Competition, “welfare” and macroeconomics– a classical/Sraffian perspective

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Abstract

An essential point to arise out of macroeconomic literature of the last twenty years is that imperfect competition in product markets allows scope for aggregate demand to affect the level of output and employment; and to have positive impacts on “welfare”. The present paper considers the connection between “imperfect competition” and macroeconomic outcomes from a Sraffian perspective. In this case, the appropriate categorisation is one of restricted versus unrestricted competition: essentially the ability of intersectoral capital mobility to enforce a uniform rate of profit. The paper also considers the significance of product differentiation, which is generally assumed to be the defining characteristic of imperfectly competitive markets. A Sraffian approach makes clear the limited significance of the concept product differentiation in a multi-commodity framework particularly in drawing hard and fast implications about “welfare”. The investigation of connections between restricted competition and macro outcomes therefore turns largely on the significance of restrictions on mobility for output and employment multipliers.

Classification codes: B51, D43, E12

Keywords: Imperfect competition, macroeconomics, Sraffian, welfare

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COMPETITION, “WELFARE” AND MACROECONOMICS – A CLASSICAL/SRAFFIAN PERSPECTIVE

I Introduction

A key point to arise out of the macroeconomics literature of the last twenty five years is that imperfect competition when combined with rigidities in prices provides scope for aggregate demand shocks to impact on output and employment (e.g. Mankiw, 1988; Blanchard and Kiyotaki 1987, Dixon and Rankin, 1994). This has been heralded (e.g. Mankiw, 1990) by the so-called ‘New Keynesians’ as the definitive modern theoretical foundation for the Keynesian premise that output and employment can be constrained by aggregate demand and in turn that there is scope for demand management policy to impact on output and employment, _albeit in the short-run_.

Of course, the relegation of the influence of aggregate demand to a short-run world of sluggish prices is merely the flipside of the notion that a competitive capitalist economy necessarily tends to full-employment of all factors, including labour. More significantly, on the basis of the capital-theoretic critique of the 1960’s, the latter notion has been well and truly shattered (although, as is patently obvious, conventional macroeconomics still clings to this discredited notion). The classical/Sraffian critique of the orthodox macroeconomics (Garegnani, 1978; Eatwell and Milgate, 1983; see also White, 2004) dismisses any hard and fast relation between competitive equilibrium in a capitalist economy and full-employment. In this critique ‘competitive’ refers to the old classical notion of ‘free competition’ (Kurz and Salvadori, 1995, Ch. 1), consistent with a uniform rate of profit across sectors. And this notion of competition is quite consistent with prices at any point in time being
influenced by discrepancies between demands and supplies (though this influence does not entail equilibrium prices being determined by forces of demand and supply).

Yet the classical/Sraffian critique of orthodox macroeconomics seems incomplete to the extent that it does not take up a significant thread of orthodox reasoning of the last three decades; viz., the significance of imperfectly competitive product markets for macroeconomic outcomes. The present paper is an attempt to do so: in particular, to clarify what a Sraffian response might be to this development in orthodox theory and to locate such a response within a more general classical/Sraffian perspective.

In articulating such a response it becomes necessary to spell out precisely how a classical/Sraffian perspective would approach the notion of “imperfect competition” and what alternative it would provide to the orthodox juxtaposition of perfect and imperfect competition. To this end, Section II provides a preliminary sketch of a Sraffian perspective on the significance of demand expansion under conditions of imperfect competition. Sections III – VI provide a more in-depth consideration of the significance of product differentiation in a Sraffian framework; including its “welfare” implications. Sections VII - IX consider the case of “restricted competition” (as an alternative to imperfect competition), the distinguishing feature being the existence of persistent profit rate differentials (other than on the basis of risk and illiquidity) between sectors. A simple multi-commodity model with profit rate differentials is used to the relation between the size and pattern of profit rate differentials and output and employment multipliers; as a means of shedding light on the claim that expenditure multipliers increase with the degree of product market imperfection. Section X provides some brief concluding notes.
II Imperfect competition, macroeconomics and the Sraffian alternative – some preliminary observations

Consider a multi-commodity, multi-industry model with monopolistic competition within each industry. In the absence of price rigidities, with downward-sloping demand curves facing individual producers, an expansion of aggregate demand would shift up marginal revenue curves for each firm. Profit maximization would then entail a rise in output price as firms move up their marginal cost curves. However, in a generalized input-output system (or as an orthodox theorist might put it, in a general equilibrium setting) all firms must suffer a rise in their cost schedules as the prices of produced inputs rise. This must negate some of the initial impact on output. But as cost functions shift up this generates a further fall in output and rise in price producing yet further shifts in firms’ cost functions.

If one adds into this the notion of an aggregate demand function monotonically decreasing in the general price level, it is not difficult to arrive at the conclusion that eventually prices will rise sufficiently to negate the original increase in aggregate demand; so that we arrive eventually back at the original level of output.

The moral of this simple story is twofold: first, that imperfect competition in product markets and thus pricing above marginal cost, by itself, is insufficient to guarantee that a rise in aggregate demand will lead to a persistent increase in output (Dixon and Rankin, (1994, p. 178)) – there must also be some stickiness in prices; second (though this is really just another way of looking at the first moral), since, from an orthodox
point of view, prices are higher under monopolistic competition vis a vis perfect competition, and given the decreasing aggregate demand function, aggregate output and, conceivably employment, must be lower under the imperfectly competitive case. However, to move to the competitive full-employment equilibrium, requires more than just an expansion of aggregate demand, it requires stickiness in prices.

So what would be the Sraffian response to this? In a Sraffian approach, as demand increases, with flexible prices, there could be no increase in long-period prices unless the increase in demand alters technical conditions or the rate of interest (supposing that the rate of profit is exogenously determined by the rate of interest and the latter in turn by the monetary authorities).

But what of short-period prices? If the market is prepared to bear a higher price for some commodities, then there may be an increase in profit rates in some industries – giving rise to short-run profit rate differentials. Yet arguably in the longer term, in the absence of barriers to entry, these differentials are eliminated by competition, as is the long-run result under conditions of monopolistic competition. Prices would return to their long-period levels.

Thus, the first reaction from someone taking a Sraffian perspective – who of course would reject the notion of a monotonically decreasing aggregate demand function and who will for the same reason suppose that regardless of the degree of product market imperfection, the system will not be at full-employment either in the short-run or long-run\(^2\) - is that the effect of the aggregate demand expansion is to increase output in the long-run and possibly in the short-run as well; and to increase prices possibly in
the short-run, but not in the long-run. In this case, any price rises associated with the expansion in aggregate demand become temporary – and the output changes permanent – the reverse of traditional orthodoxy. For the purposes of whether or not there are positive output changes, the issue of stickiness of prices is essentially irrelevant.

But is it possible to say something more definite about these matters from a Sraffian perspective? Two points are worth making in this regard. The first concerns the meaning of “imperfect competition”, from a Sraffian perspective. In the present paper we will consider the relevant aspect in defining degrees of competition to be the extent to which capital is free to move in seeking its highest rate of return. As such, the relevant comparison is between “free or unrestricted competition” on the one hand, where ultimately mobility of capital will generate a uniform rate of profit across production processes, and, on the other hand, “restricted competition” where restrictions on the mobility of capital allow differentials in profit rate (in the absence of risk and illiquidity) to persist and/or a higher average rate of profit across sectors compared with the absence of such restrictions. Hence the question of the significance of the degree of competition for macroeconomic outcomes, specifically, output and employment, can be approach by considering the significance of profit rate differentials and or higher than “normal” profit rates for aggregate output.

The second point relates back to the significance of imperfect competition for macro outcomes, at least from an orthodox view; and this has largely to do with the implications for the price level and for the profitability of expanding output in response to a demand expansion. In turn, this reflects a key defining aspect of
imperfect competition within orthodox theory – product differentiation. So it seems useful to reflect to some extent on the meaning and significance of product differentiation, from a Sraffian perspective. And this we turn to first.

III Product differentiation in a classical/Sraffian model (I)

One could start by thinking of product differentiation as having two aspects: first, it entails the appearance of additional production processes corresponding to the differentiated products and as a consequence additional prices. Second, demand for what in the absence of such differentiation would have been one commodity is now split between a number of commodities.

With regard to the first aspect, a useful question to begin with is whether product differentiation could apply to all commodities, viz., to both basics and non-basics in the Sraffian sense? Alternatively put, could one conceive of a Sraffian case, with prices at their long-period equilibrium values, where every commodity has at least one other substitutable competitor product?

Some simple reflections would suggest that such could not be the case. Consider a system producing two types of commodities – a pure consumption good which does not enter directly as an input into the production of either commodity and a capital good required as input in the production of the consumption good as well as in its own production. If we suppose that at most there are only two “varieties” of the consumer good and capital good, there are then three possible cases:
(i) Two products produced by the consumer good ‘industry’ use different circulating capital inputs – each circulating capital good process uses its own circulating capital good as input.

(ii) Two products produced by the consumer good ‘industry’ use the same circulating capital input.

(iii) One product produced by the consumer good industry but two different circulating capital goods being produced, each of which could be used in combination with labour to produce the consumption good.

The third case can be fairly easily ruled out. With only one consumption good, only one of the circulating capital goods will be in used in production. Hence only one circulating capital good is in demand from the consumption sector. Put another way, for case (iii) to persist, one must also suppose that some production processes in the consumption good “industry” use one type of circulating capital good and some use the other circulating capital good. With a uniform rate of profit, the relative price associated with the output of each production process in the consumption good “industry” must be different; this difference of course reflecting what are in fact two different commodities, this in turn reflecting the use of different capital inputs.\(^5\)

Product differentiation in the circulating capital goods “industry” cannot therefore co-exist with a homogeneous product in the consumption good “industry”.\(^6\)

However this reasoning should not apply in reverse, since, with a pure consumption good, the commodities produced in the consumption good industry do not enter as
inputs either directly or indirectly into any production process. It thus appears possible for product differentiation in the pure consumption good, with a homogeneous circulating capital good, i.e. case (ii) above.

But what of case (i), i.e. product differentiation for circulating capital as well as for the consumption good "industry", so that it is possible to produce each consumption good using a different circulating capital input? This case is more complex, although it does seem possible to say that, for any given price system, there must be at least one undifferentiated “basic” commodity. However, before reflecting further on this case and its complexities, it is useful to try and formalize the key points of the discussion so far.

**IV Product differentiation in a classical/Sraffian model (II)**

We consider in effect firstly case (ii) of the previous section and then case (i). For case (ii) we have in effect a three-commodity model; with a prices system such as that below.

\[
\begin{align*}
(p_a a_1)(1+r) + w_m l_{c1} &= p_{c1} \\
(p_a a_2)(1+r) + w_m l_{c2} &= p_{c2} \\
(p_a a_a)(1+r) + w_m l_a &= p_a
\end{align*}
\]

where \( p_a \) refers to the price of the capital good, \( p_{c1} \) and \( p_{c2} \) to the prices of the two different varieties of the consumption good, 1 and 2, \( w_m \) the uniform money wage rate, \( r \) the uniform rate of profit \( a_i \) and \( l_i \) the unit capital and labour requirements respectively in the production of commodity \( i \).
Suppose that the technologies of the production processes for the consumption goods
are related as follows

\[ a_{c2} = \alpha_c a_{c1} \]
\[ l_{c2} = \alpha_l l_{c1} \]  \[\ldots \ldots(2.)\]

in which case, price equations (1) can be written as

\[ (p_{a} a_{c1})(1 + r) + w_m l_{c1} = p_{c1} \]
\[ (p_{a} \alpha_c a_{c1})(1 + r) + w_m \alpha_l l_{c1} = p_{c2} \]  \[\ldots \ldots(3.)\]
\[ (p_{a} a_{a})(1 + r) + w_m l_{a} = p_{a} \]

Taking the money wage as numeraire, one can solve for prices relative to the money
wage as functions of technology and the rate of profit, so that

\[ (p_{aw} a_{c1})(1 + r) + l_{c1} = p_{c1w} \]
\[ (p_{aw} \alpha_c a_{c1})(1 + r) + \alpha_l l_{c1} = p_{c2w} \]  \[\ldots \ldots(4.)\]
\[ (p_{aw} a_{a})(1 + r) + l_{a} = p_{aw} \]

and therefore

\[ p_{c1w} = l_{c1} + \frac{a_{c1} l_{a} (1 + r)}{1 - a_{a} (1 + r)} \]
\[ p_{c2w} = l_{c1} \alpha_l + \frac{a_{c1} l_{a} \alpha_c (1 + r)}{1 - a_{a} (1 + r)} \]  \[\ldots \ldots(5.)\]
\[ p_{aw} = \frac{l_{a}}{1 - a_{a} (1 + r)} \]
The price of the basic (i.e. circulating capital) commodity is of course unaffected by the existence of product differentiation, as is the price of commodity 1, in terms of the money wage. Product differentiation, defined here in terms of values of one or both of the coefficients $\alpha_l$ and $\alpha_c$, being positive and different from unity, impacts of course on the relative price of commodities 1 and 2.

Taking the total differential of the expression for $p_{c2w}$ and assuming a given rate of profit and given technical coefficients, except for $\alpha_l$ and $\alpha_c$, the difference in price between the two consumption commodities can be related to the magnitude of $\alpha_l$ and $\alpha_c$, in the following way

$$l_{c2}d\alpha_l + \frac{a_{c2}l_{c2}(1+r) d\alpha_c}{1-a_{c2}(1+r)} \quad \ldots \ldots (6.)$$

where $d\alpha_l$ and $d\alpha_c$ refer to the difference in labour and circulating capital requirements associated with producing the differentiated commodity. Clearly, whether the differentiated commodity has a higher or lower price than its competitive product depends on the signs of $d\alpha_l$ and $d\alpha_c$ and their magnitude. It should be added here that, since product differentiation makes no difference to the basic commodity’s price, the absence of product differentiation could not affect the price of commodity 1, at least in a long-period setting.

V Product differentiation and “basic” commodities
Turning now to case (i) of section III above, suppose there exists a differentiated circulating capital good, where each ‘version’ is produced by means of itself and labour and the proportions in which it is combined with labour in its own production are different between the two versions of this good. Suppose also that the producers of one of the versions of the consumer good seek to differentiate their commodity from the other version of the consumer good (at least partly) by reference to the particular circulating capital good used in its production. Thus each of the “varieties” of the circulating capital good must be utilized in the production of consumer goods.

We also suppose here that in differentiating their commodity producers of the consumer good use inputs in a different proportion to those of their competitors. In other words we assume that the process of differentiating their product requires possibly additional amounts of the inputs (not all in the same proportion) or at the very least a different combination of existing inputs; so that, for the two sector case considered here

$$\frac{a_{c1}}{l_{c1}} \neq \frac{a_{c2}}{l_{c2}}.$$  

We would then appear to be left with two separate price systems:

\[
\begin{align*}
(p_{a1}, a_{c1})(1 + r) + w_a l_{c1} &= p_{c1} \\
(p_{a1}, a_{l1})(1 + r) + w_a l_{a1} &= p_{a1}
\end{align*}
\]

……..(7.)

and
\[
\begin{align*}
(p_{a_2} \cdot a_{c_2})(1+r) + w_m \cdot l_{c_2} &= p_{c_2} \\
(p_{a_2} \cdot a_{c_2})(1+r) + w_m \cdot l_{c_2} &= p_{a_2}
\end{align*}
\] ........(8.)

Taking the money wage as numeraire, we have 2 distinct real wage (in terms of the consumption good) – rate of profit relations:

\[
\frac{1}{p_{c_1w}} = \frac{1-a_{j_1} \cdot (1+r)}{a_{c_1} \cdot l_{c_1} \cdot (1+r) + l_{c_1} \cdot [1-a_{j_1} \cdot (1+r)]}
\] ........(9.)

\[
\frac{1}{p_{c_2w}} = \frac{1-a_{j_2} \cdot (1+r)}{a_{c_2} \cdot l_{c_2} \cdot (1+r) + l_{c_2} \cdot [1-a_{j_2} \cdot (1+r)]}
\]

A number of remarks are warranted in regard to this case. First, the continued existence of a differentiated circulating capital input alongside the differentiated consumption good would seem to require that some producers of the consumer good see a benefit from the use of a particular circulating capital good. They must perceive that the distinctive quality of a particular variety of the differentiated consumption good is attributable in part at least to the use of a particular circulating capital input and/or that the use of a particular variety of circulating capital as input is integral to establishing some “brand loyalty” for their consumer good.

Put another way, the essence of what it is that allows the consumer good producer to differentiate his/her output must be seen, by that producer, as being tied necessarily to the use of a particular type of circulating capital input. For as soon as producers of the differentiated consumer good perceive that they can successfully differentiate their output independently of whichever of the two circulating capital goods is used, then,
presumably, the cheapest process for producing the circulating capital good is chosen. One of the methods for producing the circulating capital good disappears and with it the corresponding price system. In this case, the two price systems (7) and (8) would collapse to the case of price system (3). Product differentiation would therefore be limited to the consumption industry producing goods which are not required as inputs into production: in a long-period setting there would exist only one circulating capital good for producing the differentiated consumption goods.9

Supposing then that this condition – that the essence of differentiation in the consumer good is tied to differentiation in the circulating capital good – is fulfilled, we have two price systems co-existing side by side.10

Of course, the question arises as to the significance of the case where different price systems co-exist; were there to exist one or more “undifferentiated basics” in the economy; namely one or more commodities used as input either directly or indirectly in the production of all commodities? In this case there should be only one price system. Price systems (7) and (8) would therefore take the role of non-basic sub-systems within the overall single price system. Hence to avoid the scenario of more than one price system, one would simply have to assume at least one basic (in the Sr affian sense) commodity.11

VI “Welfare” and product differentiation

Having established how product differentiation could be considered in a classical/Sraffian framework, it is useful to try to draw out what that framework
would suggest by way of the “welfare” implications of product differentiation. This is appropriate particularly in view of the orthodox claim of an aggregate demand externality associated with imperfect competition. Thus, for Blanchard and Kiyotaki (1987), “[t]he equilibrium level of real money balances is lower in the monopolistic equilibrium … [and thus under] monopolistic competition, output of monopolistically produced is too low … this follows from the existence of monopoly power in price and wage setting ….. it [output being too low] follows from an aggregate demand externality” (p.653).

In order to shed further light on the possible “welfare” implications of product differentiation, at least for the stationary economy, we proceed in two stages. In the first stage, we compare the net output per head in the undifferentiated and differentiated product cases; taking net output per head here as a proxy for consumption per head.12 For the purposes of this exercise we continue to assume, unless otherwise stated, that the appearance of differentiated products does not entail higher profit rates than in their absence. The second stage deals with the “welfare” implications of restricted competition, which would allow for a higher average rate of profit than under unrestricted competition. This second stage is discussed in subsequent sections.

For analytical purposes we consider it appropriate to separate these characteristics of so-called “imperfect competition”. This view is based on the result established in this and following sections that, at least from a Sraffian perspective, the significance of “imperfect” competition, for prices and outputs, primarily lies in its implications for
profit rates, their level and pattern, rather than in the substitutability of commodities for consumers, viz., the degree of product differentiation.

In considering the implications of product differentiation for net output per worker, we take in turn the cases outlined so far: differentiation only in the pure consumption good; differentiation in both the consumption and circulating capital good.

(i) Welfare and differentiation exclusively in the consumption good

In the case of a stationary economy the net output consists solely of a quantity of the consumption good(s). One can think of product differentiation in terms of the operation side-by-side of two distinct vertically integrated production systems each producing a consumption good via a combination of a quantity of circulating capital and labour. For the stationary economy, the net output of each “system” is a quantity of the particular consumption good. As is well known, the net product per worker of each system, considered separately, is equal to the maximum real wage (i.e. rate of profit is equal to zero) in terms of the relevant consumption good for that system (Garegnani, 1970 pp. 408–409) and would, for the case dealt with in section III above, be given by

\[ N_{w_1} = \frac{1-a_a}{a_{c_1}c_a + l_{c_1}(1-a_a)} \]

\[ N_{w_2} = \frac{1-a_a}{a_{c_2}c_a + l_{c_2}(1-a_a)} \]
Note that, since at this point we are considering the case where the same circulating capital good is used to produce the two consumption goods, the ‘\(a\)’ and ‘\(l\)’ coefficients pertaining to the production of circulating capital are identical for the two equations above.

With product differentiation, and thus with the imperfectly substitutable commodities 1 and 2, the “aggregate” net product expressed in terms of commodity 1 is given by

\[
NP_1^A = Y_1 + p_{21}Y_2
\]  
\ ..........(11.)

In equilibrium, the gross outputs of commodities 1 and 2 reflect demands, which, as proportions of \(NP_1^A\) are denoted respectively as \(c_{1w}\) and \(c_{2w}\), so that

\[
Y_1 = NP_1^A \cdot c_{1w} \quad \text{and} \quad Y_2 = \frac{NP_1^A \cdot c_{2w}}{p_{21}}
\]  
\ ..........(12.)

where

\[
c_{1w} + c_{2w} = 1.
\]  
\ ..........(13.)

The quantity of labour employed in the production of the net products \(NP'\) and \(NP^2\) respectively

\[
L_1 = \frac{Y_1}{NP_{1w}} = \frac{NP_1^A \cdot c_{1w}}{NP_{1w}}
\]  
\ .......... (14.)

\[
L_2 = \frac{Y_2}{NP_{2w}} = \frac{NP_1^A \cdot c_{2w}}{p_{21}NP_{2w}}
\]
so that

\[
\frac{L_1 + L_2}{NP_1} = \frac{c_{1w}}{NP_{1w}} + \frac{c_{2w}}{p_{21}.NP_{2w}} \quad \ldots \ldots (15.)
\]

and, in turn, the aggregate net product per worker in the case of product differentiation, measured in terms of commodity 1 can be written as

\[
\frac{NP_1}{L_1 + L_2} = NP_1 = \frac{NP_{1w} - p_{21}.NP_{2w}}{c_{1w} - p_{21}.NP_{2w} + c_{2w} - NP_{1w}} \quad \ldots \ldots (16.)
\]

Supposing that “initially” there is no product differentiation and that the only consumption good is commodity 1, for net product per worker in terms of commodity 1 to be reduced with the appearance of product differentiation

\[
NP_{1w} = \frac{NP_{1w} - p_{21}.NP_{2w}}{c_{1w} - p_{21}.NP_{2w} + c_{2w} - NP_{1w}} < NP_{1w} \quad \ldots \ldots (17.)
\]

More significantly, one can write inequality (17) in a form which shows that the variation of aggregate net product per worker as a result of product differentiation turns on the variation of the relative price of the differentiated consumption goods as the rate of profit changes. In particular, in order that the appearance of a differentiated product reduce net product per worker, it is necessary for

\[
p_{21}.NP_{2w} - c_{1w}p_{21}.NP_{2w} < c_{2w}NP_{1w} \quad \ldots \ldots (18.)
\]
and thus, in view of equation (13), for

\[ p_{21} < \frac{NP_{1w}}{NP_{2w}} \quad \text{.........(19.)} \]

Since the net product per worker for each system is the maximum real wage in terms of the relevant consumption good, and thus the value of the real wage where the rate of profit is zero, then the above condition becomes

\[ p_{21} < p_{21}^{r=0} \quad \text{.........(20.)} \]

where \( p_{21}^{r=0} \) represents the relative price of the two consumption goods where the rate of profit is equal to zero. Hence the behaviour of the relative price of the differentiated consumption goods as the rate of profit increases above zero is indicative of the implication of product differentiation, as it is defined here, for net product per worker.

In the simplest case where there is no differentiation in the circulating capital good, the relative price \( p_{21} \) can be derived on the basis of equations (9) (which shows the real wage expressed in terms of the two commodities); differentiating \( p_{21} \) with respect to the rate of profit and recalling equations (2),

\[ \frac{dp_{21}}{dr} = \frac{a_{c1}.l_a.l_{c1}.(\alpha_s - \alpha_t)}{a_{c1}.l_a.(1 + r) + l_{c1}.(1 - a_a.(1 + r))} \quad \text{......... (21.)} \]
Hence, the direction of change in $p_{21}$ with a change in the rate of profit and hence the change in the net product per worker as a result of the appearance of product differentiation in the form of commodity 2, turns on how the technical conditions of production compare between the two “differentiated product processes”; specifically, the magnitude $(\alpha_c - \alpha_l)$.

In other words, if for this simplest case, $(\alpha_c - \alpha_l) > 0$, the differential (21) is positive, condition (20) then does not hold and the net product per worker in terms of commodity 1 rises rather than falls with product differentiation. Interestingly, this way of considering the implications of product differentiation for output per worker also suggests that, even where one brings into consideration the prospect of a higher general rate of profit (as a manifestation of the “imperfection” of competition) accompanying product differentiation, the possibility exists that net product per worker (in terms of the commodity present prior to product differentiation) increases. Note also that this result is completely independent of the relative size of the activity levels of the processes producing commodities 1 and 2, i.e. independent of $c_{1w}$ and $c_{2w}$. Assuming $c_{1w}$ and $c_{2w}$ are < 1, the implication of product differentiation for the size of the net product depends exclusively on the movement of $p_{21}$ with the rate of profit.$^{14}$

(ii) Welfare and differentiation of commodity inputs

For the case where product differentiation involves differentiation in circulating capital inputs, the movement in the relative price of the differentiated consumer good and thus the implications for net output per worker are more complex. But simple
reflection makes clear that one can be no more definite about the welfare implications of product differentiation in this case than in the simple case above.

In effect, one can split the case where product differentiation involves product differentiation of inputs into two possibilities: the first involves no difference in the method (combination of labour and other inputs) in the production of consumer goods. This case, where differentiation arises from the use in production of differentiated inputs – i.e the use alongside labour of a different circulating capital good in the production of the differentiated consumer goods - is analogous to a standard choice of technique problem in classical/Sraffian analysis. Mathematically it is represented by the co-existence of the two price systems (7) and (8) but with the assumption that $\alpha_c = \alpha_l = 1$.

Suppose initially, in the no-product-differentiation case, the technique in use to produce a circulating capital good and a consumption good is system 1. We suppose that the appearance of a differentiated product takes the form of a consumer good produced with a circulating capital good where this circulating capital good is produced using a different method (i.e. combination of labour and itself) from the initial non-product-differentiated case – system 2. The consumer good produced by means of this “different” circulating capital good, will itself be “different” from the consumer good of the non-product-differentiated case, although we assume that the combination of labour and circulating capital to produce the consumption good is identical for the two techniques. Thus the “method of production” differs only in the production of circulating capital between the two techniques.
Product differentiation in this case amounts to the co-existence of two different techniques, 1 and the new technique 2 and can be illustrated as in Figure 1. The figure consists of two wage-rate of profit relations representing the two different price systems associated with the use of the different circulating capital input. As noted above, net product for each system will be indicated by the maximum real wage for that system. Product differentiation as noted above will entail both systems being used simultaneously, so that net product per worker, measured in terms of one of the consumption commodities will be given by equations (16) above and will depend not only on the net product per worker for each price system, considered in isolation, but also on the relative price of the differentiated consumer goods.

As is also well known, for the present case there is can be only one “switch-point” at which prices of the corresponding commodities are identical between the two techniques – in the diagram, this is at \( r = r^* \). For the case depicted in the diagram it follows that for \( r_1 < r^* \), the price of commodity 1 will be lower than that of commodity 2 because the price of the circulating capital good produced by technique 1 will be lower and conversely for \( r_2 > r^* \). It follows that \( p_{21} \) falls monotonically as
the rate of profit rises so that condition (21) above is fulfilled and thus net product per 
worker expressed in terms of commodity 1 is lower with the appearance of a 
differentiated product.

However, supposing that the wage-profit curves were the reverse of those in the 
diagram so that for \( r_1 < r^* \), the price of commodity 1 was higher than that of 
commodity 2 and conversely for \( r_2 > r^* \), then \( p_{21} \) would be rising with the rate of 
profit and net product per worker in terms of commodity 1 would be rising with the 
appearance of a differentiated product.

But what of the case with a different combination of labour and circulating capital 
used in the production of the two consumer goods; i.e. different methods in the 
production of both consumer and circulating capital goods. Effectively, this is a 
combination of the previous two cases and the best way to deal with this is to consider 
the analogous version of condition (21). In other words, we consider the conditions 
under which the relative price of the differentiated consumer goods changes with a 
change in the rate of profit. The relative price of the differentiated consumer goods in 
this case can be derived from the price systems (9); bearing in mind equations (2) and 
supposing analogously for the production of the differentiated circulating capital 
goods that

\[
\begin{align*}
    a_{2a} &= \alpha_{a}, a_{1a} \\
    l_{a2} &= \alpha_{la}, l_{a1} \quad \text{..... (22.)}
\end{align*}
\]

so that
Differentiating (23) with respect to the rate of profit, \( r \), and after some manipulation, it is possible to show that the direction of change in the relative price \( p_{c21} \) in response to a change in the rate of profit, turns on whether the term

\[
\begin{aligned}
&= \frac{(1-a_{1w})(1+r)}{a_{c1}l_{c1}(1+r)+l_{c1}[1-\alpha_{a}a_{1w}(1+r)]}(1-\alpha_{a}a_{1w}(1+r)) \\
&= \frac{(1-a_{1w})(1+r)}{a_{c1}l_{c1}(1+r)+l_{c1}[1-\alpha_{a}a_{1w}(1+r)]}(1-\alpha_{a}a_{1w}(1+r)) \quad \ldots \ldots (23.)
\end{aligned}
\]

is positive or negative. As this indicates, and as is well known (Pasinetti, 1977 and Bidard, 1998), the direction of change of relative prices in response to a rise in the rate of profit, in the vicinity of a particular rate of profit is complex even within the one price system). But in the case under consideration, two prices systems exist side-by-side, arguably complicating the analysis of relative price changes even further.

However, the analysis of previous cases allows one to give some intuitive interpretation in respect of expression (above). The first parenthetical term in expression (24) – which is analogous to what Pasinetti elsewhere refers to as the “capital-intensity effect” (*op.cit.*, pp.82-83) – shows that for given prices of the circulating capital goods used in production of the differentiated consumption goods, the impact of a rise in the rate of profit on the relative price \( p_{c21} \) is obviously partly influenced by the relative size of \( \alpha_c \) and \( \alpha_l \). This is clearly the import of the case (i) above. The second major parenthetical term in expression (24) is more complex and reflects the impact of changes in the rate of profit on the prices of the two circulating capital goods which are used respectively in the production of the differentiated

\[
\begin{aligned}
&= \frac{(1-a_{1w})(1+r)}{a_{c1}l_{c1}(1+r)+l_{c1}[1-\alpha_{a}a_{1w}(1+r)]}(1-\alpha_{a}a_{1w}(1+r)) \quad \ldots \ldots (24.)
\end{aligned}
\]
consumer goods. As is also evident, from expression (24), the sign of this second parenthetical term is clearly dependent on the particular level of the rate of profit.

Thus, in considering the impact of product differentiation on net product per worker, where product differentiation involves a different method of production of the consumer good but also a different method of producing the circulating capital good, and focusing on the condition (20) one might consider the particular rate of profit relevant for expression (24) to be zero. In the vicinity of this rate of profit, and considering Figure 1, where $a_c$ and $a_l$ are effectively both equal to unity, expression (24) would simplify somewhat to

$$
a_{c,l} \left\{ \left( \frac{dp_{a2w}}{dr} - \frac{dp_{a1w}}{dr} \right) l_c + \left( \frac{dp_{a2w}}{dr} a_{c,l} - l_c \right) p_{a1w} - \left( \frac{dp_{a1w}}{dr} a_{c,l} - l_c \right) p_{a2w} \right\}
$$

.........(25.)

As discussed above, in this case, $p_{c21}$ would be falling with an increase in the rate of profit. Expression (25) in other words would be negative, since (looking again at Figure 1), $p_{a2w} > p_{a1w}$, but $\frac{dp_{a2w}}{dr} < \frac{dp_{a1w}}{dr}$.

But with a different method of production for the differentiated consumer goods and thus either or both of $a_c$ and $a_l \neq 1$, then expression (25) will instead be

$$
a_{c,l} \left\{ \left( \frac{dp_{a2w}}{dr} a_c - \frac{dp_{a1w}}{dr} a_l \right) l_c + \left( \frac{dp_{a2w}}{dr} a_{c,l} - l_c a_l \right) p_{a1w} - \left( \frac{dp_{a1w}}{dr} a_{c,l} - l_c a_l \right) p_{a2w} \right\}
$$

.........(26.)

In other words the direction of change in $p_{c21}$ as the rate profit rises above zero, will depend on the sign of expression (26). If, as in the case of Figure 1, $p_{a2w} > p_{a1w}$ and
\[
\frac{dp_{a2w}}{dr} < \frac{dp_{a1w}}{dr}, \text{ this no longer guarantees that the sign of the expression is negative.}
\]

The sign also comes to depend, as noted above, on how \( \alpha_c \) compares with \( \alpha_l \), and thus on difference in combination of labour and circulating capital in the production of the differentiated consumer goods. Thus for example if \( \alpha_c \) is sufficiently large compared with \( \alpha_l \) (so that the production of consumer good 1 uses a higher ratio of circulating capital to labour), this would counterbalance the effect of \( p_{a2w} > p_{a1w} \) and
\[
\frac{dp_{a2w}}{dr} < \frac{dp_{a1w}}{dr} \quad \text{on } p_{c21} \text{ as the rate of profit rises, so that theoretically, } p_{c21} \text{ rises with } \tau \quad \text{rather than falls.}
\]

More significantly, in this last case, with product differentiation involving different methods in the production of both circulating capital and the consumer good, there is similarly nothing definite to be said \textit{a priori} regarding the direction of change in net product per worker as a result of the appearance of differentiated products. Moreover, as noted earlier, this result appears also to hold even where the product differentiation is accompanied by a rise in the rate of profit.

VII Restricted competition, profit rates and aggregate output and employment

This analysis so far would seem to give part of a classical/Sraffian answer to the orthodox claim that imperfect competition is associated with a “welfare loss”: even if we suppose that the rate of profit is higher in the case with product differentiation, there is no guarantee that consumption per worker (measured as net product per worker in terms of one of the consumer goods), in the stationary state case, would be lower.
Of course, this does not settle the issue of a “welfare loss”. Although consumption per worker may not be lower, “welfare” may be judged to be lower, if there is less aggregate employment as a result of imperfect or restricted competition. To assess this requires one to link the degree of competition with the scale of the economy.

What would be the effect of changes in the level and pattern of profit rates on output or activity levels in each industry? We now attempt a tentative answer to this question, but one solely in terms of the effect of changes in the general level of profit rates on income-expenditure multipliers; i.e. the multipliers relating gross outputs in for each commodity and autonomous expenditures. To further simplify, we consider that the only commodity for which there is an autonomous element in its expenditure is the circulating capital good.

For the differentiated product case of Section VI (i) previous sections nominal demands and gross outputs in equilibrium for the three commodities – commodities 1, 2 and commodity A – can be expressed as follows:

\[
Y_1, p_1 = c_{w1}, w_m \cdot \sum Y_i, l_i + c_{p1} \cdot \sum Y_i, r_i, a_i
\]

\[
Y_2, p_2 = c_{w2}, w_m \cdot \sum Y_i, l_i + c_{p2} \cdot \sum Y_i, r_i, a_i
\]

\[
Y_a, p_a = p_a \cdot \sum Y_i, a_i + p_a \cdot D_a
\]

Where \(c_{wi}\) represents the proportion of the nominal wage income spent on consumption commodity \(i\); \(c_{pi}\), the proportion of nominal profit income spent on consumption commodity \(i\); and \(D_a\) represents autonomous demand for the circulating
capital good. It is assumed that all wages are spent on consumption and part of profit income is saved so that

\[ c_{w1} + c_{w2} = l \quad \text{and} \quad c_{p1} + c_{p2} = l - s_c \] ........(24)

where \( s_c \) is the saving propensity of capitalists. We further suppose that

\[ c_{w2} = c_{w1} \cdot \varepsilon \quad \text{and} \quad c_{p2} = c_{p1} \cdot \chi \] ........(25)

so that

\[ c_{w1} = \frac{l}{l + \varepsilon}, \quad c_{w2} = \frac{\varepsilon}{l + \varepsilon} \quad \text{and} \quad c_{p1} = \frac{l - s_c}{l + \chi}, \quad c_{p2} = \frac{(l - s_c) \chi}{l + \chi} \] ........(26).

After some substitutions and manipulation, and bearing in mind that the profit rate \( r \) in each sector is simply net profit as a proportion of the value of circulating capital used in production, equations (23)-(26) allow one to express the gross output of each commodity as a multiple of the autonomous demand for the circulating capital good where the income-expenditure multipliers for each commodity are a function of technology, prices, distribution and the coefficients \( \varepsilon \) and \( \chi \). In turn, expressing prices in terms of the money wage, the gross output for each commodity could be more compactly expressed as

\[ Y_j = m_i \cdot D_a \quad \text{where} \quad m_i = m_i \left( c_{w1}, c_{w2}, p_{kn}, a_k, l_k \right), \quad i = 1, 2, 3; \quad j = 1, 2; \quad k = 1, 2, 3 \] ........(23a)
where the $m_i$ represent the income-expenditure multipliers.\textsuperscript{16}

For the sake of the present discussion, our interest is primarily in how the income-
expenditure multipliers, $m_i$, vary with the degree of competition, and specifically,
given our interpretation of restricted competition, with barriers to capital mobility
which entail a persistently higher average profit rate and/or persistent profit rate
differentials.

Equations (5) allow one to express prices relative to the money wage in terms of
technical conditions and the rate of profit. Suppose, following Pivetti (1985), that the
rate of profit in turn can be decomposed into a rate of interest, effectively governed by
monetary policy, plus a margin. In the absence of restrictions on mobility of capital –
i.e. unrestricted competition – and ignoring risk, we suppose that the excess of the
profit rate over the rate of interest would be uniform across sectors and at its
minimum. Restricted competition on the other hand would entail that some of these
margins are above the minimum.

More formally, define the rate of profit for sector $j$ as

$$ r_j = i + \tau_j $$

\text{……(26)}

and, further, suppose for simplicity that the rate of profit for the processes producing
the two consumer goods are equal and given by

$$ r_1 = i + \tau_{ca} \cdot \tau_a \quad \text{and} \quad r_2 = i + \tau_{ca} \cdot \tau_a $$

\text{……(27)}
where $\tau_a$ is the excess of the profit rate in the circulating capital good industry over the interest rate, such that

$$r_a = i + \tau_a \quad \text{.........(28)}$$

In view of equations (27) and (28), equations (5) can be re-written in terms of technology, the interest rate, the relative profit-rate margins between consumer and capital good sectors and the profit rate margin in the capital good sector i.e. $i$, $\tau_{ca}$ and $\tau_a$. In other words, equations (5) can be written as

$$p_{1i} = l_{1i} + \frac{a_{ci}I_a}{l-a_a} \left( 1 + i + \tau_{ca1}, \tau_a \right)$$

$$p_{2i} = l_{2i}, \beta + \frac{a_{ci}I_a}{l-a_a} \left( 1 + i + \tau_{ca2}, \tau_a \right)$$

$$p_{3i} = l_{1i} + \frac{a_{ci}I_a}{l-a_a} \left( 1 + i + \tau_{ca3}, \tau_a \right) \quad \text{.........(5a)}$$

In turn this makes it possible to eliminate relative prices from equations (23a) and to rewrite them in terms of $\tau_{ca}$ and $\tau_a$. That is

$$Y_i = m_i.D_a \quad \text{where} \quad m_i = m_i \left( c_{ij}, c_{pj}, \tau_{ca}, \tau_a, l_k, i = 1, 2, 3; j = 1, 2; k = 1, 2, 3 \right) \quad \text{.........(23b)}$$
Equations (23b) allow us to examine the effect of changes in the profit rates, both absolutely and between sectors on gross outputs and aggregate employment, in terms of the effects of these changes on the income and expenditure multipliers, \( m_i \).

**VIII Profit rates and income-expenditure multipliers**

(i) A given technology

One can proceed by first, relating the income expenditure multipliers to the consumption out of income generated by a unit of gross output in each sector; and, secondly, establishing a connection between the latter and the size of the margin \( \tau_a \) and the size of the differential \( \tau_{ca} \).

We adopt here what is perhaps the more intuitive approach to the multiplier in terms of the impact on outputs of a change in the autonomous component of demand for the circulating capital good, the latter denoted as \( \Delta D_a \). Assuming a lag of one-period between an increase income (wages and profits) and the subsequent increase in demand and output for consumer goods, one can write for the change in output of consumer good \( i \) between periods \( t+1 \) and \( t \) as

\[
\Delta Y_{i,t+1}^{ci} = \sum_{j=1}^2 \Delta Y_{j,t+1}^{cj} c_{ij} + \Delta Y_{i,t+1}^{a} c_{ia} \\
\ldots \ldots (29)
\]

where

\[
c_{ij} = \frac{c_{wi,j}}{p_{iw}} + c_{pi,j} \Pi_{ij}^{y} \\
\ldots \ldots (30)
\]
and thus represents the real expenditure on consumption good $i$ per unit of net income generated in the production of commodity $j$. $c_{i\alpha}$ refers analogously to the real expenditure on consumption good $i$ per unit of net income generated in the production of the circulating capital good.

The analogous expression for the change in output of the circulating capital good is

$$\Delta Y_{t+1/t}^a = \sum_{j=1}^{2} \Delta Y_{t+1/t}^{cj} \left( \frac{a_{ij}}{l-a_a} \right) \quad \text{.........(31)}$$

where the ‘$a$’ coefficients are the corresponding per unit circulating capital requirements of equations (5a).

Together, (29) and (30) imply that the change in output between periods $t+1$ and $t$ can be expressed in matrix form as

$$\Delta Y_{t+1/t} = M \Delta Y_{t+1-t} \quad \text{.........(32)}$$

where $\Delta Y_{t+1/t}$ and $\Delta Y_{t+1-t}$ are column vectors representing the change in outputs of the three production processes (two consumption goods and one circulating capital good) between $t+1$ and $t$ and between $t$ and $t-1$ respectively and $M$ is the 3x3 positive matrix

$$M = \begin{bmatrix}
    c_{11} & c_{12} & c_{1a} \\
    c_{21} & c_{22} & c_{2a} \\
    a_1 c_{11} + a_2 c_{12} & a_1 c_{12} + a_2 c_{22} & a_1 c_{1a} + a_2 c_{2a} \\
    l-a_a & l-a_a & l-a_a
\end{bmatrix} \quad \text{.........(33)}$$
The vector of initial changes in output across the three sectors in response to the autonomous demand increase, $\Delta D_a$, can be expressed as the column vector $Y_0$ in turn given by

$$ \Delta Y_0 = \begin{bmatrix} c_{1a} \\ c_{2a} \\ \frac{1}{I - a_0} \end{bmatrix} \Delta D_a \tag{34} $$

The overall change in outputs triggered by the change in autonomous demand can then be written, again in matrix form, as

$$ \Delta Y = (I - M)^{-1} \Delta Y_0 \tag{35} $$

where, $I$ is the identity matrix and $\Delta Y$ is the column vector of overall changes in output.\textsuperscript{18} Clearly the size of the “multiplier” $(I - M)^{-1}$ is unambiguously increasing in the components of $M$ which are all positive.\textsuperscript{19}

What is less clear is how the components of $M$ move with changes in the profit rate and thus how the multiplier is affected, for example, by higher profit rates associated with restricted competition. For this we consider the conditions under which the $c_{ij}$ of equation (30) will be decreasing in the profit rate margin, $\tau_a$, taking as given the profit rate relativities between sectors, i.e. taking as given the $\tau_{ca}$’s. Under such conditions, restricted competition would entail a reduction in the size of the income-expenditure multiplier, and thus, given technology, a reduction in aggregate labor employment for a given level and composition of autonomous demands.
Taking the money wage as numeraire, the coefficient $c_{ij}$ of equation (29), can be alternatively expressed as

$$c_{ij} = \frac{c_{wi}I_j + c_{pi}^r(p_{jw} - l_j - a_jp_{aw})}{p_{iw}}$$

In view of equations (5a), (27) and (28), prices relative to the money wage can be expressed in terms of technology and profit rate margins, so that

$$c_{ij} = \frac{c_{wi}I_j(1 - a_a(1 + i + \tau_a)) + a_jc_{pi}^rI_a(i + \tau_a\tau_{ca})}{I_j(1 - a_a(1 + i + \tau_a)) + a_jI_a(1 + i + \tau_a\tau_{ca})} \quad \text{……..(36)}$$

As is demonstrated in the Appendix, for the present model, and for all $i = 1, 2$ and $j = 1, 2, a$, the sign of the differential $\frac{dc_{ij}}{d\tau_a}$ (expressions (ii)-(iii), (viii) and (xi) of the Appendix) is *à priori* indeterminate. In other words, the direction of change in $c_{ij}$ following a rise in the profit rate margin $\tau_a$ depends on the specifics of technology and on the magnitudes of the coefficients $c_{wi}$ and $c_{pi}$.\textsuperscript{20}

The Appendix also provides a numerical example consisting of two different possibilities with regard to the aggregate employment impact of a rise in $\tau_a$, for a given level of autonomous demand for the circulating capital good, $D_a$. These two possibilities correspond to two different relative magnitudes for the consumption propensities, $c_{pi}$ and $c_{wi}$, for a given technology. These simple examples demonstrate – Figures A2 (a) and (b) - that no hard and fast relationship can be supposed between a change in $\tau_a$ and the direction of the consequent change in the aggregate employment multiplier, even where the direction of change in the $c_i$ coefficients is the same for the two cases.
Of particular interest is the possibility that the employment multiplier falls with a rise in $\tau_a$ for a particular technique. This implies that, for a given amount of autonomous demand, aggregate employment falls as the profit rate rises generally across sectors. In other words, the possibility exists, *ceteris paribus*, that more restricted competition – to the extent that this is defined as a higher profit across sectors in general - is associated with lower aggregate employment, for a given level of autonomous demand.

*(ii) A further complication: switches in technique*

It should also be noted in this respect, that the impact on multipliers of a rise in the profit rates is further complicated where such changes alter the cost-minimizing technique of production. To this end, the Appendix also provides a standard choice of technique example, with the dominant (cost-minimizing) technique changing with variation in profit rates and thus, given the rate of interest and $\tau_{ca}$, with $r_a$. This example indicates the possibility – Figures A3 (a) and (b) - that over a range of values for $\tau_a$, aggregate employment per unit of autonomous demand can fall and rise with $\tau_a$.

**IX Restricted competition and “Keynesian” effects: a criticism of Mankiw**

Finally, it is worth reflecting on the significance of the results so far with respect to results from the New Keynesian literature – specifically, Mankiw, 1988 - suggesting a positive relation between the degree of product market imperfection and the income-expenditure multiplier. In his analysis, a higher degree of imperfect competition is
identified with a larger price-cost margin, viz., the excess of price over cost as a proportion of price.

Two points need to be made about how this result compares with those of previous sections. First, as has been emphasized recently by Vera (2006), this New Keynesian literature, including Mankiw 1988, does not distinguish different classes of consumers – specifically workers and capitalists; so that distributional changes would not impact on the aggregate propensity to consume. But once these are taken into account (even utilizing an “optimising” approach), a systematic positive relation between the multiplier and the degree of product market imperfection does not hold (Vera, pp. 791-793). In this sense, the results above accord broadly with those of Vera.

The second, and probably more fundamental difference relates to the fact that Mankiw’s analysis identifies the degree of competition with price-cost margins (price less cost as a percentage of unit price) rather than profit rates. However, the movement of price-cost margins (or mark-ups defined as price less cost as a percentage of cost) need not correspond exactly with the movement of profit rates; but in terms of analyzing the dominant and persistent forces at work in the economic system, profit rates rather than price-cost margins are arguably the critical variable.

To be more precise and making use of the preceding discussion, Mankiw’s price-cost margins, with prices expressed in terms of the money wage, can be expressed as

\[ \mu_i = \frac{a_i \cdot P_{aw} \cdot r_i}{P_{iw}} \quad \text{and} \quad \mu_a = a \cdot r_a \quad i = 1,2 \quad \text{…….(31)} \]
where \( \mu_i \) represents the price-cost margin for the consumption commodities and \( \mu_a \) for the circulating capital good in the three-commodity case represented by equations (5).

In view of the price equations (5a), one can relate the profit rate margins for each production process – i.e. the \( \tau \)'s – to the price-cost margins of expressions (31), so that

\[
\tau_{ci} = \frac{a_{ci}I_a \mu_i + l_{ci} \mu_i (1 + a_a - \mu_a)}{a_{ci}I_a (1 - \mu_i)}
\]

and

\[
\tau_a = \frac{\mu_a}{a_a}
\]  

where \( \tau_{ci} \) is the profit-rate margin for the \( ith \) consumption good process. Clearly, taking the rate of interest as given, there is an unambiguous increasing relation between the price-cost margin and the profit rate in the circulating capital good sector.

Things are less clear in relation to the consumption good processes however. It is possible to express the differential of \( \tau_{ci} \) with respect to a change in its own margin and that of the capital good sector as

\[
d\tau_{ci} = \frac{[a_{ci}I_a \mu_i + l_{ci} \mu_i (1 + a_a - \mu_a)] d\mu_i - l_{ci} \mu_i (1 - \mu) d\mu_a}{a_{ci}I_a (1 - \mu_i)^2}
\]

\[\ldots \ldots \ldots (33)\]

Equation (33) implies a lower bound on the size of any increase in the price-cost margin in the consumption good sector in order that a general rise in price-cost
margins - in particular, including a rise in the price-cost margin in the circulating
capital good sector - is not accompanied by a fall in the profit rate of the consumption
good process. This lower bound can be expressed in terms of a constraint on the size
on the rise in $\mu_i$ relative to $\mu_a$, such that

$$\frac{d\mu_i}{d\mu_a} > \frac{l_{ai} \mu_i (1 - \mu_i)}{a_{ai} l_{ai} + l_{ai} \mu_i (1 + a_{ai} - \mu_a)}$$ ........(34)

The significance of inequality (34) is that depending on technology and the size of
initial price-cost margins, it is conceivably possible that a general rise in price-cost
margins - associated in Mankiw’s analysis with increasing imperfection of
competition – is not necessarily associated with a general rise in profit rates.
Arguably, in a more general input-output model, the complexity of production may
allow even less room for inferences about systematic effects of changes in price-cost
margins on profit rates, quite aside from problems with using such margins as a means
of measuring the degree of competition.

X Conclusion

Reinterpreted in terms of restricted versus unrestricted competition and thus in terms
of the extent to which capital is able to move sufficiently freely to enforce a tendency
towards a uniform rate of profit, restrictions on competition may well lead to lower
levels of aggregate employment, for the same level of autonomous demand. Our
analysis show whether or not restricted competition has this effect depends inter alia
on relative consumption propensities between income classes and on the specifics of technology.

In the multi-commodity, multi-technique case switches in technique mean a reduction in the aggregate employment or an increase in this multiplier as competition becomes less restrictive, at least where the extent of imperfection of competition is measured by the profit rate.

The analysis of this paper therefore suggests that under certain conditions it is possible that less restrictive competition may generate higher aggregate employment. *However, this does not entail any proposition about unfettered competition being associated with full labour employment. Nor therefore does it entail any proposition to the effect that in a world of unfettered or “unrestricted” competition there is little room in the long-run for demand stimulus engineered by government policy.* This latter proposition is merely the mirror image of the full-employment proposition at the heart of orthodox long-run analysis. As such, the (now) conventional view that there is a hard and fast connection between imperfect competition and “Keynesian” effects is on extremely shaky ground and, as has been argued elsewhere, finds no support in a classical/Sraffian analysis of relative prices and distribution.

Additionally, one finds it difficult to support the contention of Mankiw that changes in price-cost margins are associated with larger income-expenditure multipliers, not to mention the problem of conducting such an analysis in terms of such margins rather than in terms of profit rates.
Finally, the usefulness of the orthodox procedure of assuming product differentiation as a significant feature of imperfect competition is questionable. From a Sraffian perspective, arguably little is added to the analysis other than extra non-basic commodities, with no definite “welfare” implications forthcoming independently of specific assumptions about production techniques. Indeed the discussion above raises the possibility that net product per worker effects associated with product differentiation may work in the opposite direction to the effects of changes in profit rates on aggregate employment resulting from changes in profit rates accompanying restrictions on competition. What an orthodox economist would make of the welfare effects of imperfect competition looked at this way is unclear.

Endnotes

1. ‘Short-run’ here is best defined in term of a time insufficiently long enough for prices, wages and interest rates to respond to quantity imbalances. It is worth stressing then that, on this definition, the suggestion of a role for aggregate demand in influencing output and employment in the short-run is certainly nothing new: the claim of novelty by New Keynesians has to do solely with the bringing of sophisticated microfoundations to bear on the matter. Of course, the New Keynesians, as well as most macroeconomists, appear completely unaware of the fact that Keynes himself in 1936 would not have seen as novel any claim that aggregate demand could influence output and employment in the short-run.

2. The relevant arguments are canvassed in White, 2004.

3. We ignore here inflationary triggers such as a stimulus to money wages from the aggregate demand increase.

4. Thus, the approach adopted here leaves no room for assumptions to the effect that “N firms … can produce N distinct differentiated commodities under the same cost conditions” (Hart, 1985 p.530). Needless to say, the approach adopted here also assumes that even generating the perception in consumers’ minds of product differentiation requires some difference in the combination of inputs into production.

5. In other words, in this case product differentiation in the consumer good industry reflects the use of different capital goods and not just different combinations of labour and the same capital good. Different capital goods would here mean that the processes producing the capital goods are different, in that the combinations of labour and circulating capital used to produce the capital goods are different.

6. This implicitly also rules out the use of two different circulating capital goods used exclusively as substitute circulating capital input in the production of circulating capital since this would imply two different circulating capital goods.

7. One special case which arises here is where $\alpha_l$ and $\alpha_c$, are both positive and different from unity but equal. This is taken up below (see footnote Error! Bookmark not defined.).
8. Admittedly, the presence of product differentiation could lead to a rise in price of commodity 1 in a short-period setting, to the extent that competition generates marketing costs for example. But conceivably, over time the price of commodity 1 must return to its free competition level.

9. Indeed, one might suggest that this is a part of the evolution of price systems: viz., a learning process involving the realization in some cases that the ability of producers to differentiate their output was not dependent on a particular variety of a “basic” input. Hence some of the differentiation of “basics” would transform itself into a choice of technique and with it the disappearance of differentiation of such commodities.

10. Of course, the other possibility – much less plausible - is that \( \frac{a_{c_1}}{l_{c_1}} = \frac{a_{c_2}}{l_{c_2}} \) so that, in attempting to differentiate their commodity (to consumers), producers of one of the versions of the consumer good use different amounts of one input per unit of output (compared with producers of the other consumer good), they will use different amounts of all inputs per unit of output, and the change in input usage compared with the production of the competitor product will be exactly the same for all inputs. In such a case, we would observe the co-existence of two techniques so long as there exists a demand for the two different commodities produced by means of two different circulating capital goods – so that one technique is not eliminated on the grounds of cost-minimization. We are assuming here of course that the process of differentiating one’s output from that of a competitor requires some additional quantities of labour and/or circulating capital.

11. An assumption Sraffa clearly makes himself (1960, p. 8).

12. Indeed, in a stationary economy, with a constant population, given technology and imposing the condition that output be equal to demand, net output per worker and consumption per head should move together.

13. An alternative and more complex derivation of the same result involves identifying first the activity levels and associated labour employment levels for the vertically integrated consumption good industry for each of the two consumer goods. Thus, gross output for the circulating capital good, in the absence of product differentiation, is given by

\[
Y_a = \frac{a_{c_1}}{l-a_a} Y_i 
\]  

so that the total labour requirement for the vertically integrated consumption good industry is

\[
L = Y_i \left( l_{c_1} + \frac{a_{c_1}}{l-a_a} l_a \right) 
\]  

Hence the net output per worker in the undifferentiated product case, which will be equal to the maximum real wage (i.e. the reciprocal of the RHS of the equation for \( p_{c_1}w \) in equations (5) where \( r = 0 \), is given by

\[
\frac{Y_a}{L} = \frac{l-a_a}{(l-a_a)l_{c_1} + a_{c_1}l_a} 
\]  

The activity level in the capital good industry with a differentiated consumer good (but homogeneous circulating capital good) would be given by

\[
Y_a = \frac{a_{c_1}Y_i + a_{c_2}Y_2}{l-a_a} 
\]  

and thus, in view of equations (16),

\[
Y_a = \left( \frac{NP_{c_1}(a_{c_2}c_{2w} + a_{c_1}c_{1w}p_{21})}{(l-a_a)\cdot p_{21}l_{c_1}} \right) 
\]  

The total labour requirement for the vertically integrated consumption industry is therefore
\[ L = NP_i c_{1w} I_{1w} + NP_j c_{2w} I_{2w} + \left( \frac{NP_i (a_{jw} c_{2w} a_{jw} c_{jw} p_{21})}{(1-a_a) p_{21} I_{1w}} \right) I_a \] 

\hspace{1cm} \text{......(vi)}

so that net output per worker for the differentiated product case is

\[ NP_{tw}^d = \frac{(1-a_a) p_{21}}{a_{jw} c_{2w} I_a - (1-a_a) c_{jw} I_{2w} + c_{jw} (a_{jw} I_a + (1-a_a) I_{2w}) p_{21}} \]

\hspace{1cm} \text{......(vii)}

In view of equations (13) and (15) it is possible to rewrite equation (vii) as

\[ NP_{tw}^d = \frac{(1-a_a) NP_{tw}^d p_{21}}{(1-c_{1w}) (a_{jw} I_a + (1-a_a) I_{2w}) NP_{tw}^d + (1-a_a) c_{1w} p_{21}} \]

\hspace{1cm} \text{......(viii)}

In turn, in view of equations (10) and (13), expression (viii) can be written as equation (16).

14. This result is not surprising since the proportions in which the two consumption goods are demanded and thus produced would not influence prices with constant returns to scale and an exogenously determined rate of profit (the so-called non-substitution theorem) – a standard feature of Sraffian models. It is worth noting also that we are assuming that \( c_{1w} \) and \( c_{2w} \) are largely independent of \( p_{21} \) and there is some precedence for this even in the orthodox literature – e.g. see the argument in Hart (1985), p. 540.

15. In other words, the technique generating the highest real wage at the given rate of profit will do so regardless of the commodity in terms of which the real wage is expressed.

16. Note that these multipliers would be different from the traditional textbook income-expenditure multipliers in a number of ways – but one worth noting here is that the multipliers here include the circulating capital input required in production in each sector, what have elsewhere been referred to as “supermultipliers”.

17. Cf. the Appendix.

18. The square matrix \((I - M)^{-1}\) is a convergent power series provided that the maximum eigenvalue of the matrix \(M\) is in modulus less than unity (Pasinetti, 1977, p.66-67).

19. Since the \( c_{ij} \) are all positive as are the ‘\( a \)’ coefficients, and given also the viability requirement that \( 1 - a_a > 0 \)

20. This is not really surprising given that, with the size of the profit rate differential between sectors, determined by \( e_{ca} \) taken as given, along with technology, a rise in \( e_a \) and thus a rise in the rate of profit across the board would generate a fall in the real wage, measured in term of any of the commodities or combination of those commodities.

21. More precisely, Vera’s analysis, following Mankiw’s, is concerned with the fiscal multiplier and inter alia with its change in response to a changes in the degree of product market imperfection either measured in terms of price –cost margins or as mark-ups over variable cost. Vera’s result is stronger than stated in the text – namely that the relation between the fiscal multiplier and the size of the mark-up is unambiguously negative (p. 789 and p. 793).

22. The approach adopted here is therefore also different from Vera’s which focuses on mark-ups. Vera is however cognizant of the fact that conducting the analysis in terms of mark-ups thereby focuses the analysis on the short-run which is clearly Vera’s intention (e.g. the comment on p.791).

References


Sraffa P. (1960), Production of Commodities by Means of Commodities, Cambridge, CUP.


Appendix

Impact of changes in \( \tau_a \) on \( c_i \) coefficients

The purpose of this appendix is to determine the sign of the differentials \( \frac{dc_{ij}}{d\tau_a} \) and \( \frac{dc_{iu}}{d\tau_a} \). Considering first the coefficient \( c_{ij} \), where \( i \neq j \),

\[
c_{ij} = \frac{c_{ij} l_j (1-a_i (1+i+\tau_a)) + a_j c_{pj} l_a (i+\tau_a \cdot \tau_{ca})}{l_j (1-a_i (1+i+\tau_a)) + a_i l_a (1+i+\tau_a \cdot \tau_{ca})}
\]

\[
\ldots \ldots \text{(A.1)}
\]
the sign of the differential $\frac{dc_{ij}}{d\tau_a}$ turns on whether

$$
\left( a_i, c_{wi}, (a_i, l_i + l_j) - a_i, c_{wi}, l_j \right) \tau_{ca}
$$

$$
- a_i \left( a_i, c_{wi}, l_j + a_i, c_{pi}, l_i - a_i, c_{wi}, l_j \right) \left( \tau_{ca}, (1 + i) - i \right) > 0
$$

\[ (A.2) \]

After some manipulation this condition can be written as

$$
\frac{c_{wi}}{c_{mi} - c_{pi}} > \frac{Z}{Z + a_i, l_j, (a_i - a_i, i - 1), \tau_{ca} - a_i, a_i, l_j (1 + i)}
$$

\[ (A.3) \]

where

$$
Z = a_i, a_i, i, l_j + a_j, (a_i, l_i + l_j, (1 - a_i - a_i, i)), \tau_{ca}
$$

\[ (A.4) \]

Since the maximum rate of profit for the price system (5a) is equal to $1 - a_a$ and the rate of for the circulating capital good sector is $r = i + \tau_a$, the maximum $\tau_a$ must be equal to $\frac{1 - a_a - a_a, i}{a_a}$. A positive maximum $\tau_a$ therefore requires that $1 - a_a - a_a, i > 0$.

Thus $Z$ in expression is positive and the expression

$$
a_i, l_j, (a_i - a_i, i - 1), \tau_{ca} - a_i, a_i, l_j (1 + i) \text{ in the denominator must be negative.}
$$

Provided also that

$$
Z > \left| a_i, l_j, (a_i - a_i, i - 1), \tau_{ca} - a_i, a_i, l_j (1 + i) \right|
$$

\[ (A.5) \]

the denominator of the RHS of inequality (A.3) will be positive, though less than $Z$ so the whole expression on the RHS $> 1$.

With the LHS of the inequality $> 1$ also, it cannot be determined a priori whether the inequality holds.

Condition (iv) implies a bound on the size of the differential $\tau_{ca}$ relative to technology, namely,
\[ \tau_{ca} > \frac{a_a \left( a_i J_j, (1 + i) - a_j i J_i \right)}{(a, a_i J_a + a_j J_i, (1 - a_a - a_a i) - a_i J_j, (1 - a_a, a_a i))} \quad \ldots \ldots \text{(A.6)} \]

For the case where \( i = j \), the sign of the differential \( \frac{dc_{ji}}{d\tau_a} \) is similarly \textit{a priori} unpredictable and depends on the particulars of technology, the coefficients \( c_{wi} \) and \( c_{pi} \) along with the profit rate margin differential \( \tau_{ca} \). For this case, the analogous expression to that of A.1

\[ c_{ii} = \frac{c_{wi} J_i, (1 - a_a, (1 + i + \tau_a)) + a_i c_{pi} J_a (i + \tau_a, \tau_{ca})}{J_i, (1 - a_a, (1 + i + \tau_a)) + a_i J_a, (1 + i + \tau_a, \tau_{ca})} \quad \ldots \ldots \text{(A.7)} \]

In order that the differential \( \frac{dc_{ii}}{d\tau_a} > 0 \) it is necessary that

\[
\left( a_i c_{pi}, J_a + (c_{pi} - c_{wi}), J_i \right) \tau_{ca} \\
+ a_i J_i (c_{wi}, (1 + i), (\tau_{ca} - 1) + c_{pi}, (i - \tau_{ca} (1 + i))) > 0
\]

\[ \ldots \ldots \text{(A.8)} \]

and in turn that

\[ \frac{c_{wi}}{c_{pi} - c_{pi}} > \frac{a_a J_a, \tau_{ca} + J_i, (\tau_{ca} + a_a (i - (1 + i), \tau_{ca}))}{a_i J_a, \tau_{ca} - a_i J_i} \quad \ldots \ldots \text{(A.9)} \]

The numerator on the RHS of the above inequality is positive since \( 1 - a_a - a_a i > 0 \).

Provided that \( \tau_{ca} \) is greater than unity, as is the LHS. Hence, \textit{a priori}, the sign of the differential is ambiguous.

Finally, with regard to the coefficient \( c_{ia} \), given by

\[ c_{ia} = \frac{J_a, (c_{wi}, J_i, (1 - a_a) (1 + i + \tau_a)) + a_i c_{pi} (i + \tau_a)}{J_i, (1 - a_a, (1 + i + \tau_a)) + a_i J_a, (1 + i + \tau_a, \tau_{ca})} \quad \ldots \ldots \text{(A.10)} \]

The positivity of the differential \( \frac{dc_{ia}}{d\tau_a} \) requires that

\[ a_a \left( c_{pi}, J_a + a_i J_i, (c_{wi}, (1 + i), (\tau_{ca} - 1) + c_{pi}, (1 + i, \tau_{ca})) \right) \]
\[ - (a_a)^2, c_{pi}, J_a - a_i c_{wi}, J_a, \tau_{ca} > 0 \quad \ldots \ldots \text{(A.11)} \]
which requires in turn that

\[
\frac{c_{wi}}{c_{pi}} > \frac{a_i(1 + i - i \tau_{ca}) + l_i(1 - a_i \tau_{ca})}{(1 - a_i)(a_i l_i - a_i l_i \tau_{ca})}
\]

\[
\ldots \ldots (A.12)
\]

As with the differentials \( \frac{dc_i}{d\tau_a} \) and \( \frac{dc_{ii}}{d\tau_a} \), the sign of \( \frac{dc_{ia}}{d\tau_a} \) is clearly ambiguous \( \text{\textit{à priori}} \).

Impact of changes in \( \tau_a \) on output and employment multipliers

Figure A.2 illustrates the changes in \( c_i \) coefficients, \( m_{ii} \) coefficients (the last row of the \( M \) matrix in expression (33)) and in the associated output and employment multipliers as \( \tau_a \) changes, for the three-commodity model of Section III for a given technology.

Panels (a) and (b) show these changes for two different sets of values of the consumption coefficients.

**Figure A.2(a): Impact of changes in \( \tau_a \) for a single technique**

<table>
<thead>
<tr>
<th>( a_{c1} )</th>
<th>( \alpha_c )</th>
<th>( a_{c2} )</th>
<th>( a_a )</th>
<th>( l_{c1} )</th>
<th>( \alpha_l )</th>
<th>( l_{c2} )</th>
<th>( l_a )</th>
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<td>0.765</td>
<td>0.22</td>
<td>0.9</td>
<td>0.198</td>
<td>0.235</td>
</tr>
</tbody>
</table>

\((c_{w1} = c_{w2} = 0.45; c_{p1} = c_{p2} = 0.4)\)
Figure A.2 (b): Impact of changes in $\tau_a$ for a single technique

$(c_{w1} = c_{w2} = 0.45; c_{p1} = c_{p2} = 0.2)$

$c_1$ coefficients as functions of $\tau_a$

$c_2$ coefficients as functions of $\tau_a$

$m$ coefficients as functions of $\tau_a$
Figure A.3: (a) Multiple techniques – real wage-rate of profit relations

<table>
<thead>
<tr>
<th>Technique</th>
<th>α</th>
<th>β</th>
<th>δ</th>
<th>γ</th>
<th>θ</th>
</tr>
</thead>
<tbody>
<tr>
<td>a₀₁</td>
<td>0.0465</td>
<td>0.0465</td>
<td>0.0465</td>
<td>0.0465</td>
<td>0.07</td>
</tr>
<tr>
<td>a₀₂</td>
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<td>0.07</td>
<td>0.07</td>
<td>0.07</td>
<td>0.04</td>
</tr>
<tr>
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<td>0.8</td>
<td>0.835</td>
<td>0.885</td>
</tr>
<tr>
<td>l₀₁</td>
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<td>0.22</td>
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</tr>
<tr>
<td>l₀₂</td>
<td>0.198</td>
<td>0.198</td>
<td>0.198</td>
<td>0.198</td>
<td>0.198</td>
</tr>
<tr>
<td>l₁</td>
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<td>0.365</td>
<td>0.165</td>
<td>0.115</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Real wage - rate of profit
Figure A.3: (b) Multiple techniques – impact of changes in $\tau_a$ on output and employment multipliers ($c_{w1} = c_{w2} = 0.45$; $c_{p1} = c_{p2} = 0.4$)