Technical Change with Non-Produced Means of Production

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INTRODUCTION

We are somewhat puzzled that D'Agata has chosen to, once again, raise an issue discussed in detail elsewhere[1] and, moreover, one which has so little bearing on the substance of our *RRPE* paper (1983). He argues that technical change in *extensive* rent bearing processes *can* affect the general level of profit and that technical change in extensive systems does *not* necessarily obey Okishio's theorem. This criticism is entirely tangential to the substance of our paper and, moreover, misleading. D'Agata is unnecessarily hostile to the distinction between intensive and extensive rent regimes.[2]

First, it should be noted that in all D'Agata's numerical examples, technical progress provides a switch in the methods of production. Changes in output per unit of land, relative to the fixed demand for agricultural goods, cause the technology matrix A to change. Clearly this kind of "large" technical change was not possible in our Figure 5. We considered "small" changes which guaranteed that the matrix A would remain intact. This was absolutely clear in our Figure 5 in which method (I) remained undisturbed by technical progress in method 2. The main point of the discussion remains unaffected by D'Agata's criticism in that it is clearly still true that while technical change in extensive rent-paying systems may or may not affect the prices of basics and the rate of profit, technical change in intensive processes (flukes aside) always will. This fundamental difference in the nature of the two production systems, made plain in our Figure 5, fully survives D'Agata's critique.

D'Agata's scenario clearly constitutes a more complex set of events than considered in our discussion and in this sense amounts to an extension rather than critique of our model. Of course there is no reason why the analysis could not be further extended to account for changes in the quantity demanded of agricultural goods which is induced by technical change and the consequent shift in the distribution of income. Clearly, if one accounts for this level of generality, a D'Agata-styled observation that "anything is possible" is trivially true.

Such generalization would not, however, undermine the result that without large changes, technical progress can be usefully categorized. Gibson and McLeod (1986) prove two theorems which set limits on the range of possible technical change. For extensive rent-paying systems, it is possible to show that Okishio-superior technical change in labor and/or produced commodity input

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coefficients of any rent-paying process has no effect on the prices of basics or on the rate of profit. "Land-saving" technical change, which reduces the demand for or increases the output of goods which directly employ produced means of production has no effect on the prices of basics or the rate of profit as long as the technical change does not provoke a switch in technique such that there is a new marginal process (see Gibson and McLeod 1986, for a rigorous statement and proof).

Finally, D'Agata points out that Figure 1 of our 1983 *RRPE* paper is incorrectly drawn and provides an algebraic argument supporting his claim. This critique is again a replay of D'Agata (1986a) and is no more relevant to our 1983 *RRPE* paper than it was to Gibson and McLeod (1983). It is true that the dotted line and the interior solid line should be reversed. The intuitive explanation is that techniques *a* and *b* pay no rent while the dotted technology does and, consequently, for any given wage rate, the latter must pay a lower profit rate than either of the former. Note, however, that the statement accompanying the diagram, "scarce land implies that the economy is forced to operate *inside* the envelope of the two techniques" requires no modification whatsoever and stands as in the original. Nothing crucial to the arguments of our paper rests on the configuration of the diagram and, indeed, it has been correctly drawn in the literature since Montani (1975).[3]

NOTES

1. See Gibson and McLeod (1986).
2. See D'Agata (1986a) for arguments which seek to deny the distinction between intensive and extensive systems through an attack on Gibson and McLeod's (1983) distinction between "non-basics" and "quasi-basics."
3. Incidentally, it is quite obvious from the heuristic nature of the discussion that there was no strict correspondence between the formal mathematical model of equations (1) and (1*) and the diagram. Nowhere, for example, do we say that Figure 1 *plots* the equations (1) and (1*); instead, we note that the wage-profit line is "familiar" to readers. That two-dimensional systems give rise to wage-profit lines without points of inflection is so well known that it would have been a diversion to have gone into the details of how these diagrams are constructed from systems of price equations. See Bharadwaj (1970).

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