TWO CONCEPTS OF 'CENTRE OF GRAVITY'
Commentary on contributions by Gary Mongiovi and Fred Moseley

Alan Freeman Friday, 23 February 2001

A central assertion in Gary Mongiovi's paper is that Prices of Production, for Marx, function as 'centres of gravity' for market prices and that this is one of the senses in which such prices can be said to constitute an essence for which market prices are the appearance. Fred Moseley, in a number of papers and on the marxist discussion list OPE-L, makes the same argument.

Both authors identify the concept of 'centre of gravity' with various other concepts in political economy which they treat as identical. In particular both treat it, uncritically, as simply another term for 'long-run' price by which is clearly meant 'long-run equilibrium' price.

In my paper to the 1999 conference entitled 'The Limits of Ricardian Value: Law, Contingency and Motion in Economics' I pointed up two fatal flaws in this argument:

(1) long-run equilibrium prices are not the only concept which can instantiate the idea of a 'centre of gravity'. TSS prices of production function as centres of gravity.

(2) Sraffian equilibrium prices possess a fatal flaw if one interrogates the idea that they function as centres of gravity. Namely, any actual sequences of market prices compatible with Sraffa's assumptions diverges. This violates an important property required of any concept that instantiates 'centre of gravity', since it it is difficult to see how they 'attract' market prices.

(3) For any arbitrary random sequence of market prices, TSS prices of production exhibit all the properties one might require of a 'centre of gravity'. They constitute a time average of market prices, they attract market prices, and changes in them produce changes in market prices.

(4) Thus, whether or not Marx treated Prices of Production as 'centres of gravity' (and the textual evidence suggests he considered value, not price of production, to function as centre of gravity), Mongiovi's and Moseley's argument does not prove that Marx employed equilibrium prices. The term 'centre of gravity' cannot be uncritically or automatically taken to mean 'equilibrium price'

This short contribution summarises the evidence of my 1999 paper. A spreadsheet detailing the calculations can be found on www.greenwich.ac.uk/~fa03/iwgvt/1999

The physical system

The system assumes the following physical sequence:

t	C_I	C_{II}	L_I	L_{II}	X_I	X_{II}
1	10	20	20	10	30	30
2	11	20	20	10	32	30
3	12	20	20	10	34	30
4	13	20	20	10	36	30
5	14	20	20	10	38	30
Etc						

There are two sectors I, II both of which consume commodity I and labour. The production system is thus (in aggregate)

$$\begin{bmatrix} C_I & 0 \\ C_{II} & 0 \end{bmatrix} \textit{with labour} \begin{bmatrix} L_I \\ L_{II} \end{bmatrix} \textit{produces outputs} \begin{bmatrix} X_I \\ X_{II} \end{bmatrix}$$

The real wage w is assumed equal to 0.5 units of commodity II. Thus the output (and input) of sector I steadily increases, for a constant labour input, constant real wage, producing rising productivity in this sector, constant labour productivity in sector II, and falling values throughout (these assumptions can be altered by the reader after downloading the spreadsheet to any desired physical sequence)

If for simplicity we suppose that p_{II} is 1 throughout (again, the reader can modify this supposition), this yields the following sequence of equilibrium profits and production prices p_I, p_{II}:

$1+r$	p_I	p_{II}
1.37	0.84	1
1.39	0.89	1
1.40	0.93	1
1.42	0.97	1
Etc		

Letting c_I stand for the coefficient C_I/X_I, etc, these are the profits and prices that satisfy the simultaneous equations

(1a) $$(p_I c_I + p_{II} w l_I)(1+r) = p_I x_I$$

(1b) $$(p_I c_{II} + p_{II} w l_{II})(1+r) = p_{II} x_{II}$$

and hence the eigenvalue equation

(2) $$\lambda^2 + (c_I + l_{II} w)\lambda + (c_I l_{II} w - l_I w c_{II})$$

(3) whence $$\lambda^2 = (c_1 + l_2 w) + \sqrt{\Delta}$$

$$\Delta = (c_I + l_{II} w)^2 - 4(c_I l_{II} w - l_I w c_{II})$$

However this is not the only way to calculate prices of production. Temporal prices of production are yielded, for a constant MELT of 1, by the equations

(4a) $$(p_{It} c_{It} + p_{IIt} w l_{It})(1+r_t) = p_{It+1} x_{It}$$

(4b) $$(p_{It} c_{IIt} + p_{IIt} w l_{IIt})(1+r_t) = p_{Iit+1} x_{IIt}$$

where r, the profit rate, is given by $S_t/(C_t+V_t)$

where S, (total)surplus value, V, (total)variable capital and C, (total)constant capital, are given by

(5a) total labour: $L = L_I + L_{II}$

(5b) total variable capital: $V_t = p_{II} w L_t$

(5c) total constant capital $C_t = p_{It}(C_I + C_{II})$

(5d) total surplus value $S_t = L_t - V_t$

This yields the sequence

r	p_I	P_{II}
0.37	0.84	1.00
0.36	0.82	0.99
0.37	0.80	0.97
0.38	0.77	0.95
0.39	0.74	0.93
0.40	0.72	0.91

The non-identity of equilibrium and temporal production prices.

The first point is that the two sequences of production prices (and profits) are simply *not the same*. Two concepts are involved; one must choose between them. Figure 1 shows, first of all, the ratio of the temporal to the equilibrium prices of production and second, the ratio of the *relative* prices in both systems. Of course, equilibrium and temporal prices can be expected to differ in any case because of the arbitrary choice of numéraire in the equilibrium system. But this cannot account for all the difference since the two ratios move in *opposite directions* for the two sectors. Moreover the relative prices also diverge, which is not caused by the choice of numéraire.

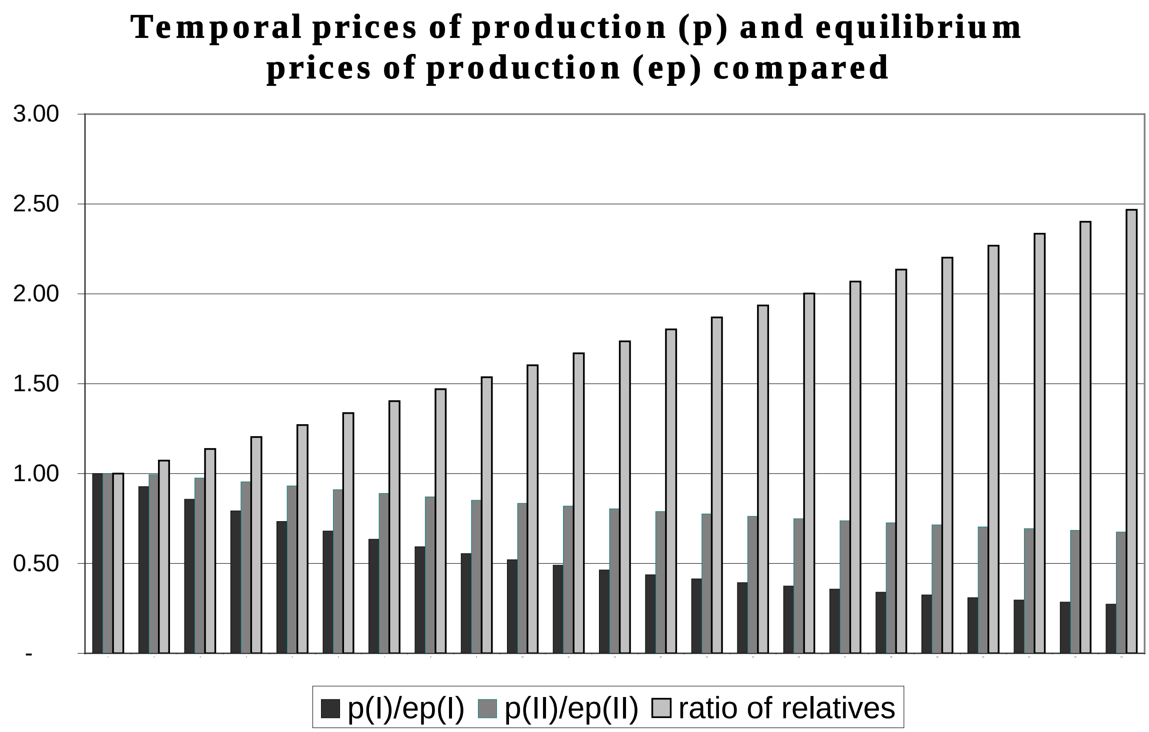

Figure 1

Marketising equilibrium prices

Second, however, there is an intractable problem with the equilibrium prices of production which can be seen if, in each period, we set next to each other the prices, in sector I, which producers pay for their inputs, and the price for which these same inputs were sold

Start of period	Sale price	Purchase price
1		0.84
2	0.84	0.89
3	0.89	0.93
4	0.93	0.97
Etc	0.97	

Because input prices equal output prices, the purchasers pay an amount of money different to the amount of money which the sellers of the same goods receive. That is, these ‘prices’ of production cannot possibly function as actual prices, as the actual basis of exchange. The term ‘prices’ is a misnomer. Note that for temporal prices this problem does not arise. By definition, the temporal price for which goods are sold at the end of a period, is equal to the price paid for the same goods at the beginning of the next period.

The claim is, however, not that these prices function as actual prices, but as centres of gravity for actual prices, and that this is what Marx intended. In that case, however, it is reasonable to ask: is there any actual sequence of market prices, conformable with the suppositions of the equilibrium paradigm, for which these prices of production could serve as a centre of gravity?

Suppose, then, the following sequence of market prices: in each period, the money *actually* paid by the producers is equal to the equilibrium price for which they were sold, thus:

t	Sale price	Purchase price
1		0.84
2	0.89	0.89
3	0.93	0.93
4	0.97	0.97
Etc		

This is a perfectly reasonable sequence of market prices. What profit rates does it yield? Profits are, by the normal commercial definition, the difference between sales and revenue. This yields the sequence

Sector I			Sector II		
Costs	Sales	Profit	Costs	Sales	Profit
18.43	26.57	0.44	21.86	30	0.37
19.74	29.68	0.50	22.71	30	0.32
21.13	32.95	0.56	23.55	30	0.27
22.60	36.37	0.61	24.38	30	0.23
24.14	39.94	0.65	25.20	30	0.19
25.76	43.66	0.69	26.02	30	0.15
27.46	47.52	0.73	26.83	30	0.12
29.23	51.53	0.76	27.63	30	0.09
31.08	55.69	0.79	28.42	30	0.06

The profit rates in the two sectors diverge, as figure 2 shows. Thus, the equilibrium profit rate does not serve as centre of gravity for the sectoral profit rate.

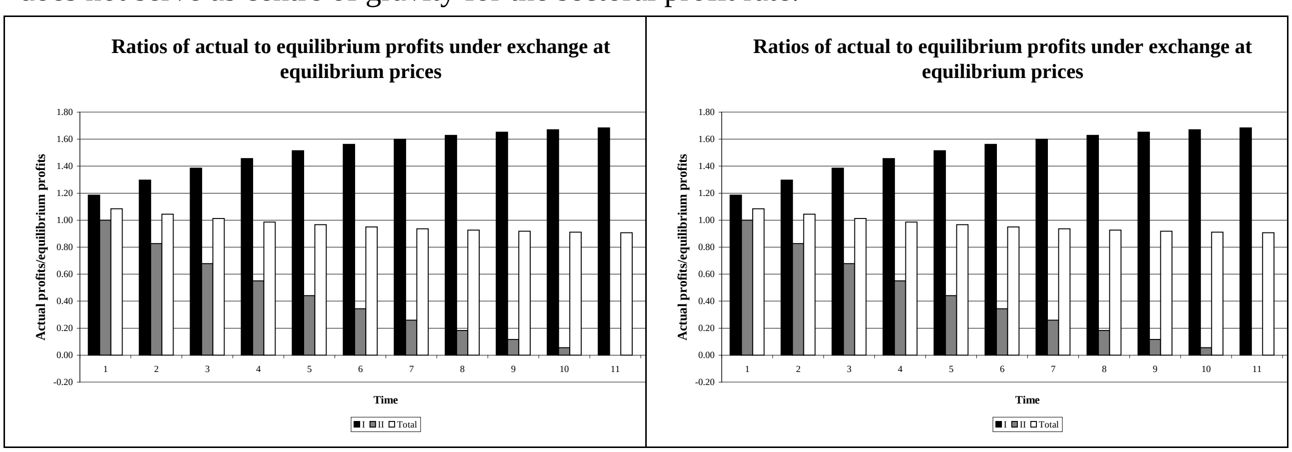

Figure 2	Figure 3

In order to 'save the phenomena' we might ask the following question: is there a sequence of market prices for which profit rates do not diverge (that is, the equilibrium profit rate serves as centre of gravity for sectoral profit rates). The resultant prices are shown in Figure 3.

But now, as can be seen, the prices diverge: that is, the equilibrium price does not act as centre of gravity for the resultant market prices. In summary, thus:

Either the equilibrium profit is centre of gravity for sectoral profit rates, and prices diverge

Or the equilibrium price is centre of gravity for sectoral prices, and profits diverge

Finally, it should be noted that the temporal production prices in general fulfil the role of centre of gravity: this is not tautological for two reasons

(1) they were not calculated as averages of the prices (it was the profit rate that was calculated as an average)

(2) it is conceivable that while the production price will serve as a centre in each period, over time it will lack some desirable properties of a centre of gravity, eg it might not be a time average, market prices might not oscillate around them, etc.

There are two tests of this property. The first is to set up a simulation in which we suppose some exogenously-given process governing market prices that is stated independent of the production price, and observe whether the production price nevertheless serves as centre of gravity. I tested this hypothesis in 1991 with a simulation model in which it is simply supposed that in each sector, profits are re-invested, and that prices tend downwards for excess supply and upwards for excess demand, both measured by stock movements. Sectors with high prices will then invest more because of their excess profits, and vice versa.

A simple reproduction of this simulation is to suppose *random* market prices, randomised by supposing that sectoral profits are a random distance from average profits. The reader can supply whatever rule he/she chooses in the spreadsheet I have supplied. Below are the production and market prices for one such simulation which, I think, exibit the centre of gravity property reasonably convincingly