Journal of Development Economics 10 (1982) 31–45. North-Holland Publishing Company

TERMS-OF-TRADE POLICY IN A MODEL WITH NON-PRODUCED MEANS OF PRODUCTION*

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Received October 1980, final version received April 1981

Terms-of-trade policies between agriculture and industry are analysed in a two-sector Sraffian model. If both sectors use only produced means of production and labor, it can be shown that an improvement in agriculture's terms of trade always leads to higher profits in agriculture. However, when non-produced means of production are introduced an exogenous increase in the relative price of agricultural commodities may cause the rate of profit in agriculture to increase, remain constant, or even decrease. Two preconditions are identified for the case in which a favorable movement in agriculture's terms of trade decreases that sector's profit rate. First at least one quality of competitively priced land must be scarce relative to the total output required. Second, the initial, economy-wide rate of profit must be positive. Finally, the effect of an input subsidy used in conjunction with terms-of-trade policy is considered. It is shown that under certain conditions reducing the price of production inputs can also cause profits to fall and rents to rise in agriculture.

1. Introduction

In the past decade, development strategies to promote growth and accumulation in agriculture have placed increased emphasis on the role of price policy and 'producer incentives' [e.g., see Schultz (1978)]. Raising agricultural prices, it is argued, will increase profits leading to more investment and better utilization of scarce resources, thereby increasing the output and productivity of the farm sector. Recent literature questioning the efficacy of price policy has focused on 'structural' obstacles to investment in agriculture [Griffin (1974), Cleaver (1972)]; on the macroeconomic consequences of agricultural prices on savings rates and effective demand [Chichilnisky and Taylor (1980)]; as well as upon the regressive distributional impacts of higher food prices [Mellor (1979)]. The question investigated in this paper, on the other hand, is in many respects

*Interpretation and clarification of many of the results of this paper was greatly facilitated by the comments of Margaret Andrews, Alain de Janvry and other members of U.C. Berkeley Terms of Trade Seminar. Giannini Foundation Working Paper no. 154.

0304–3878/82/0000–0000/$02.75

more fundamental; that is, can it be shown that an improvement in the terms of trade for agriculture will always lead to higher profits in that sector?

Using a simple two-sector, Sraffa-type model incorporating both heterogenous capital goods and non-produced means of production, this paper explores the impact of exogenously induced changes in the relative price of agricultural commodities on sectoral rates of profit, wages and rents. A somewhat surprising result of this analysis is that in economies with positive profit rates, an improvement in agriculture's terms of trade may lead to an increased, unchanged or even a decreased rate of profit in agriculture, depending upon the structural parameters of the economy. The essential conditions precipitating a fall in agricultural profits following a rise in the relative price of its products are found to be a competitive market for scarce land of a particular quality and a positive initial rate of profit in agriculture. The fact that this perverse profits response can only occur in economies with positive profit rates indicates that these findings may be interpreted as yet another instance in which a positive rate of profit acts as 'turnover tax', distorting the ability of prices to function as 'efficient allocators' of resources [a phenomenon well documented in the trade literature, see Steedman (1979) or Samuelson (1975)]. Hence, to the extent that investment is related to changes in the rate of profit among sectors, the conventional prescription of higher prices as an antidote to agricultural stagnation must be qualified accordingly.

We begin by reviewing the impact of price changes on the relative profitability of agriculture and industry in the case where neither sector employs non-produced 'land' inputs. The relation between terms-of-trade shifts and sectoral profit rates is shown to be quite well behaved under these circumstances. We then introduce land into the model using two different specifications corresponding to the well-known cases of intensive and extensive rents. It is found that with intensive rents, an improvement in agriculture's terms of trade may increase rents but decrease profits on produced capital goods. With only extensive rents however, this perverse profits response cannot arise. In the final section of the paper we examine the impact of an input (e.g., fertilizer) subsidy which is used in conjunction with terms of trade policy.

2. The model

We assume throughout that the economy consists of two sectors, industry and agriculture. Land is required in agriculture, but for the present we assume that its rent is zero or, equivalently, that its price is determined exogenously. This assumption will be relaxed below. No fixed capital is required by either sector, although it would be easy to amend the model to allow durable capital equipment to be produced jointly with primary commodities in each period. Finally, there is no presumption that the magnitude of capital can be measured independently of the rate of profit and the level of wages.

Thus the price determining equations can be defined as follows: Let the elements of the matrix $A=(a_{ij})$ $(i,j=$ agriculture, industry) denote the amount of the ith commodity to produce one unit of commodity j. $P=(p_j)$ is a row vector of prices, $L=(l_j)$ is a row vector of direct labor requirements and w is the uniform money wage rate.[1] With r_i denoting each sector's profit rate, the price equations can be written:

$$p_1=(1+r_1)(p_1a_{11}+p_2a_{21}+wl_1), \tag{1}$$

$$p_2=(1+r_2)(p_1a_{12}+p_2a_{22}+wl_2), \tag{2}$$

where wages are assumed to be paid in advance.

So specified, the model is a simple two-sector Sraffian system except for the fact that wages are part of the total capital advanced (this assumption is one of pure convenience and affects none of the fundamental arguments of this paper). However, whereas the standard Sraffian analysis would investigate the effects of changes in the distribution of income on relative prices, here we turn the model on its head and ask how setting relative prices (via terms of trade policy) influences sectoral profits, rents and wages. The basic assumption of fixed money wages and given output levels implicit in the Sraffian approach is well suited to an analysis of the short-run impacts of changes in price policy since profits and rents tend to adjust much more rapidly than the structural parameters of the economy (especially in agriculture where the adjustment of outputs and production methods is characterized by long lags).

The distinctive feature of this model then is that the price of the agricultural commodity, call it wheat, relative to the price of the industrial commodity (fertilizer) is taken as given. This price ratio is the government's policy instrument for regulating the terms of trade between agriculture and industry. As the terms of trade change, the two sectoral profit rates may converge or diverge, depending upon their initial levels. The classic objective of terms of trade policy has either been to (1) bring about an increase in the agricultural rate of profit in an effort to stimulate investment and productivity growth in that sector, or (2) to increase the rate of growth in industry by lowering the cost of wage goods and raw material inputs. The choice between these two objectives depends of course on the specific political and economic circumstances encountered by the agencies of the state. In particular, this choice is likely to be influenced by the response of money wages to changes in food prices, by the degree of dependence on foreign markets and by the overall objectives of development planning in that country.

In fig. 1, we plot eqs. (1) and (2) with the sectoral profit rates r_1 and r_2 as a

[1]Extension of the model to the case of fixed real wages is straight-forward and alters few of the arguments to follow (see footnotes 7 and 8).

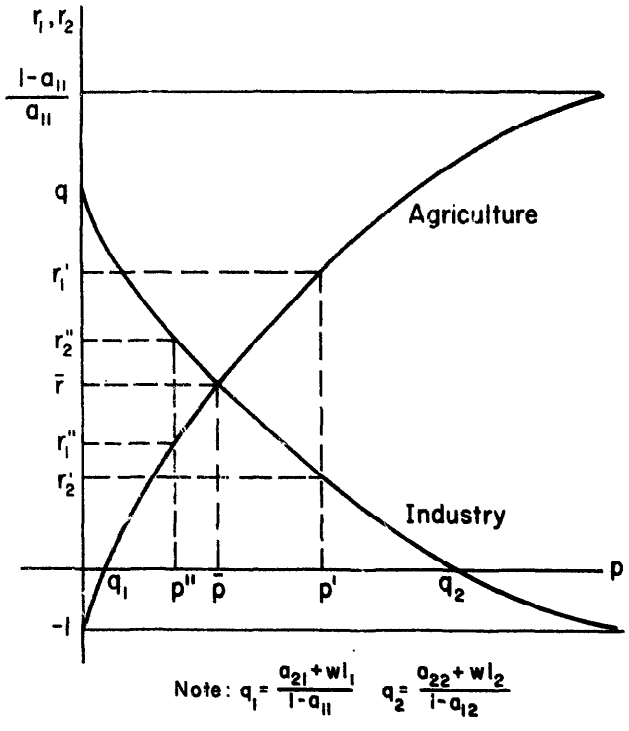

Fig. 1

function of the terms of trade p with the price of fertilizer as the numeraire,[2] $\bar{p}$ and $\bar{r}$ are the equilibrium market price and (equal) profit rate that would obtain if there were no terms-of-trade intervention by the government. The terms of trade can only be manipulated over the range q_1 to q_2, lest the rate of profit turn negative in one sector. At p' price policy has shifted in favor of agriculture as agriculture's rate of profit has risen to r_1'. The rate of profit in industry has fallen

[2]The slope, curvature and limit as $p \to \infty$ of eqs. (1) and (2) are determined as follows (p_2 is taken as the numeraire): Let

$$C_1 = (pa_{11} + a_{21} + wl_1), \qquad C_2 = (pa_{12} + a_{22} + wl_2), \text{ so that}$$

$$r_1 = (p - C_1)/C_1, \quad r_2 = (1 - C_2)/C_2, \text{ then}$$

$$dr_1/dp = (a_{21} + wl_1)/C_1^2 > 0, \qquad dr_2/dp = -a_{12}/C_2^2 < 0. \qquad \text{(1.1) and (1.2)}$$

The first curve approaches an asymtote given by

$$\lim_{p \to \infty} r_1 = (1 - a_{11})/a_{11} \quad \text{while} \quad \lim_{p \to \infty} r_2 = -1.$$

Finally, the curvature is easily established from (1.1) and (1.2):

$$d^2r_1/dp^2 = \frac{-(a_{21} + wl_1)(2C_1 dC_1/dp)}{C_1^4} < 0, \qquad d^2r_2/dp^2 = a_{12}(2C_2)dC_2/dp > 0.$$

to r'_2, indicating that a transfer of income has taken place from industry to agriculture. One would expect therefore that the rate of accumulation would rise in agriculture and fall in industry.

Similarly, if the state sets the terms of trade at p'', the rate of profit in industry rises relative to that in agriculture. This 'cheap food' policy transfers income from agriculture to industry with presumably corresponding effects on sectoral investment rates.[3]

Note that while an improvement in agriculture's terms of trade also reduces real wages measured in terms of food, industry does not benefit from lower real wages as the entire surplus transfer generated by price policy benefits agricultural producers.

Under a price regime favorable to agriculture, investment in new methods of production causes agriculture's technical coefficients to fall shifting its price–profit curve, shown in fig. 2, upward from AA to A_1A_1. The opposite phenomenon occurs in industry, where as investment lags, industry's technical coefficients rise; or what amounts to the same thing, no longer fall at the previous rate. Thus underinvestment in industry (shifting its curve from II to I_1I_1 in fig. 2) along with more rapid investment in agriculture works to intensify the profit rate disparity. Industry lapses more deeply into stagnation while agriculture leaps ahead.

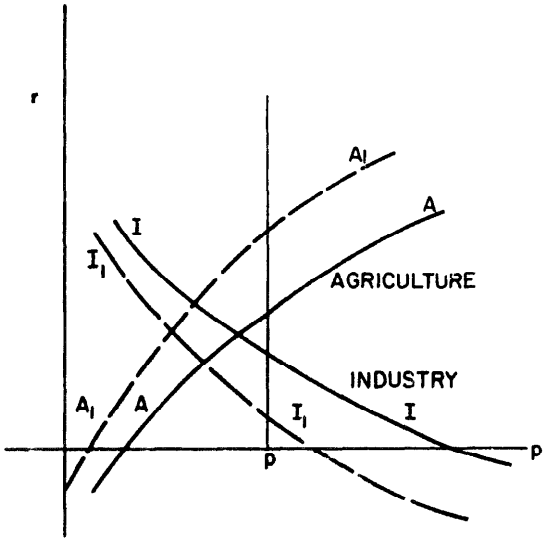

Fig. 2

If the government maintains terms of trade p shown in fig. 2, a crisis can result. If output expands with new investment in agriculture while industry stagnates, the

[3]Note that this 'cheap food' policy only involves setting one price of wheat for both consumers and producers (i.e., no consumer food subsidies are considered in this discussion).

state will come under increasing pressure to readjust relative prices. If money wages do not increase, reduced real wages may create additional political pressures. But of course, even if the government is finally forced to roll back food prices, it can still take credit for a successful terms of trade policy to the extent that investment has improved productivity and incomes in agriculture.

What is most significant about this model is the *possibility* of a successful terms of trade policy in the sense that raising the relative price of agricultural commodities *always* leads to higher profits (and presumably higher output) in agriculture. In the following section, on the other hand, an equally plausible model is presented in which an improvement in the terms of trade for agriculture does *not* increase the rate of profit in that sector. The essential feature of this new model is a competitive market for agricultural land.

3. Terms of trade policy and land rents

There are two general approaches to incorporating non-produced land inputs into our model corresponding closely to the Classical distinction between extensive and intensive rents. In the former case, two or more qualities of land are distinguished, each of which define an alternate agricultural production method. Further, at least one quality of land is assumed to be in excess supply such that its rent is zero or is fixed exogenously.[4] In the intensive rent case all land is assumed to be of a single quality[5] and in short supply (thus there may be no land which earns a zero rent). In both approaches land is not a produced good[6] and therefore has no process to determine its price. In an economy with n commodities and k qualities of land there will only be $n+k-1$ processes to determine the value of $n+k$ unknowns (including the endogenous distribution variable). The additional equation required to close the extensive system is

$$\prod_{i=1}^{k} \rho_i = 0,$$

where ρ_i is the rent paid to the owner of ith quality of land. This equation simply restates our assumption that one quality of land receives a zero rent, implying that the product of the rental rates will also be zero.

For intensive rents, the price determining system is closed by the existence of two alternate wheat producing processes competing for a single quality of land.

[4] *Which* land is scarce depends upon the money level of profits and wages and therefore is not an a priori assumption of the model [Montani (1975)].

[5] Of course it is not necessary to assume all land in the economy is homogenous. All that is required is that land be scarce to the extent that two processes with different land-output ratios may be observed operating on the same quality of land in equilibrium. The assumption that only one quality of land is available is made here only for convenience.

[6] It is only when land is unaffected by the production process that rents are analytically distinguishable from other prices. For a full discussion of transformable resources and the joint product treatment of land inputs see Gibson and McLeod (1981).

In fact, the very presence of two different methods of production operating side by side on the same quality of land implies that land is scarce since if that quality of land were not scarce, all wheat would be produced using one method, the cheapest. Note that land is scarce in this model only because the land-output ratio of the cheapest method is such that the total demand for wheat cannot be met using all of the land of that quality. Hence the effective demand for wheat can only be satiated by introducing a process which produces more wheat per acre at a higher unit cost [Sraffa (1960, p. 76)].

We can now rewrite our price determining equations in a general form in which both extensive and intensive rents appear as special cases. Taking the price of fertilizer as the numeraire so that $p = p_1/p_2$ we have

wheat

$$\begin{aligned} &p = \pi_1 C_1 + \rho_1 t_1 \quad \text{with either} \quad \rho_1 = \rho_2 \quad \text{(intensive rents), or} \\ &p = \pi_1 C_2 + \rho_2 t_2 \qquad\qquad\quad \rho_1 \rho_2 = 0 \quad \text{(extensive rents),} \end{aligned} \tag{3}$$

fertilizer

$$1 = \pi_2 C_3,$$

where[7]

$$C_j = (pa_{1j} + a_{2j} + \bar{w} l_j), \qquad j = 1, 2, 3,$$

$$\pi_i = (1 + r_i), \qquad i = 1, 2.$$

The variables of the system are ρ_1, ρ_2, r_1, and r_2. Note that since the terms of trade p are taken as given, the system decomposes such that ρ_1, ρ_2 and r_1 can be determined independently of r_2. In fig. 3 we have depicted graphically several possible solutions for rents and the agricultural rate of profit. Written in vector notation the first two equations of (3) for the intensive case (i.e., when $\rho_1 = \rho_2$) become

$$[p\ p] = [\pi\ \rho] \begin{bmatrix} C_1 & C_2 \\ t_1 & t_2 \end{bmatrix},$$

where for notational convenience, $\pi = \pi_1$.

As shown in fig. 3a, profits and rents are the scalar multiples of the rows of the matrix

$$\begin{bmatrix} C_1 & C_2 \\ t_1 & t_2 \end{bmatrix}$$

[7] If money wages were thought to depend upon the price of wheat, we would have $C_j = (pa_{1j} + a_{2j} + pb_{1j})$ $(j = 1, 2, 3)$, where b_{1j} represents the amount of wheat per unit of output consumed by workers in sector j.

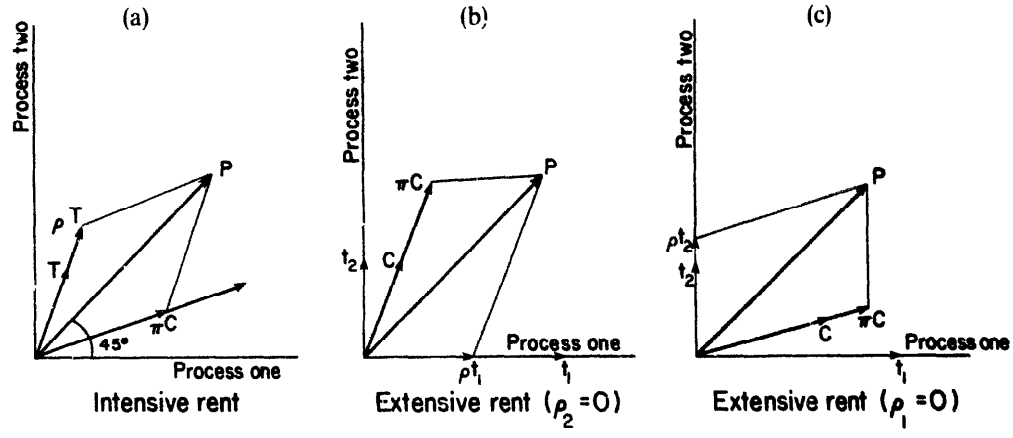

Fig. 3

which locate the vector P. If P lies in the convex cone formed by the vectors $T=(t_1\ t_2)$ and $C=(C_1\ C_2)$, then both profits and rents are positive. In the extensive case, shown in figs. 3b and 3c the relative cost vector C has been drawn such that the rent to one quality of land is zero causing only one component of the vector T to enter the basis for P with a positive multiplier. In fig. 3b only the horizonal component of T, t_1, is relevant for the determination of profits and rents. Finally, in fig. 3c the cost vector has been drawn such that the rent to land of the second quality, t_2, is positive. Note that had vector $(t_1\ 0)$ been used as part of the basis for P, its multiplier would have been negative. Since changing the terms of trade, p, may shift the direction of C, it is possible that a shift in the terms of trade will change the quality of land which is considered scarce (and therefore obtains a positive rent).

4. Comparative statics

We now consider the effect of parametric variations in the terms of trade on profits and rents. Differentiating the first two equations of (3) with respect to p we have

$$[1-\pi a_{11}\ \ 1-\pi a_{12}]=[\pi_p\ \rho_p]\begin{bmatrix} C_1 & C_2 \\ t_1 & t_2 \end{bmatrix}, \tag{4}$$

where $\pi_p=\mathrm{d}\pi/\mathrm{d}p$ and $\rho_p=\mathrm{d}\rho/\mathrm{d}p$. Several possible solutions to (4) are shown in fig. 4 where we have represented the vector $[1-\pi a_{11}\ 1-\pi a_{12}]$ as S. The components of S are the net outputs of wheat for each process *less* the profit markup on wheat used in the production of wheat.[8]

[8]If we assume fixed real wages in terms of food, the S vector would become (using the notation of footnote 7): $S=(1-\pi a_{11}-\pi b_{11},\ 1-\pi a_{12}-\pi b_{12})$.

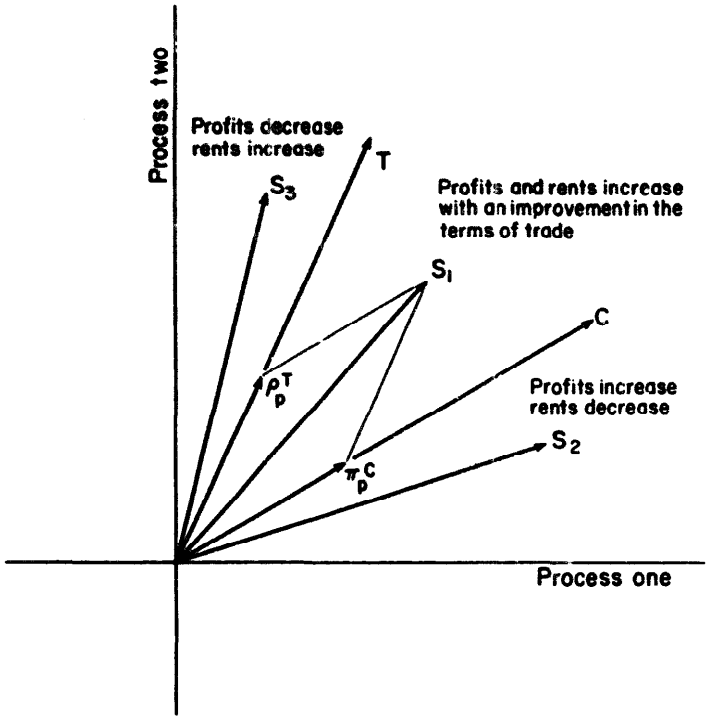

Fig. 4

The convex cone formed by C and T now divides the first quadrant of fig. 4 into the three regions into which S may fall. When $S=S_1$, both profits and rents increase with a favorable shift in the terms of trade (i.e., both multipliers π_p and ρ_p required to locate S are positive). If $S=S_2$ on the other hand, profits increase with a rise in p, but rents fall. Finally, if S should fall into the region which includes S_3, an improvement in the terms of trade for agriculture will cause profits to fall in agriculture (while rents increase).[9]

The consequences of this last possibility seem to us to be quite dramatic. A policy designed to increase capital accumulation in agriculture can actually cause profits to fall in agriculture whenever the slope of the vector S is greater than that of T; that is if[10]

$$(1-\pi a_{12})/t_2 > (1-\pi a_{11})/t_1. \tag{5}$$

[9]Depending upon the particular theory of capital markets or profit-investment linkages one adopts, it may be the change in *relative* rather than absolute profit rates which affects the pace of capital accumulation among sectors. For both relative and absolute profit rates to fall in agriculture, the following additional condition must be fulfilled [using the notation of eq. (3) above]:

$$|-a_{13}/C_3^2| < |[t_2(1-\pi a_{11})-t_1(1-\pi a_{12})]/(t_1C_2-t_2C_1)|. \tag{3.1}$$

In other words, when $|d\pi_2/dp| < |d\pi_1/dp|$ then profits will fall more rapidly in agriculture than in industry following an improvement in the terms of trade.

[10]Note that all discussion of the relative slope of the vectors S and T depends on our assumption that process two uses more land per unit of output than process one.

The question which remains to be answered is, of course, whether we would ever expect to find two alternative processes conforming to eq. (5) operating on the same quality of land. In other words, would rational, profit-maximizing capitalists ever adopt a higher cost process for which output per acre (net of wheat inputs marked up by the rate of profit) was lower? Recall that our original justification for the coexistence of two alternative processes was that the output of the cheapest process was insufficient to meet total effective demand even when all available land of that quality was employed by that process. Since the demand for wheat was not satiated, it was necessary to induce capitalists to adopt a second method which was capable of producing more wheat per acre. If this new process happened to have higher costs, then both processes would coexist in equilibrium and rents would be positive. While the theoretical details of this transition between land using techniques are at best preliminary, it does not seem unreasonable to assume that at some point the price of wheat must have risen to induce capitalists to use the new higher cost method.

But note that no matter how the transition is triggered, the end result must be a higher level of *net* output in order to satisfy the increase in effective demand. If net output of wheat does not increase with adoption of the new technique, the price of wheat would continue to rise. No new equilibrium price system could be attained until the excess demand which caused the original disequilibrium is satiated.

We can thus conclude that only when the rate of profit is positive can an improvement in the terms of trade for agriculture lead to a fall in the agricultural rate of profit. To see why this is the case let the rate of profit be zero (i.e., let $\pi = 1$). Now note that without a positive rate of profit S cannot lie above the T vector in fig. 4 since this would imply

$$(1-a_{12})/t_2 > (1-a_{11})/t_1.$$

That is, the high-cost process (one) produces less net output whenever the vector S lies above T in fig. 4. Hence, no new equilibrium could obtain until another process was introduced which, in combination with the original low cost process (two), could produce the total amount of wheat required by the new level of effective demand.

Now assume that the zero-profit $S(\pi = 1)$ vector does not lie above the T vector but instead falls within the cone formed by T and P in fig. 3a. In this region, an increase in π always shifts S toward the vector T. In fact, it is possible that for some positive profit $S(\pi > 1)$, an autonomous increase in the rate of profit could push S into the region above T.[11] At this higher profit rate this particular technique

[11]By 'autonomous' shift we mean a change in agriculture's profit rate *not* induced by agricultural price policy since a change in agriculture's terms of trade could not push S into the region above and including T in fig. 4. The implications of the fact that π_p becomes zero when S becomes colinear with T are discussed further below.

meets both criteria necessary for the perverse profits response to occur. First it is a viable equilibrium technique because the higher cost method does produce more physical net output of wheat [that is, its $S(\pi = 1)$ vector lies below T in fig. 4]. And second, its positive-profit-rate S vector lies above T, implying that profits in agriculture will fall with an increase in p.

We conclude therefore that it is apparently the existence of a positive profit rate in agriculture which authorizes the perverse response of profits to terms of trade policy. Since capitalist economies generally require positive rates of return to capital, we further conclude that this perverse profits response is at least a possible outcome of agricultural price policy. Further studies would of course have to be undertaken to determine the historical/empirical incidence of these conditions.

A second interesting implication of this model is the possibility of a fixed-profit rate equilibrium 'trap' in agriculture. Suppose the process which saves on land inputs also uses more wheat per unit of output. If we again assume that S initially lies between P and T (fig. 3a), then an increase in P will shift S toward T as the rate of profit increases. But as S becomes nearly colinear with T it is clear from fig. 4 that $\pi_p \rightarrow 0$. In other words, at this particular profit rate, changes in the relative price of agricultural commodities have virtually no affect on the rate of profit in agriculture. In this modified 'land-price treadmill', further improvements in agriculture's terms of trade cause land rents to increase but leave profits unchanged. Only a change in technique or the wage rate can break agriculture out of this fixed-profit equilibrium.

Turning to the case of extensive rents, we find that profits will always increase with an improvement in agriculture's terms of trade. This proposition is demonstrated in fig. 5. Since both the non-negativity conditions for prices and rents and the derivatives with respect to changes in the terms of trade can be studied in the same diagram, it is easy to see why the perverse profits effect cannot arise. Note that fig. 5 has been drawn such that only the quality of land used in the second process (t_2) is scarce (T lies along the vertical axis). To insure that rents and profits are positive, we know that P must fall within the convex cone formed by C and T. In addition, we know that for the derivative π_p to be negative, S must not only lie outside the cone formed by C and T, but its slope must be greater than that of the vector T. As shown in fig. 5, these restrictions imply that S must fall in the second quadrant, implying that the net after profit output of wheat must be negative. Since processes yielding a negative-after-profit output would never be adopted, we conclude that in the case of extensive rents profits must always increase with an improvement in the terms of trade (although rents may increase or decrease).

This difference in the behavior of rents in response to price changes is not surprising in that it illustrates a fundamental difference between the role of land in the extensive case and its effect on prices in the intensive rent model. While Sraffa has defined land as non-basic in both instances, we have noted previously that

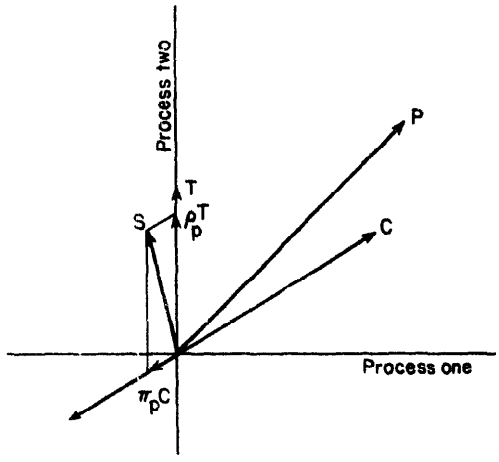

Fig. 5

only the extensive rent specification renders the price–rent system decomposable [Gibson and McLeod (1981, p. 5)]. This decomposability implies that prices and profits in the basic system (both wheat and fertilizer are basic commodities in the above model) can be determined independently of the price of land (i.e., rents are 'price determined'). Thus in the extensive case we would not expect rents to influence profits unless land entered the basic system with a positive price. Indeed, the only land which enters the all-basic system, that used in the marginal process, has a price of zero by assumption. In the intensive rent case, the price–rent system is not decomposable and, as we have seen, prices, profits and rents are determined simultaneously.

5. Input subsidies

In addition to setting the relative price of agricultural output, policy strategies to improve agriculture's terms of trade often involve complementary efforts to reduce the price of key production inputs. Examples of this type of intervention would include fertilizer subsidies or manipulation of exchange rates to reduce the cost of imported machinery. Here we are concerned only with instances in which input subsidies are used in conjunction with terms of trade policy; that is when the price of wheat is set exogenously.

Consider the case in which the government buys the input at its market price and then resells it to agricultural users at a lower price. Let λ represent the ratio of the subsidized price to the market price (thus $\lambda \leqq 1$; and the subsidy increases as λ decreases). Since the subsidy is granted to agricultural users only eqs. (3) become

$$C_j = (pa_{1j} + \lambda a_{2j} + wl_j), \qquad j = 1, 2,$$

$$C_3 = (pa_{13} + a_{23} + wl_3),$$

and as before,

$$p=\pi C_j+\rho_j t_j, \qquad j=1,2, \quad \rho_1=\rho_2 \text{ (intensive rents)},$$

$$1=\pi_2 C_3.$$

System (6) remains decomposable with respect to the determination of π and ρ, so we need differentiate only the first two equations with respect to parametric change in the subsidy rate λ to obtain

$$[\pi_\lambda \ \rho_\lambda]\begin{bmatrix} C_1 & C_2 \\ t_1 & t_2 \end{bmatrix}=[-\pi a_{21} \ -\pi a_{22}], \tag{6}$$

where $\pi_\lambda=d\pi/d\lambda$ and $\rho_\lambda=d\rho/d\lambda$. Again, the interpretation of eqs. (6) is greatly facilitated by the graphical representation of their solution depicted in fig. 6.

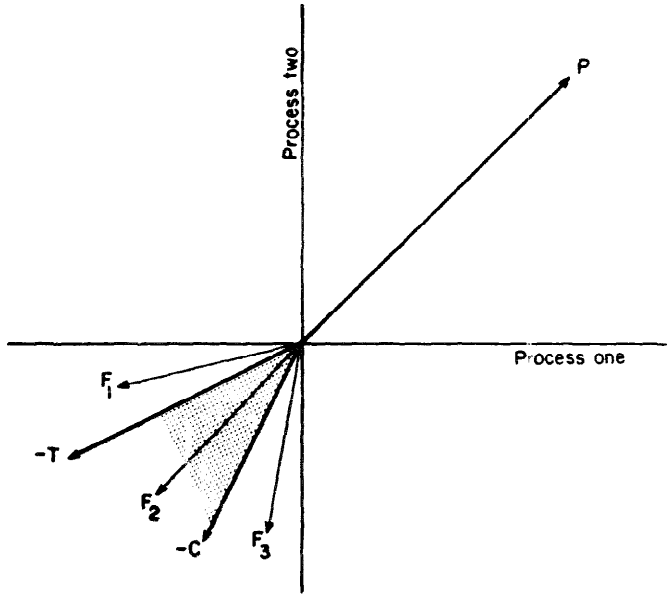

Fig. 6

Denoting the vector $(-\pi a_{21} \ -\pi a_{22})$ by F, it is clear from fig. 6 that if the slope of F is *less* than that of T (e.g., when $F=F_1$) then $\rho_\lambda<0$ and $\pi_\lambda>0$ implying that an increase in the subsidy (a fall in λ) leads to *fall* in the rate of profit in agriculture along with a rise in rents.[12] If, on the other hand, F lies in the shaded cone formed by $-C$ and $-T$ (as does F_2) the scalar multipliers π_λ and ρ_λ required to locate F

[12]Note that since a change in profits cannot influence the direction of F or T in fig. 6, this perverse profit response does not hinge on a positive rate of profits.

will always be negative, implying that an increase in the fertilizer subsidy will lead to higher rents and higher profits. Finally, if $F = F_3$ the input subsidy policy will be doubly effective since both falling rents and lower fertilizer prices contribute to rising profits in agriculture.

Recalling that in the extensive case T must lie along either axis, reasoning similar to that behind fig. 5 indicates that a fertilizer subsidy cannot lower the agricultural rate of profit in the extensive rent model. For F to have a slope less than that of $-T$ would require one process to have a negative input of fertilizer. Since only wheat is produced by agriculture in this model (i.e., there is no joint production) this possibility can be ruled out a priori.

6. Conclusion

The introduction of non-produced means of production into a simple general equilibrium model of terms of trade policy has yielded some surprising results and led us to conclusions which may have important implications for economic policy. We have identified a set of plausible techniques for which price policies designed to increase output and stimulate new investment may only serve to depress profits and increase rents. Subsequent efforts to remedy this situation via price policy may reduce profits further. While these policies may make holding land assets more attractive, it is difficult to see how falling sectoral profit rates would induce capitalists to adopt the new methods necessary to break the downward price–profit spiral.

Nothing out of the ordinary is required to obtain these results. It is necessary for land of a particular quality (or all land) to be competitively priced and scarce to the extent that the land–output ratio of the cheapest available process is not low enough to meet the total demand for that commodity. If the higher-yield process introduced in order to meet this unsatisfied demand is also characterized by higher unit costs, then the two methods will be compatable in equilibrium and intensive rents will be positive. Even then the perverse movement of profits and rents will not occur unless the general rate of profit is positive. Given this competition for scarce land and the profit distortion, price policy favorable to agriculture may create a downward spiral of profits coupled with escalating land prices while a shift in prices against agriculture may actually increase profits and drive down rents.

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