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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the author.

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I Introduction

In this note we argue that existing statistical studies of the intersectoral terms of trade in India are misleading since they typically focus on the terms of trade at controlled prices. Price and other controls in India are so extensive that black market rather than controlled prices should clearly enter any assesment of changes in the intersectoral terms of trade. However, we also argue that the problem with these studies is deeper than simply the use of black market or controlled prices. Because of the coexistence of black market and controlled prices an equilibrium process is present in the Indian economy in which controlled prices determine sellers prices and black market prices determine buyers prices. With risk neutral behaviour, black market prices are endogenously determined such that in equilibrium sellers at black market prices receive an expected price net of penalties equal to the controlled price which can be generated free of penalties by selling on 'white' markets. Equally, buyers at controlled prices face endogenously determined search costs such that their expected buying price including search costs is the black market price.

Because of the presence of this equilibrium process, we argue that in the presence of controls there is no single intersectoral terms of trade in India. Indeed, because of the real resource costs associated with controls, we argue the terms of trade of both sectors deteriorate relative to a no control environment. Thus, if the severity of controls increases over time the terms of trade of both sectors can worsen making most of the earlier discussion of this terms of trade issue in India irrelevant at best, and most probably totally misleading. We suggest that rather than engineer the intersectoral terms of trade in one direction or the other, policy makers in India should perhaps concentrate instead on reforming the system of controls and improving the terms of trade of both sectors.

Since independence in 1947, the direction of movement in the Indian terms of trade between the agricultural and industrial sectors has been discussed with great vigour by both academics and policy makers. The Indian economy is to all intents and purposes closed to outside market forces, and as a result the intersectoral terms of trade is especially important in the policy process. Industry is equated with the urban, moder sector; agricultural with the rural, tradition sector. Just as the debate on the North-South terms of trade following Singer (1950) and Prebisch (1950) has preoccupied discussion on international trade arrangements between developing and developed economies, the debate on the intersectoral trade seems to have played a comparable role in India. If growth, as with Singer-Prebisch, causes a deterioration of the terms of trade of the traditional sector, then policy measures to offset the associated redistributive effects are seen in India as justified. These can take the form of subsidies to agriculture, maintainence of the current tax free status of agriculture, and other measures. Equally, since extensive redistribution through tax transfer schemes is administratively infeasible, an improvement in the agricultural-industrial terms of trade in favour of agriculture is often seen as a substitute for redistribution. Since poverty is concentrated in rural areas, manipulating the terms of trade in favour of agriculture through price controls, subsidies and the like is a widely supported policy stance. Our analysis suggests that a new approach to these issues might be in order.

II Controls and the Debate on the Intersectoral Terms of Trade in India

A substantial amount of recent Indian literature, especially that on growth performance has focussed on the terms of trade between agriculture and industry as one of the key levers available to policy makers in India. In some

circles, it is also believed that the intersectoral terms of trade also reflect many deeper issues in India such as agrarian institutions, the pattern of land ownership, and the balance of political forces.[1] Most of this literature is statistical, and is, importantly, based on comparison of controlled (or official) prices in two sectors.

Some studies (such as Griffin (1974), Dantawala (1967, 1976), Mitra (1977), and Thamarajakshi (1969, 1977)) claim to show that between 1950 and the mid-1970s the terms of trade have moved in favour of the agricultural sector. Others, such as Mason (1966) and Lipton (1977) argue that farm prices in India have systematically been suppressed and the terms of trade has been disadvantageous to the farm sector resulting in slower agricultural growth. The most recent paper on this topic, Kahlon and Tyagi (1980), argues that the terms of trade have been persistently disadvantageous to agriculture from 1967 to 1978.

Those who subscribe to the first view usually argue that price policies of the Indian government and other incentives (subsidies) to the agricultural sector have pushed farm prices disproportionately upward. According to Mitra (1977), for instance, this has eroded the profitability of the industrial sector, retarded its growth[2], and benefited large farmers. It is also sometimes claimed that this has resulted in a skewed income distribution and a smaller market for industrial consumer goods.[3]

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[1] Kelkar (1977).

[2] "The profitability of the corporate sector has tended to stagnate during the past decade, and its own-account earnings have shrunk in real terms. This failure to generate resources for growth on the part of private industry can be causally related to the rise in input-costs following the continuous shift in the terms of trade: wherever product prices could not be adjusted fully in response to increases in unit costs or economizing was not possible in input-use, savings to all appearances fell." Mitra, op. cit., p.158. See also Chakravarty (1974).

[3] Sau (1974).

Most studies, except Thamarajakshi, and Kahlon and Tyagi, evaluate the intersectoral terms of trade using a direct comparison of the wholesale price indices published by the Economic Advisor's office for both agricultural and industrial products. Kahlon, et al and Thamarajakshi use their own weights, adjusting their data for the pattern of trade between the two sectors and for relative sector shares in exports and imports in order to arrive at alternative indices for the calculation of the terms of trade.

All these studies, however, use published reported prices even though for most industrial commodities prices are controlled and the differentials between controlled prices and black market (scarcity) prices are known to be substantial. A number of important industrial products such as steel, paper, cement, vegetable oils, fertilizer, and textiles are under one form of price control or another, and are actually sold at far higher prices than the controlled prices. The situation in agriculture is also affected by controls, but in a different way since for most price controlled agricultural products legal markets rather than black markets operate.

Elsewhere, (Mohammad and Whalley (1983)) in an analysis of rent seeking we have listed some of the more important controls which form part of the policy environment in India. We have grouped these controls in four broad categories--controls in the external sector, capital markets, goods markets, and labour markets. Here we are primarily concerned with the role of price controls on the intersectoral terms of trade. We argue that these controls have a potentially major impact which needs to be taken into account in any policy discussion of their importance in India.

III The Intersectoral Terms of Trade in the Presence of Controls

With this background, we now analyze the impact of price controls on the intersectoral terms of trade in an analytical framework. We consider two sectors A and I, and assume for simplicity that prices are free in agriculture but controlled in industry. Most price controls do not apply to marginal sales of agricultural products, and so as an approximation to the situation in India this may not be unrealistic. The effect of the price controls on I is to restrict output, and create an excess demand for the output of I at the controlled price. This in turn leads to a black market being established whose size is determined by the risk of detection and prosecution.

If sellers are liable for penalties if caught trading in the black market, under risk neutrality they equate the expected black market price to the certain controlled price. We assume that the probability of detection if a producer sells on the black market is a decreasing function of the ratio of sales at controlled to black market prices. Since there are shortages of industry output at the controlled prices, buyers find they can either buy with little or no search costs on the black market and pay higher prices, or incur the search or queuing costs and buy at controlled prices. Again the endogenous determination of the size of the black market results in expected buying prices gross of search costs being the same.

Thus if P_I = controlled industrial prices

P_I^B = black market industrial prices

P_A = agricultural price

ρ = probability of detection for sellers on black markets

γ = fine per unit of sales on black markets

S = search costs per unit of industrial product bought at controlled prices,

the following equilibrium conditions apply:

for sellers of industrial products

(1) $P_I = P_I^B - \gamma.\rho$

for buyers of industrial products

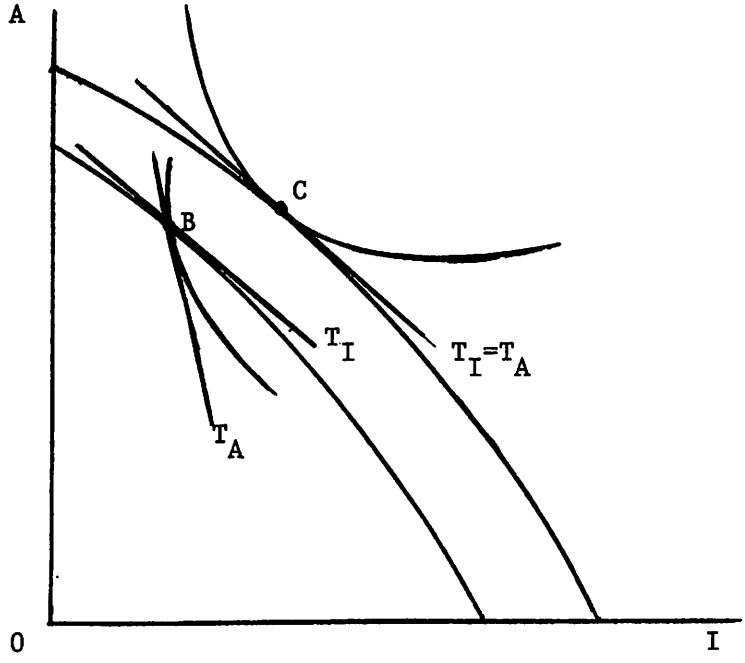
(2) $P_I^B = P_I + S$

Thus two different terms of trade are established. For the agricultural sector buying industrial products the terms of trade are $P_I^B/P_A = (P_I + S)/P_A$. For the manufacturing sector selling manufacturing and buying agricultural products, the terms of trade are $P_I/P_A = (P_I^B - \gamma.\rho)/P_A$. Two different terms of trade are established through the system of controls, both of which can deteriorate if controls become harsher over time. As an approximation to reality we assume that ρ is a function of the relative value of transactions for any seller at contolled and free prices. A trader engaging in relatively small transactions relative to his total business on the black market can go undetected, but a trader operating exclusively on the black market faces a higher probability of detection. Under this assumption the size of the black market in equilibrium will be consistent with the differential generated between buying and selling prices.

Diagramatically, this process can be represented as follows. Consider the same two commodity economy with production possibilities described by a production possibilities frontier. Point C represents an equilibrium in the absence of controls; the agricultural terms of trade T_A are the same as the industry terms of trade T_I. In the presence of controls the relative producer prices P_I/P_A determine production at a tangency between the PPF and the corresponding price line T_I. Consumer prices adjust endogenously to produce a tangency to the indifference curve through this production point giving the consumption prices T_A as the agricultural terms of trade. The production frontier shifts inwards due to the real income loss caused by the controls

Figure 1

Price Controls and the Intersectoral Terms of Trade



through search costs and the administration of penalties. The net effect is that the economy is worse off and the terms of trade of both sectors deteriorate.

The situation in Figure 1 can also be represented algebraically using CES functions for both preferences and the transformation frontier, in a way which provides a convenient way to quantify the effects involved.

Suppose we have the CES utility function

$$(3) \qquad (a_I^{\frac{1}{\sigma_c}} X_I^{\frac{\sigma_c-1}{\sigma_c}} + a_A^{\frac{1}{\sigma_c}} X_A^{\frac{\sigma_c-1}{\sigma_c}})^{\frac{\sigma_c}{\sigma_c-1}} \qquad \sigma_c>0$$

and the CES transformation frontier

$$(4) \qquad (b_I^{\frac{1}{\sigma_T}} X_I^{\frac{\sigma_T-1}{\sigma_T}} + b_A^{\frac{1}{\sigma_T}} X_A^{\frac{\sigma_T-1}{\sigma_T}})^{\frac{\sigma_T}{\sigma_T-1}} \qquad \sigma_T<0$$

Then in a no control equilibrium MRS = MRT = P_A/P_I

$$(5) \qquad MRS = MRT = \left(\frac{b_A}{b_I} \cdot \frac{a_I}{a_A}\right)^{\frac{1}{\sigma_c-\sigma_T}}$$

If, however, the MRT is set equal to δ through price controls on industry solving for X_A/X_I and substitution in the first order conditions, gives the MRS in the presence of controls as

$$(6) \qquad MRS = \left(\frac{b_I}{b_A} \cdot \frac{a_A}{a_I} \cdot \delta^{\sigma_c}\right)^{\frac{1}{\sigma_T}}$$

If values are known for both share parameters and elasticities, changes in the terms of trade for both agricultural and industrial sectors caused by controls can be calculated.

IV Some Calculations of the Impact of Price Controls on the Indian Intersectoral Terms of Trade

To illustrate our point that the terms of trade of both agricultural and industrial sectors can deteriorate in the presence of price controls on industrial products, we report results of some simple counterfactual equilibrium calculations using the CES formulation reported above. Following the procedures widely used in recent applied general equilibrium literature (see, for instance, Mansur and Whalley (forthcoming)), we assume that a simplified benchmark equilibrium data

set for India for 1979 - 80 represents an equilibrium in the presence of controls. We use this data, along with extraneously specified values of σ_T and σ_c to solve for the share parameters in equations (3) and (4). We then consider a removal of controls, and calculate the no control terms of trade along with the income loss to the economy.

Our data for 1979-80 are National Accounts data[1] on value added for industry and agriculture. From a GDP of R 939 bill; the former is Rs 268 bill and the later Rs 321 bill. Industry includes manufacturing, construction, utilities, railways, banking, and road transport, but importantly excludes public administration and defence. This explains why the industry GDP estimates do not total to National Accounts GDP. We adopt alternative elasticity values for σ_c and σ_T which we vary in sensitivity analysis.

Our procedure is to assume a MRS of 2.0 and MRT of 1.0 in the presense of controls. This is in Mohammad and Whalley (1983) which, in turn, draws on Bhagwati and Srinivasan (1975) and Minhas (1975) where the suggestion is made that black market prices for industrial products may be double the controlled prices. Choosing units for outputs such that producer prices are unity in the equilibrium under controls, the value of δ along with the solution for MRS can be used to solve the share parameters, b_i, in (4). These can then be used to solve for a_i from (5) given that MRS under controls is known. With all parameters determined, the MRS with no controls in the counterfactual equilibrium, equation (6), can be solved for. A Hicksian equivalent or compensating variation provides our estimate of the real income loss from controls under the assumption that both search costs and penalties collected are real income losses. The former are real resource costs of consumers. The latter involves the strong assumption

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[1]National Accounts Statistics 1970-71 to 1979-80, c.s.o. February 1982.

that penalties collected equal administration costs of controls.

Results are reported in Table 1. While perhaps largely illustrative these results nonetheless show that the terms of trade of both sectors improves from an abolition of controls. More of the gains go to the agricultural sector if $\sigma_c > \sigma_T$, and vice versa if $\sigma_c < \sigma_T$. A striking feature is the size of the real income gains from the elimination of controls, which in these calculations can easily be in the order of 50% of GDP. While careful calculations would need to be done in a more ambitious applied general equilibrium study, our main point as to the potential for both sectors to improve their terms of trade is nonetheless illustrated by these calculations.

V Conclusion

In this paper we reexamine the issue of how the intersectoral terms of trade in India between industry and agriculture may have been changing through time, and the associated policy implications which follow. We argue that existing statistical studies of this issue are possibly quite misleading not only because they use controlled rather than black market prices, but because in the presence of controls the terms of trade of <u>both</u> sectors can deteriorate. This is because in an equilibrium process in the presence of controls, black market arise. Buyers prices on black markets equal controlled prices plus endogenously determined search costs of transactors on controlled markets. Sellers prices on black markets, less the expected penalty if detected, equal sellers prices on controlled markets. Thus, black market prices are expected buying prices on either market, and controlled prices equal expected sellers prices (net of penalties) on either market. As a result a real income loss results from controls. We illustrate our point concerning movements in the intersectoral terms of trade using some counterfactual equilibrium calculations for India for 1979-80.

Table 1

Counterfactual Equilibrium Simulations and the Intersectoral Terms of Trade

Elasticity Configuration		With Control Terms of Trade		No Control Terms of Trade	Income Gain From Removal of Controls Rsbill. 1979 - 80	
σ_T	σ_c	MRS	MRT	MRS = MRT	CV	EV
-.5	.5	2.0	1.0	1.41	549	677
-.5	1.5	2.0	1.0	1.68	615	686
-.5	3.0	2.0	1.0	1.81	647	690
-1.5	.5	2.0	1.0	1.19	504	687
-1.5	1.5	2.0	1.0	1.41	571	714
-1.5	3.0	2.0	1.0	1.58	629	732
-3.0	.5	2.0	1.0	1.10	486	691
-3.0	1.5	2.0	1.0	1.26	542	733
-3.0	3.0	2.0	1.0	1.41	601	767

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