (Whitney, 1968; Anthonio, 1968).

These conclusions can only follow logically from a verdict on the operation of the commodity markets as essentially competitive. Even so, they fail to face questions of the means and the nature of policy implementation and of the form of ownership of the proposed infrastructure. Jones writes, "it probably could be demonstrated that we have got into trouble when we overlooked some of the assumptions underlying the models we were using. But in many instances more precise examination of the extent to which basic assumptions were satisfied would not have helped because, theory frequently does not predict the consequences of lifting assumptions" (1974, p. 23). When the assumption about market competitiveness is lifted, it does not follow that the infrastructural improvements will diminish the antisocial behavior that is elsewhere denied to exist.

For the present, therefore, a question mark must be placed not simply beside the methodology of conventional agricultural marketing economics in the structure, conduct, performance tradition, but also beside the history of the interpretation of the results.⁵

⁵ Any reader interested in the author's experiments with alternative methodologies may refer to "Cereals Surpluses in the Sudano-Sahelian States," ICRISAT, Hyderabad, India, 1978; "Going Against the Grain," *Development and Change*, 1979 for West Africa; and "The Role of Agro-Commercial Capital in Rural Development in S. India," *Social Scientist*, Vol. 7, No. 7, 1979; "Coarse Grains, Coarse Interventions," Overseas Development Institute, London, 1979, draft; and "Transitional Trade and Rural Development," Vikas, New Delhi, India, 1980, for India.

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