EMPERICAL SUPPORT FOR THE "DOUBLE-SOLUTION" TO THE TRANSFORMATION PROBLEM.

When I began investigating the Transformation Problem, I soon realised that Marx's definition of prices of production was incomplete. I provided a fuller definition: "*The 'price of production' is not the price which yields an average rate of profit on the old capital, but the average rate of profit on the newly appreciated or depreciated capital.*" This broader definition thus requires not one but two transfers of surplus value, the first, as in Chapter 9 was needed to average out profit rates and arrive at "*prices of commodities*", and the second to move from prices of commodities to prices of production by pricing capital and adjusting profits to compensate. Thus we may call my solution to the transformation problem, the *double-solution*.

The need for this double transfer has not been previously recognised. And in not being recognised it opened the door to all the criticisms levelled at Marx where it was said his examples (Tables) were incongruous because inputs were cast in their value form while outputs were cast in their price form. And as prices deviated from values, the inputs and outputs were incongruous. The result of all of this criticism was to turn the defenders of Marx into intellectual acrobats as they tried to defend Marx and to rescue him from this predicament. Most just ducked the issue at hand, that is the movement from value to price.

For my part there was nothing wrong with Marx's arithmetical example. All he was trying to do in Chapter 9 was to show in which direction and by how much surplus value needed to be distributed to achieve an average rate of profit in an economy were capitals differed in their composition. All that was required was to use Chapter 9 as the foundation and take the additional step to ensure equality between inputs and outputs without deviating from the methodology lodged in that Chapter.

In order not to repeat myself the reader needs to read two articles in the order, http://theplanningmotive.com/harmonising-transformation-with-reproduction-completing-the-defense-of-the-law-of-value/ and then the earlier article http://theplanningmotive.com/a-comprehensive-update-of-the-transformation-problem/ The first article is called: "*HARMONISING THE TRANSFORMATION OF PRICES WITH REPRODUCTION, or making Marx's Labour Theory of Value bullet-proof",* and the second: "*A COMPREHENSIVE UPDATE OF THE TRANSFORMATION PROBLEM".* There I explain why there needs to be two distributions of surplus value, one to adjust the mass of profits and the second to price capital, and which once done, it yields the actual prices of production.

What I did not do in either of these articles was provide any empirical proof based on real life economic data to support this solution. This article seeks to remedy this. In the article on "*Harmonising*", I make the bald claim that "*The rising composition of capital necessarily leads to an appreciation of constant capital and a depreciation of labour power in terms of money*", to which may be added, because of the second transfer of value. There was no support for this assertion. This article will provide the proof.

In investigating the various price indexes at this unique time of high inflation, I realised it was possible to compare the prices of constant capital, with the prices of consumer goods, many of which go into making up the basket that prices labour power. If I was right then the respective price indexes would show a rise in the price of constant capital relative to the price of labour power.

To begin. Graphs 1 & 2 are linked. Their purpose is to demonstrate the business cycle. The green graph provides the classic sine wave representing the industrial (business cycle) with its upside and downside. For our purposes the upside is the more important because it represents the phases of capital accumulation (investment in constant capital). We are able to detect three distinct periods from 1992. However, we will ignore the fourth valley formed by the pandemic because it is extraordinary.

Graph 1.
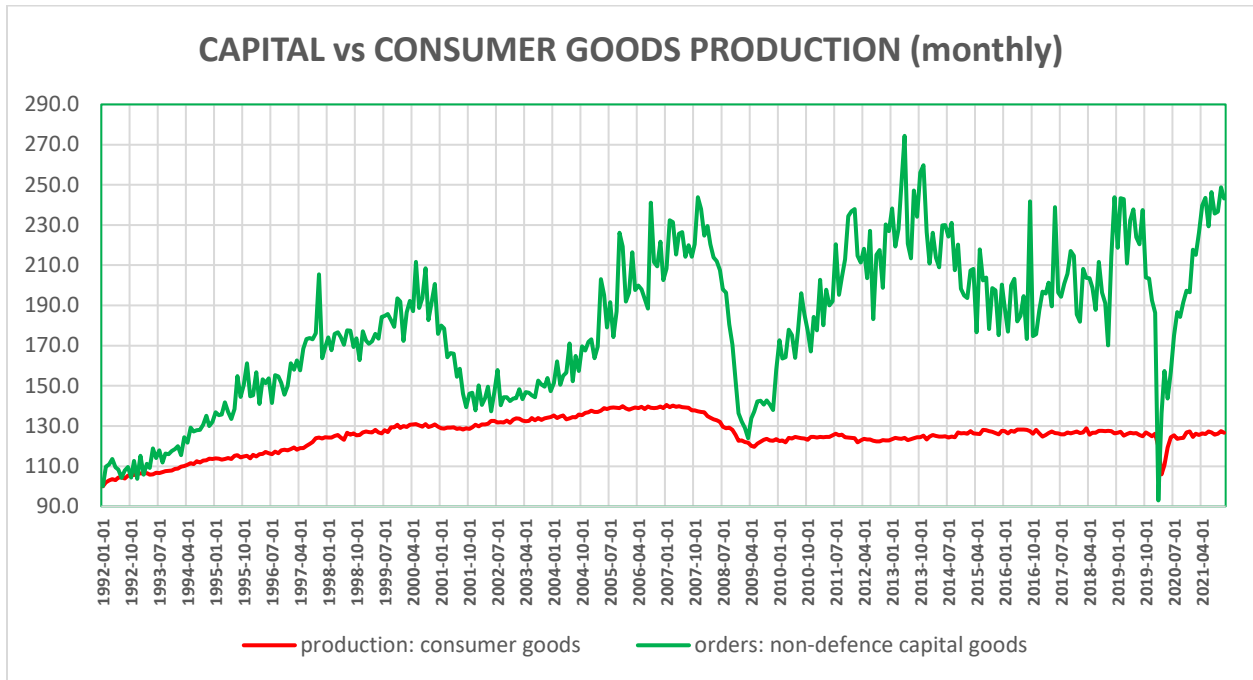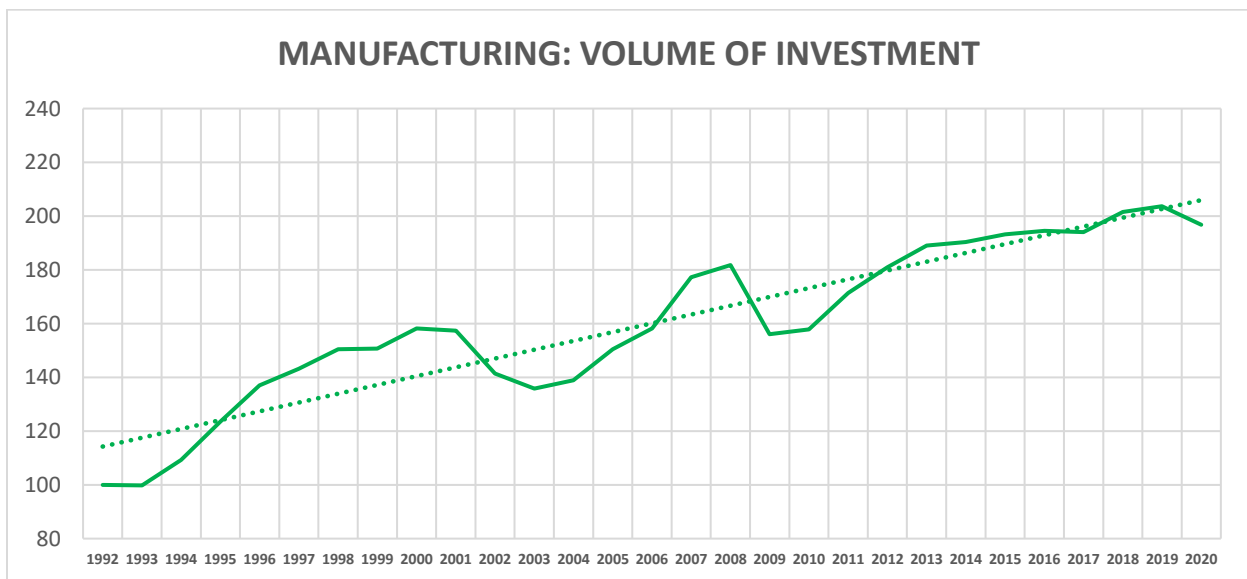
I used the orders for capital goods because unlike actual investment it is more spontaneous, more sensitive to market conditions. It is easier to cancel orders than stop an investment once started. In every

case, leading to the end of cycle in 2000, 2008 and yes 2013 we find peaks above the trend. This is particularly obvious in Graph 2. Following the peaks we have the declines as recessions ensue. Post 2013 we have a flattening rather than a fall in investment due to the financial support by central which avoided a full-blown recession breaking out at the end of 2015.

It is also worth pointing out how much more volatile orders and investment are compared to consumer spending. And yet, according to economists, it is consumer spending and changes to it, rather than changes to investment which causes expansion and recession. In reality however, it is the change in investment patterns, particularly that of circulating capital that precipitates recessions.

Focusing on the period of accumulation, what the 'double solution' hypothesis should reveal is that within the price patterns, the price of capital goods should rise faster than the price of consumer goods, particularly during the up-phase of the business cycle when investment in means of production is accelerating. All the indexes exclude services which would muddy the analysis. This exclusion allowed a comparison between industrial prices (Producer Price Index) and consumer prices (Consumer Price Index) for goods only to be made, or the goods PPI vs the goods CPI.

Graph 3 does confirm the hypothesis. This was particularly apparent in 2008 and 2014. In the former, from trough to peak, the PPI rose by 37.5% and the CPI by 25.5%, and in the case of the latter, the PPI rose by 20.3% and the CPI by 15.5%. These measures are not perfect. In the case of the PPI there is an understatement because that Index contains prices for both capital and consumer goods. In the case of the CPI the issue of cheaper import prices would tend to understate it as well. Nevertheless, these two understatements are offsetting rather than compounding and therefore the comparisons still work. If anything, were we to find indexes relating purely to capital goods, and to locally manufactured goods only, it is likely that the deviation in indexes would be greater not smaller.

Graph 3.
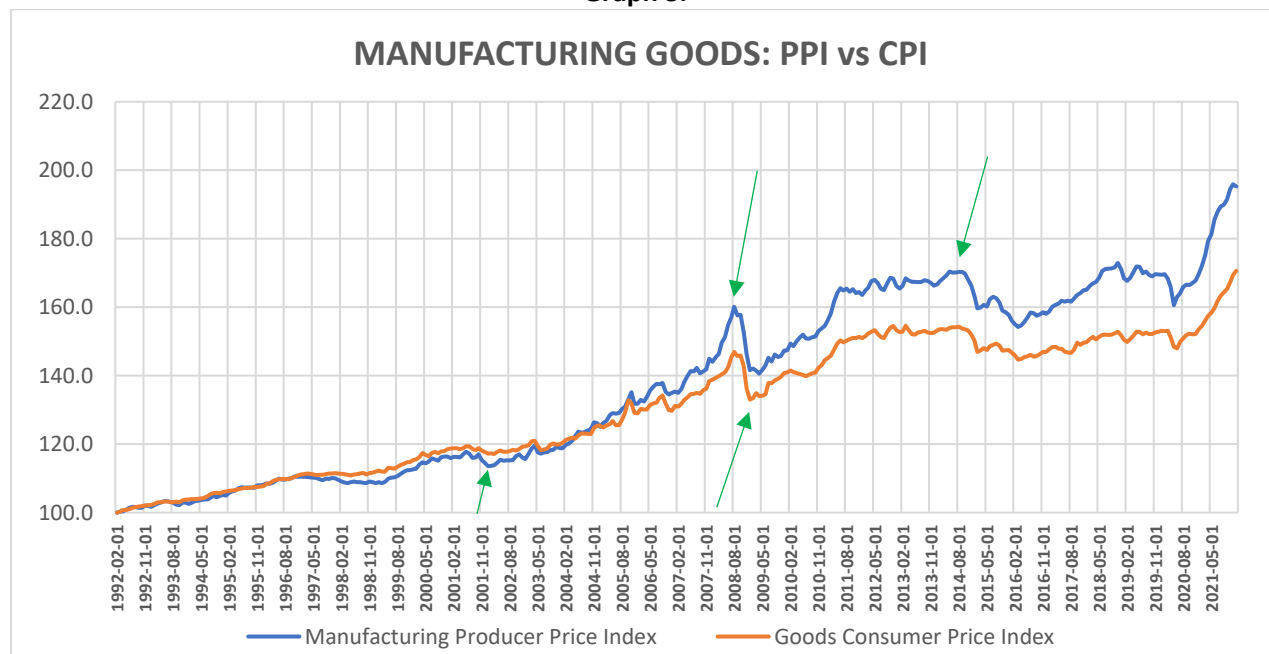

(Sources: Manufacturing PPI, FRED Table PCUOMFGOMFG & CPI Tables CUSR0000SAN + CUSR0000SAD*)
(*As there is no joint goods CPI, I blended the CPIs for durable and non-durable goods in the same proportion as the sales of durable to non-durable goods.)

To provide greater clarity into the relative movements of the two indexes I prepared Graph 4. It clearly shows that in the up-phases of the cycle the prices of means of production rises faster than articles of consumption and in the down phase they fall faster.

Graph 4.

MANUFACTURED GOODS: PPI relative to CPI
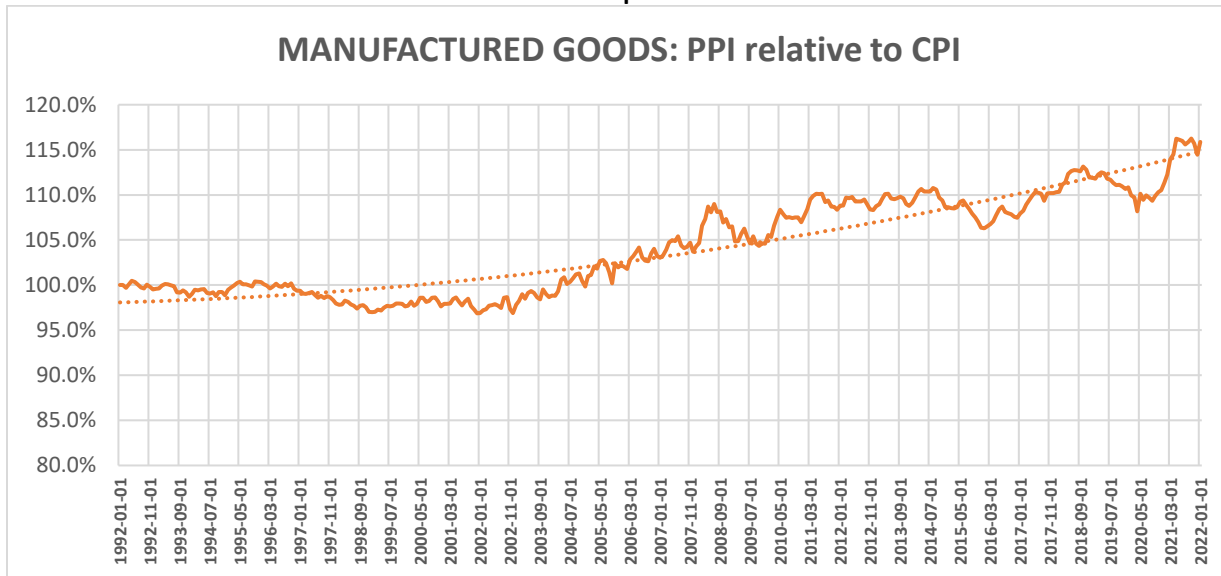
Up to now the emphasis, when considering the transformation problem, has been on profits rather than capital. Strictly speaking the emphasis should be on both. When that is done, the period of overproduction is more easily understood. The starting point for understanding why this is so begins with the capitalists' simplistic view that selling price is formed from cost price plus profit margin. It follows that the higher the composition of capital is, the higher the profit margin must be to yield an average rate of profit, and consequently so must the selling price be.

But the selling out price for one capitalist is the buying in price for another. Therefore higher selling prices in Department 1 (capital goods production) must appreciate capital during the up-phase of the cycle. In turn this requires higher margins. This being the compounding case, then it is clear that as selling prices forms input prices, there must be an escalating appreciation of the prices of capital. The capitalists at this time experience this as rising inflation focused in this sector. As Graph 3 shows the gap between capital and consumer goods widens at this point and reaches its maximum divergence just as the cycle turns. (It is at its narrowest once accumulation stalls and the economy enters a recessionary phase.) Thus, what competition executes, the 'double solution' mimics.

But if this is the case, the tendency towards breakdown (overproduction) is exacerbated. We could also define this as the period when the redistribution of surplus value becomes most stretched. And it will be most stretched in those industry with the highest composition of capital. They will be the first to experience the relative fall in the rate of profit. They will be the ones to first reign in investment, which is why orders to peak a year before the fall in the rate of profit becomes generalised. In Graph 1 that fall in orders occurs at the end of 2013. We will ignore the lead up to 2008 confounded by the financial crash and concentrate on the lead up to 2014. The reason being that the lead up to 2014 was unencumbered with issues of finance. It was a more regular end to the industrial cycle with the normal deceleration in

turnover as the peak was reached. This did not happen in 2008. Turnover, driven by the flurry of speculation and its enticements increased even as the rate of profit fell.

Graph 5 and its rate of profit is introduced to synchronise movements and changes. (Methodological note. As fixed capital is only estimated once a year at the end of the year, I subtracted each year end figure from the previous year end figure. Then I divided the annual difference arrived at by 4 to obtain quarterly differences which were then added incrementally to each quarter. In fact this produced a more accurate figure for fixed capital. Circulating capital was once again problematic. The formula for circulating capital is gross output less net surplus divided by the number of annual turnovers. Net surplus is only available once a year because national income and compensation for workers is an annual figure for manufacturing. The only quarterly figure available is post-tax profits found in NIPA Table 6.17D. Obviously the profit figure is smaller than the net surplus which includes interest and tax. To get around this problem I took the annual net surplus figure and compared it to the profit figures. On average the net surplus is 160% bigger. Using this factor I was able to bulk up the profit figure to obtain a reliable circulating figure. I am satisfied that both the fixed capital and the circulating capital components are proximate, enabling the rate of profit to be calculated. As always it is based on total capital comprising both the fixed and the fluid elements. Finally, the series is more time limited because some of the quarterly data only starts in 2005.)

The result is found in Graph 5. Although the data is less extensive than earlier graphs which extend back as far as 1992, the fifteen years found below are sufficient for our needs. We note how the rate of profit rises by over 250% between 2009 and 2013. It plateaus between 2013 and the end of 2014 before falling from this plateau. By then orders are down 20% (Graph 1).

Graph 5.
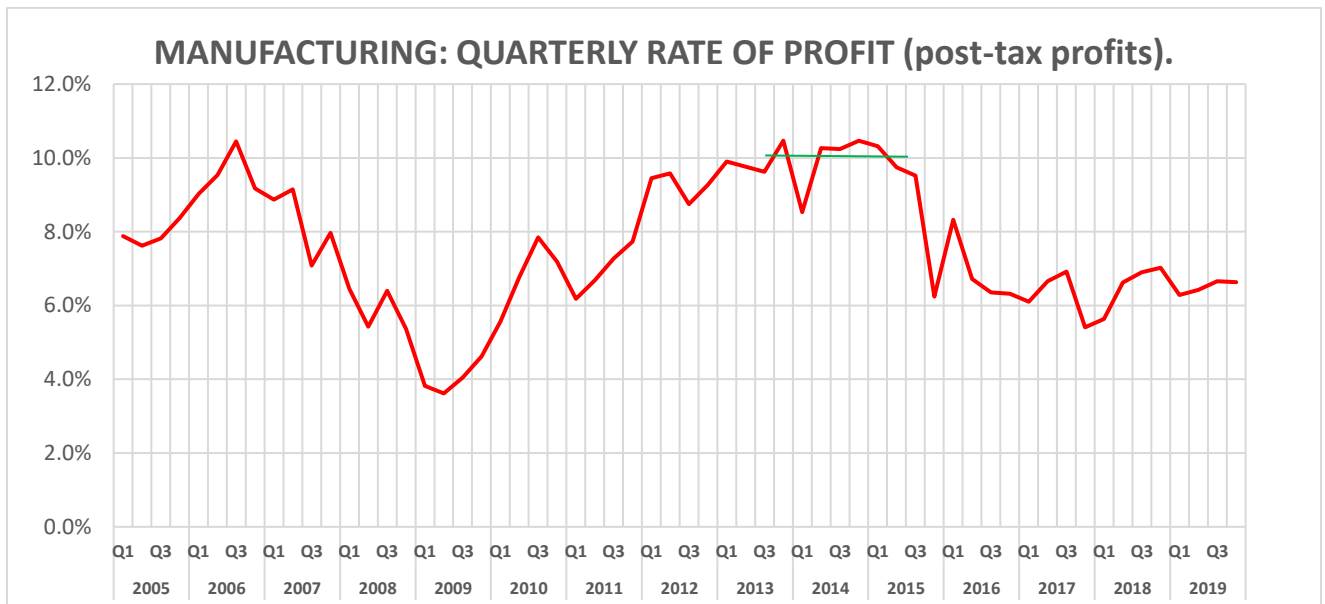
I have included a further two Graphs to nip any counter-arguments in the bud. Firstly, the rise in wages is neutral. There has been no spurt in wages sufficient to effect profits. If anything, post 2014 the rise in employment costs fell below trend but this did not bolster the rate of profit which continued to fall significantly after that.

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Graph 6.

MANUFACTURING: EMPLOYMENT COST INDEX
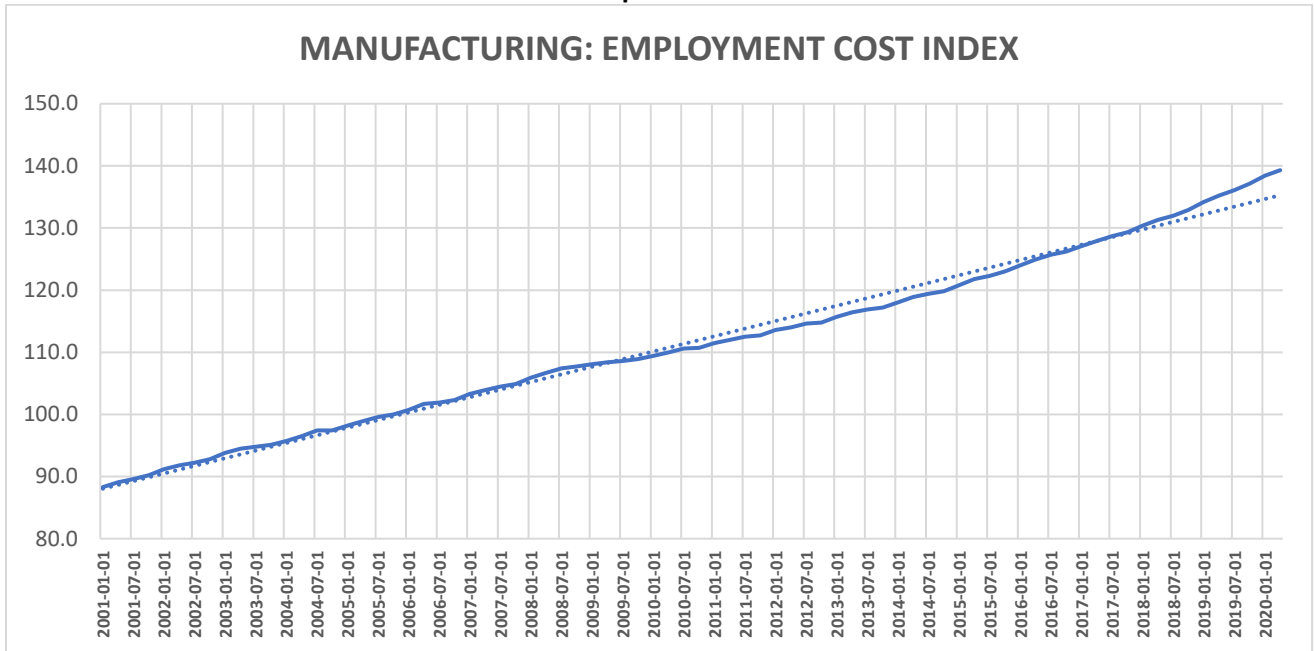
Nor was the data affected by changes to productivity. Productivity rose from the trough of 2009 to 2011 and then sat on the same plateau as did the rate of profit up to 2014, before declining. Clearly, it had stalled by this time, but some of this was due to the soggy pricing power found in manufacturing after 2014. Prices fell between 2014 and 2016 as shown in Graph 3 reducing the price of output measuring productivity. The price of output or Local GDP is the numerator in the productivity equation, a point sometimes forgotten when accounting for the deceleration in productivity post-2008.

Graph 7.

Proof from within.

The empirical proof above was from without, now I would like to share a proof from within, using five tables. Table 1 is the starting point, a synthesis of Marx's first tables found in Chapter 9 of Volume 3. Here we note [in column (7)] how much surplus value needs to be redistributed, and in what direction. The total is 26.

Table 1. (The original distribution of surplus value)

Capitals	Surplus value	Value of commodities	Cost price of commodities	Price of commodities	Rate of profit	Divergence price vs value
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i) 80c+20v	20	90	70	92	22%	2
ii) 70c + 30v	30	111	81	103	22%	-8
iii) 60c + 40v	40	131	91	113	22%	-18
iv) 85c + 15v	15	70	55	77	22%	7
v) 95c + 5v	5	20	15	37	22%	17
390c+110v=500	110	422	312	422	22%	+26-26=0

The next table provides the aliquot shares (in green) of the original table where Marx first provides c + v + s in their value form (in red). To obtain the aliquot shares, columns (1), (2) & (3) are divided by 610 the sum of circulating and non-circulating value equal to 500 in capital and 110 in surplus value. The aliquot shares will act as our base line, and they will change as prices change, but once these price changes are accounted for, the base line should be restored. Another way of addressing this is that the green figures are the volume figures. All that the transformation does is to change prices not volumes. This is important, because the price changes seem to imply volume changes when in fact they do not change. Competition distorts the way we see the market. In sum, all that has happened is that the price per item has changed.

Table 2. Aliquot shares)

capitals	c	v	s	total	c	v	s	total
columns	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	80	20	20	120	13.1%	3.3%	3.3%	19.7%
ii)	70	30	30	130	11.5%	4.9%	4.9%	21.3%
iii)	60	40	40	140	9.8%	6.6%	6.6%	23.0%
iv)	85	15	15	115	13.9%	2.5%	2.5%	18.9%
v)	95	5	5	105	15.6%	0.8%	0.8%	17.2%
totals	390	110	110	610	63.9%	18.0%	18.0%	100%

Table 3. (Prices of Commodities - after the equalisation of the rate of profit)

capitals	c	v	s	total	c	v	s	total	difference
columns	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	80	20	22	122	13.1%	3.3%	3.6%	20.0%	+0.3%
ii)	70	30	22	122	11.5%	4.9%	3.6%	20.0%	-1.3%
iii)	60	40	22	122	9.8%	6.6%	3.6%	20.0%	-3.0%
iv)	85	15	22	122	13.9%	2.5%	3.6%	20.0%	+1.1%
v)	95	5	22	122	15.6%	0.8%	3.6%	20.0%	+2.8%
totals	390	110	110	610	63.9%	18.0%	18.0%	100%	100%

Table 3 is as far as Marx goes. The 26 of surplus value has been distributed between the capitals so that each now realises a rate of profit of 22% or 22/100. Previously the rate of profit ranged from 5% to 40%. Whether Marx intended each capital to share the same price-output aliquot of 20% (Column 8 above), we will never know.

In Table 4, the second part of the double-solution is found. A further 26 in surplus value has been transferred to reprice capital and adjust prices. As a result, the total prices commanded by each capital has changed (Column 4). Accordingly their aliquot shares are no longer 20% but vary (blue highlighted column 6) Within that, the price of each capital is no longer 100 (column 2) nor is the mass of profit 22 throughout (column 3). This is due to the second distribution transforming "prices of commodities" into actual "prices of production"

Table 4. (Prices of Production)

capitals	C	profit	total	Rate of profit	Aliquot (column 4)	Final price changes	% Change	Aliquot shares
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	Table 3
i	102	22.4	124.4	22%	20.4%	+2.4	+0.4%	20.0%
ii	93	20.5	113.5	22%	18.6%	-8.5	-1.4%	20.0%
iii	85	18.7	103.7	22%	17.0%	-18.3	-3.0%	20.0%
iv	106	23.3	129.3	22%	21.2%	+7.3	+1.2%	20.0%
v	114	25.1	139.1	22%	22.8%	+17.1	+2.8%	20.0%
totals	500	110	610	110/500	100%	=0	0%	100%

The final table, Table 5, is proof of solution. In column 5 we find the total or double redistribution cast in terms of aliquot shares. When we subtract column 5 from column 2 we arrive at column 6 (in green). Column 6 corresponds to the same aliquot shares we began with in Table 2 which formed our base line. This provides proof that the double solution is in order. It also confirms that all that has changed is the price per unit. Finally the magnitude of change is shown in column 7, it amounts to 52 or 26 x 2. This is a secondary proof.

Table 5. (Proof)

capitals	Aliquot (column 4)	First redistribution	Second redistribution	Total Redistribution	= Column 8 Table 2.	Price movements
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i	20.4%	+0.3%	+0.4%	0.7%	=19.7%	+4.3
ii	18.6%	-1.3%	-1.4%	-2.7%	=21.3%	-16.5
iii	17.0%	-3.0%	-2.9%*	-5.9%	=22.9%	-36.0
iv	21.2%	+1.1%	+1.2%	+2.3%	=18.9%	+14.0
v	22.8%	+2.8%	+2.8%	+5.6%	=17.2%	+34.2
totals	100%	0%	0%	0%	=100%	+52 −52 =0*

(*Rounded off)

Conclusion.

The journey to get here has taken many years. Along the way I passed by the cemetery where reputations lie buried of all those who have attempted to remedy Marx's theoretical solution to the transformation problem. All high theory comprises mis-steps and corrections. My journey has not been free of this. I failed to recognise that my original solution did not so much transform values into prices of production as much as it transformed the price of commodities into prices of production. That the solution therefore implied a total redistribution of 52 and not 26, because the price of commodities is based on the prior transfer of 26.

It is now clear why Marx used the category price of commodities instead of prices of production. He must have know that the original transformation in Chapter 9 stopped short of realising prices of production. Therefore the attack on Marx is misguided because it assumes that Marx was describing prices of production when he wasn't.

In my original writings, one error still needs to be corrected, which I will do shortly. The error lies in the movement from prices back to their original market values as found in Step 6 and Table 11+ in my article titled: *A COMPREHENSIVE UPDATE OF THE TRANSFORMATION PROBLEM* mentioned above http://theplanningmotive.com/a-comprehensive-update-of-the-transformation-problem/ as well as the original article titled *THE PRICE OF PRODUCTION IS THE PRICE WHICH YIELDS AN AVERAGE RATE OF PROFIT, NOT ON THE OLD CAPITAL, BUT THE NEWLY PRICED CAPITAL.*

During all this time was confident that I was on the right track. That the methodology lodged in Chapter 9 held the key, and that all that was needed was to extend Marx's analysis to its finality. It was not necessary to render Marx more profound. It was not necessary to violate his method by claiming that as total values equalled total prices, by implication they had been transformed and that therefore all Volume 3 needed to do was describe how the already produced pool of surplus value was distributed via the pricing system, so that each capitalist received a share from this pool in proportion to their investment. However, the transformation problem exists at the level of individual prices and values because individual capitals differ in their composition and not at an aggregate level where all differences are masked. And if Marx's method was not violated then it was skirted around by supporters of TSSI who begin not with market values, but prices. The former set of theories was disingenuous while the latter was simply dishonest.

A durable solution now exists. Its importance cannot be sufficiently stressed. The capitalist system is bleeding, and like all injured beasts, it is now at its most dangerous, as illustrated in Ukraine. In the years to come as the crisis of capitalism deepens, the ideological struggle will catch fire. Central to this struggle, and at its core, will be the law of value. Unless we can show how values are transformed into prices we cannot defend this law, and if we cannot defend this law we cannot explain exploitation nor the movement of actual prices. The law of value is an elastic law, prices can and must deviate from values to make capitalism function, but in the end these elasticities are clamped to actual costs of production or what is the same thing weighted average labour times. The "double-solution" measures this elasticity and its limits. In doing so it makes the law of value based on labour times, bullet-proof.

Brian Green, 21st February 2022.