

PART III

THE UNDERGROUND YEARS

CHAPTER 6

THE RISE OF A NEW VIEW OF PRODUCTION AND EXCHANGE

The 1870s was a watershed for economic theory. Pre-1870s was the domain of classical political economy while post-1870s are the domain of neoclassical economics. The process through which this change took place is quite complex and the resulting differences between the two schools of economic thought are many. In order to reduce all of this to a manageable size, I want to delineate some of the salient features which make up the core of neoclassical theory, relate some of these features to William Stanley Jevons and Carl Menger, and finally briefly present one particular episode concerning the transition from the classical theory to the neoclassical theory.

The early 1870s marked the turning point in economic theory. On the one hand, Marx published *Capital* (1867), in which the issues discussed in the earlier writings in political economy were systematized, interpreted in a different and richer theoretical context, and the critique of capitalist production developed in an impressively comprehensive framework. On the other hand, an entirely new theory of value, based on the ‘novel’ idea of marginal utility, was “discovered” by William Stanley Jevons, Carl Menger, and Leon Walras. This new theory of value was readily accepted (although the notion of marginal utility was old). The reason for this is to be found in the historical conditions of the period. By the 1870s, capitalist relations in Europe had become pervasive and the major arena of conflict shifted to relations between capitalists and workers. Moreover, the conflict was not merely a matter of a theoretical

possibility; it had already assumed overt and militant forms. It appears that the intellectual confrontation with the theoretical system of political economy and the view of social relations it propounded could not be delayed any further, and a new theoretical system was called for. While in England the confrontation was openly with Ricardo's theory, on the Continent the Austrian School took explicit cognizance of Marx and challenged his system of political economy. The major theoretical ground chosen for attack was the labor theory of value.¹

A New Basis For Explaining Prices

The attempt at reconstruction appeared in the form of offering a new, more cogent explanation of relative prices. However, no explanation can exclude the question of distribution. In fact, the primary aim was to alter radically the view concerning distribution, and this, in turn, was to be based on a new vision regarding the functioning of the economic system. Many different explanations were offered, each of which had similar and different propositions. However certain basic similarities in the many approaches may be noted. First, symmetry was sought to be introduced among the different distributive classes, particularly labor and capital. This was attempted through various analytical conceptualizations aiming to render symmetrical the role of capitalists and wage-earners in production by depicting the services of both as analogous in being essential prerequisites for production to proceed. Secondly, recourse was taken to the Benthamite world of rational pursuit of self-interest which placed all individuals in the society on an equal basis. This also implied a major change: the appropriate unit of analysis was assumed to be the free, decision-making individual replacing economic 'classes' that played

¹ The material in the next few sections comes from Bharadwaj (1986).

a central role in classical political economy. Lastly, analysis was shifted to the sphere of circulation; under competitive exchange, where ‘equivalents’ are freely exchanged, there appears to be an intrinsic justice in the operation of the impersonal and self-propelling market forces of supply and demand. Thus, the new theoretical structures based on the equilibrium of supply and demanded were constructed on these foundations.

Shift To Supply And Demand Theories

The shift to supply and demand theories did retain some features found in classical political economy--such as the significance of long-period positions as distinct from short-period positions, and the tendency towards a uniform rate of profit and wage rate was retained. However, classical market prices became synonymous with short period prices and classical natural prices became ‘long-period’ prices; the main theoretical shift being that both were now represented as values attained in equilibrium through the balancing of symmetrical but opposite forces of supply and demand but under different conditions. Further, the rates of both wages and profits were determined, like the prices of products, by the equilibrating forces of demand and supply for labor and capital respectively.

Relation Between Consumption and Production

In the supply and demand theories, in order to explain price as determined by the equilibrium of opposite and symmetrical forces of demand and supply it was essential to treat them as independent of each other. This was achieved by seeking the foundation of demand in individual preferences and that of supply in independently stipulated technology. This also meant that production consisted of a one-way street from factor endowments (that is endowments of land, labor, and capital as produced means of production) to consumption goods, thus implying

that consumption activities guides production activities. This kind of relationship between production and consumption is entirely foreign to classical political economy, where the notion of productive consumption played an important role.

Relation Between Production And Distribution

Production concerns the transformation of scarce factor inputs into products. The individual producer's decisions are based entirely on the information concerning prices in factor and product markets and the feasible technology possibilities of converting factors into products. In such a depiction, all changes in conditions of production would be explained either by changes in technological possibilities and/or changes in prices. While distinct factors of productions (usually land, labor and capital) are recognized and the payments to these, namely, rent, wages, and profits, appear as prices paid out per unit of their services, the existence of distributive classes and relations among them (as found in classical political economy) do not enter the discussion of production which is confined to the market decisions of individual producers. Distribution at the level of the economy appears as personal income distribution determined by the initial endowment of resources among persons. No attempt is made to probe into how this given initial distribution comes about.

William Stanley Jevons

Jevons's contribution to the development of neoclassical economics (as far as we are concerned) falls into two areas. His first contribution was the placing of the maximizing individual at the center of economic analysis and then providing a mathematical analysis of prices in a pure exchange model. That is, Jevons argued that the individual seeks to maximize its utility; thus when the individual is in the market trading its given stock of goods, he/she will

engage in exchange in such a way as to equalize the utility of the final increments of all goods consumed. Moreover, the ratio of exchange of any two goods, Jevons argued, will be the reciprocal of the ratios of the final degrees of utility of the quantities of goods available after the exchange is completed. This last point Jevons called the keystone of his theory of exchange. However there are two problems with Jevons' analysis. First he had no analysis of the operations of the market mechanism by which the ratio of exchange is arrived at. Rather Jevons contented himself with describing a perfect market in quasi-institutional terms as a market in which there must be no conspiracies for absorbing and holding supplies to produce unnatural ratios of exchange and in which the law of indifference is in force, thus precluding effective transactions at other than equilibrium prices by virtue of a full and instantaneous publication of (a) the stocks of goods available (b) the intentions of exchanging of all the traders, and (c) the ratio of exchange agreed upon between any two traders. Secondly, Jevons failed to derive demand schedules from his utility functions. Jevons second contribution was in the area of production and capital theory.

Carl Menger

The importance of Menger's work for our purposes falls in the area of the relationship between production and consumption. Menger states that human needs "arise from our drives and the drives are imbedded in our nature. An imperfect satisfaction of needs leads to the stunting of our nature. Failure to satisfy them brings about our destruction. But to satisfy our needs is to live and prosper. Thus the attempt to provide for the satisfaction of our needs is synonymous with the attempt to provide for our lives and well-being. It is the most important of all human endeavors, since it is the prerequisite and foundation of all others." Thus, in short,

human needs are natural and therefore are given to economic analysis. Moreover, because they are natural, economic activities can be directed towards satisfying them without, at the same time, affecting them. This property permits the notions of rationality and efficiency to be used when examining economic activity.

Now Menger states that an “item or thing” is a good if it has the following characteristics:

- (1) there exists a need which it can satisfy or fulfill;
- (2) humans knows that the ‘thing’ can satisfy this need; and
- (3) humans can command the thing to satisfy the need.

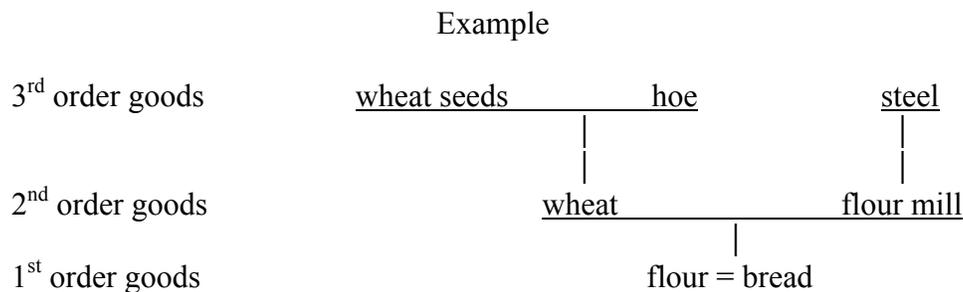
In short, a good is one that satisfies a human and actually does so. Menger goes on to state that there are two categories of goods: non-economic goods--goods which are available in quantities larger than the requirements for them; and economic goods--goods which are available in quantities smaller than the requirements for them. In this context, economics goods are ‘scarce’ with respect to their demand and that they are coveted by individuals (that is economic goods have a ‘property’ aspect).

Menger deals with production in a novel way that was quite different from that found in classical political economy. He first classifies goods in their relationship to final consumption:

- (i) goods of the first order--goods that can be used directly for the satisfaction of needs
- (ii) goods of higher order--goods that can be used directly and indirectly make goods of the first order

Production exists, Menger argued, because when goods of higher order exist, they must be transformed into goods of the first order if needs are to be satisfied. Therefore, Menger viewed

production as a linear process in which goods of the higher order are transformed into goods of the first order.



Thus it can be argued that goods of the higher order are just an ‘immature’ form of the first order goods. Although it is not possible to point to a specific passage for confirmation, Menger appears to imply that the highest order goods are produced by labor alone or in conjunction with land. This point will be dealt with below. It should also be noted that goods of the higher order are produced means of production and can be denoted as capital goods, which is another point that will be dealt with later.

In combination these two views of production and consumption, Menger went on to argue that the value (and price) of the higher order goods (and even labor and land) depend upon the value (and price) of the first order goods. The value (and price) of these goods depend upon their ‘demand and supply’--that is upon the subjective appraisal of the good to satisfy needs and the quantity available to satisfy them. This value in turn is based on marginal utility of the good of the higher order have their values *imputed* to them through the values of the first order goods.

Bohm-Bawerk and the Austrian Approach to Production

The Austrian economists—Jevons, Eugen von Bohm-Bawerk, and Knut Wicksell—conceived of this essence as resulting from capital goods being produced means of production

distinguishable from land and labor which were classified as ‘original’ means of production. Coupled with the distinction was the Austrian emphasis on capitalistic production requiring time. Capitalistic production requires that the production of capital goods precede the production of consumption goods. It was the hallmark of Austrian capital theory to link these two characteristics together. That is, dealing with capital from the point of view of the rank or hierarchy of goods, it is obvious that capital cannot be conceived of as an original or independent factor of production for only labor (and land) is the naturally occurring good in that it is not itself explicitly produced within the productive structure, but enter into the production of all other goods, especially the first capital good which it enters into it *alone*. Capital is thus associated with the distance or the number of stages of intermediate goods that are required between the highest and lowest order goods. The degree of this intermediation is the basis of what the Austrians called the ‘average period of production’ or the ‘roundaboutness of production.

Bohm-Bawerk stated the Austrian position as follows:

We put forth our labor in all kinds of wise combinations with natural processes. Thus all that we get in production is the result of two, and only two, elementary productive powers – Nature and labor. There is no place for a third primary resource – such as capital. But through these primary productive powers man may make the consumption goods he desires, either immediately, or through the medium of intermediate products called capital. The latter method demands a sacrifice of time, but it has the advantage in the quantity of product, and this advantage, although perhaps in decreasing ratio is associated with every prolongation of the roundabout way of production. [NEED TO GET REFERENCE]

Thus, in the Austrian view there are two types of original productive power, land and labor. In fact, Bohm-Bawerk simplified his analysis by abstracting from land and regarding labor as homogeneous. Capital goods are goods produced with the aid of original factors and are used as intermediate inputs in the production of consumer goods. Capitalistic production is, therefore, indirect or ‘roundabout’ production. It is undertaken because it is more productive of consumption goods than is direct production.

The Austrians worked with two kinds of production and price models: a point input – point output model and a flow input – point output model. The former is a one production period model in which labor directly creates, without the intervention of capital goods, a consumption good, while the latter is a flow of inputs at various dates but with output emerging at a single date. The production and price models of each are given in Table 1. This view of production is called a linear view because the original input of labor can be traced unilaterally to its final resting place in the consumption good.

Table 1

Point Input – Point Output Model

Production Model

$$L_c \rightarrow C$$

where L_c is the number of homogeneous labor hours needed to produce C amount of the consumption good.

*Price Model (i)*²

$$L_c w = C p_c \text{ or } \gamma_c w = p_c$$

Price Model (ii)

$$L_c w(1 + i) = C p_c \text{ or } \gamma_c w(1 + i) = p_c$$

where w is the wage rate,

p_c is the price of the consumption good,

γ_c is L_c/C the input-output or the labor production coefficient that represents the amount of labor needed to produce a unit of the consumption good, and

i is the rate of interest (or rate of profit).

Flow Input – Point Output Model

Production Model

$$L_m \rightarrow M_c$$

$$M_c + L_c \rightarrow C$$

where L_m is the number of homogeneous labor hours needed to produce M_c number of machines that are needed to produce C amount of the consumption good, and

L_c is the number of homogeneous labor hours needed to work with M_c number of machines to produce C amount of the consumption good.

Price Model (i)

$$L_m w = M_c p_m$$

$$M_c p_m(1 + i) + L_c w = C p_c$$

or

$$\gamma_m w = p_m$$

Price Model (ii)

$$L_m w(1 + i) = M_c p_m$$

$$[M_c p_m + L_c w][1 + i] = C p_c$$

$$\gamma_m w(1 + i) = p_m$$

² The difference between the two price models is whether wages are advanced or not; that is whether wages are part of the capital advanced or come out of the surplus. MORE ON THIS.

$$m_c p_m (1 + i) + \gamma_c w = p_c \qquad [m_c p_m + \gamma_c w][1 + i] = p_c$$

where w is the wage rate,

p_m is the price of the machine,

p_c is the price of the consumption good,

γ_m is L_m/M_c the input-output or labor production coefficient that represents the amount of homogeneous labor hours need to produce M_c number of machines that are needed to produce C amount of the consumption good,

m_c is M_c/C the input-output or the machine production coefficient that represents the number of machines needed to produce a unit of the consumption good,

γ_c is L_c/C the input-output or the labor production coefficient that represents the amount of labor needed to produce a unit of the consumption good, and

i is the rate of interest (or rate of profit).

Austrian Model of Production With Capital

The purpose of the Austrian model of production was to develop a theory of interest that was opposed to the Marxian-Classical theory of profits. Working from Menger's utility theory and integrating it with his vertical ordering of goods and Jevons's conception of capital as advances to workers for production, Bohm-Bawerk developed the following theory of capital and interest. He developed a theory of interest at two different levels of abstraction. At the most abstract level, we have a psychological theory of interest. Economic agents are assumed to have a time preference for present consumption relative to consumption in the future. Consequently, inter-temporal exchange ensures that a premium accrues to those who trade present for future consumption. Two principle conclusions derived from this analysis are interest arises from

exchange and that it is a universal economic category that is not historically specific to capitalism.³ Bohm-Bawerk presented the following argument for positive time preference and hence the existence of interest (profit):

The great frequency of desire for present goods to meet the current needs of people who will be more adequately provisioned with goods in the future. Therefore we systematically undervalue our future wants and also the means which serve to satisfy them because of the fragmentary nature of the imaginary picture that we construct of the future state of our wants, the failure of willpower, and the consideration of the brevity and uncertainty of human life. Therefore the greater productivity of more roundabout methods of production leads to a physical and value surplus over what was used up in production. [WORK ON]

At the second level of abstraction, Bohm-Bawerk applied his theory of interest to the institutions of capitalism. Here it is the strength of labor's time preference for present consumption relative to that of capitalists' which ensures interest for the latter. Capitalists can advance consumption goods to workers in the form of wages, engage them in roundabout production processes, and thereby receive a premium on advances made. To show this, let us consider the following argument.

The capitalists have a supply of a consumption good—say corn—of the amount K to start the production cycle. The total amount of labor to start the production process is L and the workers need to buy corn in order to survive the production process. Thus $Kp_c/L = w$ or $Lw =$

³ Hence Marx's theory of profits is thereby questioned at its foundation.

Kp_c or $(L/K)w = p_c$ where p_c is the price of corn and w is the wage rate. Working with a two-stage flow input-point output production/price model

$$L_m w(1 + i) = M_c p_m$$

$$[M_c p_m + L_c w][1 + i] = C p_c$$

Now reducing the price model to dated quantities labor via substitution and adopting Bohm-Bawerk assumption that interest accrues on the basis of simple interest (as opposed to compound interest) [NEED REFERENCE], we have

$$L_m w(1 + 2i) + L_c w(1 + i) = C p_c$$

Since labor is assumed to be homogeneous the dated labor price model can be rewritten as:

$$wL + w(2L_m + L_c)i = wL + wKi = C p_c$$

where $K = 2L_m + L_c$ represents the quantity of capital—more below.

Now assuming $p_c = 1$ and rearranging, then i and w can be written as a wage rate-interest rate relationship: $i = \frac{C - wL}{wK}$. Now for a given quantity of labor and corn or L and K and assuming that the roundabout production is productive (that is $C > K$), it is possible to determine w and i . In this context, the interest exists because not all the corn that is produced is immediately consumed by workers.⁴ [MORE/WORK ON]

⁴ This can be showed in the following example.

Price model: $10Lw(1 + i) = 5_m p_m$
 $(5_m p_m + 5Lw)(1 + i) = 30_c p_c$

Adopting Bohm-Bawerk' assumption that interest accrues on the basis of simple interest (as opposed to compound interest) and assuming $p_c = 1$, the price model can be rewritten as

$$10Lw(1 + 2i) + 5Lw(1 + i) = 30_c p_c \text{ or}$$

$$15Lw + 10Lw2i + 5Lwi = 30_c \text{ or}$$

$w(15L + 25Li) = 30_c$ where $25L$ is the amount of labor that is considered capital and $15L$ is the amount of direct or 'living' labor used in production. Since $Kp_c/L = 25L/15L = w$, then $w =$

Given his theory of interest, Bohm-Bawerk went on to argue that technically efficient production processes are ordered by their degree of roundaboutness. The more roundabout production processes are the more productive of consumption goods per unit of original factor input (which is labor since land has been abstracted from), but are subject to diminishing returns. That is, an increase in roundaboutness relative to the inputs of original factors generates an incremental increase in final output but at a decreasing rate. Pivotal to this conception is the definition of the degree of roundaboutness and the determination of the quantity of capital. Bohm-Bawerk defined the degree of roundaboutness (or the length of ‘time’ between the first original input, labor, and the last output) in terms of what he called the *average period of production* (APP):

$$APP = \frac{PP_n L_n + \dots + PP_1 L_1}{L_n + \dots + L_1} = \frac{\sum_{j=1}^n L_j j}{\sum_{j=1}^n L_j}$$

where the numerator represents the sum of the original factor inputs (labor) weighted by the time in which they remain in production;
the denominator is the unweighted sum of these factor inputs; and
APP expresses the average period that inputs are required in the production before the emergence of final input.⁵

1.67. With the wage rate known, the interest rate can be determined by the wage-interest rate relationship: $w = 1/(\cdot 5_{lc} + \cdot 833_{lc}i)$ or $i = 12\%$.

⁵ Working with the price model in the previous footnote the average period of production is:

$$APP = \frac{(2)(10L) + (1)(5L)}{10L + 5L} = \frac{25L}{15L} = 1.67.$$

Turning to the quantity of capital, the cost of producing the consumption good can be written as $L_n w(1 + ni) + \dots + L_1 w(1 + i) = C p_c$. Since the wage bill can be written as

$$\sum_{j=1}^n L_j w \text{ and total interest (or profit) can be written as } \sum_{j=1}^n L_j w(1 + ji) - \sum_{j=1}^n L_j w = iw \sum_{j=1}^n j L_j.$$

Since i is the rate of interest, $w \sum_{j=1}^n j L_j$ is the value of capital, $\sum_{j=1}^n j L_j$ is the quantity of

capital in terms of ‘dated’ labor.⁶

Now we are in a position to make the following statements. First, production processes can be ranked in terms of their roundaboutness with respect to their productiveness. Since all techniques can be denoted or marked in terms of their capital-labor ratio, K/L , we can state as did Bohm-Bawerk did that the greater the K/L ratio the greater the output. However, this is the same as stating that the greater the average period of production the greater the output since

$$APP = \frac{\sum_{j=1}^n j L_j}{\sum_{j=1}^n L_j} = K/L \text{ that is the average period of production is the capital-labor ratio}$$

in terms of labor. Thus the APP is a measure of both the degree of roundaboutness and the K/L ratio or the degree of capital intensity. Secondly, an increase in the APP relative to labor (meaning an increase of K relative to a given quantity of L) increases output but at a decreasing rate—that is the marginal product of capital declines [MORE ON THIS]. From these two

⁶ Working with the price model in footnote 5 we have $10Lw(1 + 2i) + 5Lw(1 + i) = 30cp_c$. Subtracting out the wage bill we have $10Lw(1 + 2i) + 5Lw(1 + i) - 15Lw = i25Lw$ which is total interest; thus $25Lw$ is the value of capital and $25L$ is the quantity of capital in terms of dated labor.

statements, Bohm-Bawerk made a third significant statement in that the greater the APP (or K/L), the lower the interest rate and that the wage rate and the interest rate are inversely related.

To show this, let us go back to our integrated price model:

$$L_n w(1 + ni) + \dots + L_1 w(1 + i) = C p_c \text{ or}$$

$$\sum_{j=1}^n L_j w + i w \sum_{j=1}^n j L_j = C p_c.$$

Now setting $p_c = 1$, substituting in L and K for the aggregate quantity of labor and capital (in terms of labor) and rearranging we get the wage rate-interest rate relationship:

$$i = \frac{C}{wK} - \frac{wL}{wK} = C/(wK) - 1/APP = APP^{-1}(C/Lw - 1)$$

Now as the average period of production increases, meaning K increases relative to L remaining constant, the interest rate declines; and it also declines because C/K declines due to the declining marginal productivity of capital. And as the interest rate declines the wage rate increases. Thus there is an inverse relationship between the wage rate and the interest rate; and in addition, there is an inverse relationship between the interest and the average period of production or K/L as well as the demand for capital—that is the demand curve for capital is negatively sloped.

CHAPTER 7

V. K. DMITRIEV AND THE THEORY OF VALUE OF DAVID RICARDO

Vladimir Dmitriev was a Russian economist who was born in 1868. He went to Moscow University to study medicine, but subsequently transferred to the Law Faculty, where he began his studies on political economy. He graduated in 1896 and in 1898 he wrote an essay "The Theory of Value of D. Ricardo, an attempt at a rigorous analysis". The essay was part of a larger study in which he set out to develop a synthesis between the labor theory of value and the 'marginal utility' theory, as set out by the Austrian economists. In doing so, Dmitriev was continuing a dominant stream of thought amongst Russian economists of his era which began with an initial wide acceptance of Marxian economics, which was later tempered by efforts to incorporate aspects of the marginalist revolution into a kind of Ricardian-Marxist-Austrian synthesis. Dmitriev's major interest was in the Ricardian theory of value (prices) and in fact he defended Ricardo against false statements put forth by the likes of Walras and against Marx's developed form of a labor theory of value. Our interest in Dmitriev is in how he kept alive the surplus approach while discussing Ricardo's theory of value.

Smith's Theory of Prices

Dmitriev opens up his essay by discussing price theory prior to Ricardo, especially Adam Smith's theory prices. Starting with Smith's "adding up" approach, Dmitriev described it in the following manner:

$$\text{Price} = \text{direct wages} [\text{number of days (hours)} \times \text{subsistence} \times \text{price of subsistence}] + \\ \text{direct materials costs} [\text{material inputs} \times \text{prices}] + \text{direct profits}.$$

= 'total' wages + 'total' profits (since material cost could also be broken up in wages and profits).

Putting this into a more precise (and correct) format, the price equation (in numerical form) can be written as:

$$\begin{aligned} 5L_m w + Y_m &= 10_m p_m \\ 10_m p_m + 5L_c w + Y_c &= 20_c p_c \end{aligned}$$

where Y_m is the total profits in the machine industry,

Y_c is the total profits in the consumption good industry,

L_m is the total labor employed in the machine industry, and

L_c is the total labor employed in the consumption good industry

By substituting we get:

$$5L_m w + Y_m + 5L_c w + Y_c = 20_c p_c.$$

Now, by dividing by 20 we get:

$$.25_m w + y_{mc} + .25_c w + y_{cc} = p_c.$$

In abstract form we get:

$$l_{mc} w + y_{mc} + l_{cc} w + y_{cc} = p_c,$$

where

$$l_{mc} = L_m / C$$

$$y_{mc} = Y_m / C$$

$$l_{cc} = L_c / C$$

$$y_{cc} = Y_c / C.$$

Now let a be the subsistence amount of corn. The above equation can now be rewritten with

$a p_c = w$ as:

$$\begin{aligned}
p_c &= l_{cc}ap_c + l_{mc}ap_c + y_{mc} + y_{cc} \\
&= (l_{cc} + l_{mc})ap_c + (y_{mc} + y_{cc}) \\
&= (L / C = l_c)ap_c + (Y / C = y_c),
\end{aligned}$$

where l_c is the total sum of the labor directly and indirectly expended on the production of one unit of corn; and

y_c is the total sum of profit received by all producers involved directly and indirectly in the production of one unit of corn.

Therefore, Dmitriev concluded in this case, the price of corn is made of only two elements – wages and profits.

With the price equation for p_c delineated explicitly and the price equation for $p_m = l_{m}ap_c + y_m$, Dmitriev then proceeds to determine the exchange ratio at which corn and machines exchange:

$$(1) \quad \begin{aligned} p_m &= l_{m}ap_c + y_m \\ p_c &= l_{c}ap_c + y_c \end{aligned} \Rightarrow p_m / p_c = (l_{m}ap_c + y_m) / (l_{c}ap_c + y_c) = p_{mc}.$$

(2) For p_{mc} to be known, y_m and y_c must be given (or known).

(3) Drawing on Smith's notion of the rate of profit and the equalization of the rate of profit,

Dmitriev reformulated his price equations in the following manner:

$$\begin{aligned}
p_m &= l_{m}ap_c(1 + r) \\
p_c &= (l_{m}ap_c(1 + r) + l_{cc}ap_c)(1 + r) = l_{m}ap_c(1 + r)^2 + l_{cc}ap_c(1 + r).
\end{aligned}$$

(4) Thus p_m / p_c is known once r is determined.

Dmitriev notes however that Smith did not proceed further in his analysis of prices (except to suggest a supply-demand approach to the determination of r). The honor for a complete solution of the problem of prices belongs to his great successor Ricardo.

Ricardo and the Pure Labor Economy

Dmitriev dealt with Ricardo's theory of prices by first considering a pure labor economy in which each good is produced solely by direct labor without the use of tools and materials that are themselves produced by human effort. In this case, the relative prices of two goods are determined by the relative amounts of labor expended in their production. This can be shown in the following manner:

$$(1) \quad \gamma_m w(1 + r) = p_m$$

$$\gamma_c w(1 + r) = p_c$$

where γ_m is the amount of labor needed to produce one machine;

γ_c is the amount of labor needed to produce one unit of corn;

w is the wage rate;

r is the rate of profit; and

p_m and p_c are the prices of machines and corn respectively.

Thus the relative price ratio $p_m/p_c = \gamma_m/\gamma_c$ which says that the relative price of machines in terms of corn is determined by the ratio of the amount of direct labor expended (embodied) in the production of one machine relative to one unit of corn. This represents a labor theory of value.

Now what would happen if labor productivity is assumed to be continually increasing but at different rates for the two goods? It is clear that the relative price ratio would change based since γ_m and γ_c would be changing at different rates.

Ricardian Two-Stage Classical Production Model

Vladimir Dmitriev proceeded to expand his one-stage two good model to include produced means of production:

In addition to the directly expended or 'current' labour, let there now be additionally expended in the production of [good] A a certain amount of capital; this capital good is itself the product of a certain amount of current labour assisted by a certain amount of new capital good; ascending even higher and higher to 'production goods of higher orders' (the Productivguter hoherer Ordnung of the theoreticians of marginal utility), let us finally arrive at a capital good (or capital goods) produced solely by current labour.

[Dmitriev, 1974, pp. 53 - 54]

In its most simplified form, Dmitriev's model of production by means of labor and capital goods has the following form:

$$(2) \quad L_m w(1 + r) = M p_m$$

$$(M p_m + L_c w)(1 + r) = C p_c$$

or, through substitution we get

$$(3) \quad L_m w(1 + r) = M p_m$$

$$L_m w(1 + r)^2 + L_c w(1 + r) = C p_c$$

where L_m is the total amount of labor needed to produce M number of machines; and

L_c is the total amount of labor needed to produce C units of corn.

Equations (2) and (3) can also be written in terms of per unit of output:

$$(2') \quad \gamma_m w(1 + r) = p_m$$

$$(m_c p_m + \gamma_c w)(1 + r) = p_c$$

or, through substitution we get

$$(3') \quad \gamma_m w(1 + r) = p_m$$

$$\gamma_{m_c} w(1 + r)^2 + \gamma_c w(1 + r) = p_c$$

where γ_m is the amount of labor needed to produce one machine;

m_c is the number of machines needed to produce a unit of corn;

γ_c is the amount of labor needed to produce one unit of corn; and

γ_{mc} is the amount of 'machine-labor' needed to produce a unit of corn.

Working with (3') it was possible for Dmitriev to imitate Ricardo and determine the rate of profit r without recourse to prices. Assuming that $w = \alpha p_c$ where α is known and falls between zero and the model's corn-labor ratio (that is assuming a real wage in terms of corn), it can be substituted into the price equation for corn where we have the following:⁷

$$(4) \quad \gamma_{mc}\alpha p_c(1+r)^2 + \gamma_c\alpha p_c(1+r) = p_c.$$

With p_c cancelling out on both sides, we have remaining an equation with only one unknown, r ; and this can be easily solved for.⁸ With the rate of profit solved for, it is now possible to determine the relative price of machines in terms of corn (p_m/p_c) (that is it is assumed that $p_c = 1$).⁹ As indicated in equation (5) below, the price ratio is not solely a function of the amount of

⁷This is the same thing as assuming a real wage in terms of corn.

⁸ Example: let $l_{mc} = .25$ and $l_{cc} = .25$. Then we have $a(.5 + .75r + .25r^2) - 1 = 0$. Now if $a = 1$,

then we get

$$.25r^2 + .75r - .5 = 0$$

$$.25(r^2 + 3r - 2) = 0$$

$$r = .56.$$

⁹ Example: let $l_m = .5$, $l_{mc} = .25$, $l_{cc} = .25$ and $r = .56$. Then

labor expended in their production; rather p_m/p_c is also a function of the rate of profit and cannot be determined independently of it:

$$(5) \quad \frac{p_m}{p_c} = \frac{\gamma_m W(1+r)}{\gamma_{mc} W(1+r)^2 + \gamma_c W(1+r)} = \frac{\gamma_m}{\gamma_{mc}(1+r) + \gamma_c}$$

Dmitriev also showed that, in general, relative prices could not be determined independently of the rate of profit even if each price had the same number of $(1+r)$ terms or stages of production as long as the ratio of indirect to direct labor for each sector are not the same for each price. This can be shown using a two-integrated sector model:

$$(6) \quad \frac{p_b}{p_c} = \frac{\gamma_{xb} W(1+r)^2 + \gamma_b W(1+r)}{\gamma_{mc} W(1+r)^2 + \gamma_c W(1+r)} = \frac{\gamma_{xb}(1+r) + \gamma_b}{\gamma_{mc}(1+r) + \gamma_c}$$

Dmitriev concluded his discussion of Ricardo's theory of value by establishing three points - that the wage rate and the rate of profit are inversely related to each other, that commodities not directly and/or indirectly used in the production of all other commodities have no affect on the rate of profit, and that the origin of profits is found in those sectors that produce the goods found in the workers' subsistence bundle. To establish the first point, let us consider the two-sector model of equation (2'):

$$(2') \quad \gamma_m W(1+r) = p_m$$

$$\begin{aligned} \frac{p_m}{p_c} &= \frac{l_m a p_c (1+r)}{l_m a p_c (1+r)^2 + l_c a p_c (1+r)} = \frac{l_m}{l_m (1+r) + l_c} \\ &= \frac{.5}{(.25)(1.56) + .25} \\ &= .64 \end{aligned}$$

$(m_c p_m + \gamma_c w)(1 + r) = p_c$ or, through substitution we get

$$(7) \quad \gamma_{mc} w(1 + r)^2 + \gamma_c w(1 + r) = p_c.$$

Now if we set $p_c = 1$, then equation (7) can be rearranged into the following form:

$$(8) \quad w = 1/[\gamma_{mc}(1 + r)^2 + \gamma_c(1 + r)].$$

Thus we can easily see that w and r are inversely related to each other and as $w \rightarrow 0$, $r \rightarrow \infty$, a result that is particular to these production models. The second point can be shown as follows:

$$(9) \quad (5L_m w)(1 + r) = 15_m p_m$$

$$(10_m p_m + 5L_c w)(1 + r) = 20_c p_c$$

$$(5_m p_m + 5L_b w)(1 + r) = 10_b p_b$$

Letting $\alpha p_c = w$ and $\alpha = 1$ and $p_c = 1$, then $r = 0.812$, $p_m/p_c = 0.6039$ and $p_b/p_c = 1.453$. Thus we can easily see that r , p_c , and p_m determined p_b but p_b plays no part in determining r , p_c , or p_m .

The classical economists called commodity b a luxury good. To establish the final point, consider the following example where wages are equal to the total production of the consumption good:

$$(10) \quad (5L_m w)(1 + r) = 10_m p_m$$

$$(10_m p_m + 5L_c w)(1 + r) = 20_c p_c$$

Now if $\alpha p_c = w = 2p_c = 2$ since $p_c = 1$, then we get

$$(11) \quad (5L_m 2)(1 + r) = 10_m p_m$$

$$(10_m p_m + 5L_c 2)(1 + r) = 20_c p_c$$

By substituting, we get

$$(12) \quad (10_c)(1 + r)^2 + (10_c)(1 + r) = 20_c \text{ or } 20_c + 30_c r + 10_c r^2 = 20_c \text{ or}$$

$$r(30_c + 10_c r) = \text{or } r = 0.$$

CHAPTER 8

DEVELOPMENTS IN MARXIAN ECONOMICS

Marx's Transformation Problem

The link between the classical surplus approach and its emphasize on the interdependencies of the various sectors and industries and the labor theory of value is quite complex. One specific instance which highlights the existence of such a link (while at the same time suggesting that the link is very tedious indeed) is the transformation problem. The historical genesis of debate on the problem involves an attack on Marx's discussion of value and price in volumes I and III of *Capital*. In volume I, as was noted above, Marx went from value to price without any problem – that is prices and values were equivalent to each other. However, in volume III this equivalence between price and values did not exist; thus Marx was faced with the task of explaining how values are transformed into prices.

The history of Marx's concern with the relationship between values and prices has been briefly mentioned above and recounted by R L Meek more fully. However, it must be noted that this concern was prompted by Marx's inquiry into the relationship between profits and surplus value. That is, Marx was concern primarily with the allocation of the surplus value via the rate of profit to the various capitalists as profits and secondly with the relationship of values to prices that emerged as a by-product of this concern. Marx argued that profit was simply a converted form of surplus value or just a different name of surplus value (especially when prices equal values). Mover Marx defined the surplus rate of profit as $r = \frac{s}{c + v}$. Finally he assumed that the rate of exploitation $s/v = \sigma$ in each sector was the same. Thus assuming that each sector has a

different organic composition of capital c/v and that the commodities exchange at their labor values, Marx showed that the surplus rate of profit in each sector would be different:

$$\text{Sector one: } \sigma_1 + v_1(1 + \sigma) = \text{value of commodity one}$$

$$\text{Sector two: } \sigma_2 + v_2(1 + \sigma) = \text{value of commodity two}$$

$$\text{Sector three: } \sigma_3 + v_3(1 + \sigma) = \text{value of commodity three}$$

Since $c_i + v_i$ is not uniform for each sector, then $\pi_i = s_i/(c_i + v_i)$ will not be the same across sectors. However, because the surplus rate of profit in a capitalist is supposed to be uniform, Marx had to amend his analysis. He did so by first assuming that $\pi = r$ the rate of profit and second by introducing prices of production:

$$\text{Sector one: } (c_1 + v_1)(1 + r) = p_1$$

$$\text{Sector two: } (c_2 + v_2)(1 + r) = p_2$$

$$\text{Sector three: } (c_3 + v_3)(1 + r) = p_3$$

Because there are three equations and four unknowns, p_i and r , Marx, in effect, employed an addition equation to close the system: $r[\sum_{j=1}^3 c_j + v_j] = \sum_{j=1}^3 s_j$ or total profits equals total surplus

value. The results of Marx's analysis are as follows:

- (1) Prices of production differ from values. This is due to the fact that the rate of profit distributes the total surplus value over the three sectors in a manner that would make the profit rate uniform.
- (2) The prices of commodities produced with capitals of higher organic composition than the

social average will be higher than their values; the prices of commodities produced with capitals of lower organic composition than the social average will be lower than their values; and only in those sectors where the organic composition of capital happens to be equal to the social average will prices be equal to values.

- (3) Total value equals total prices, and total surplus value equals total profits (this is due to equation above). Consequently, since the total value of the commodities regulates the total surplus values, and this in turn regulates the level of average profit and thereby the uniform rate of profit, it follows that the law of value regulates the prices of production. Thus, like Ricardo, Marx felt that deviation of prices from values was irrelevant to his main task – the analysis of surplus value and profits.

Von Bortkiewicz and Marx's Transformation Problem

In Marx's method of transformation, the prices of production are calculated by adding a proportionate share of the given sum of the surplus values to $c_i + v_i$, the magnitudes of the latter being reckoned in value terms and assumed to remain unaffected by the transformation. In other words, while the value of the commodities comprising the output of the system are duly transformed into prices of production as a result of the redistribution of the given sum of the surplus values, the values of the commodities comprising the input of the system are left untransformed. This method would only make proper sense if all the inputs whose values make up $c_i + v_i$ were produced by capitals with the same c/v , or if they were produced outside the system. However since this not the case with classical production models, Marx's method must be altered so that prices of production show upon both the input and output side. One of the first

individual to detect this flaw in Marx's method and to 'correct' it was Ladislaus von Bortkiewicz.

Bortkiewicz pointed out that Marx's method of transformation cannot be accepted because it excluded the constant and variable capitals from the transformation process, whereas the principle of the equal profit rate required that the constant and variable capitals be similarly transformed. To correct Marx's mistake, Bortkiewicz reformulated in the following manner:

$$\text{Sector one: } (c_1 p_1 + v_1 p_2)(1 + r) = a_1 p_1$$

$$\text{Sector two: } (c_2 p_1 + v_2 p_2)(1 + r) = a_2 p_2$$

$$\text{Sector three: } (c_3 p_1 + v_3 p_2)(1 + r) = a_3 p_3$$

where $a_1 = c_1 + v_1 + s_1 = c_1 + c_2 + c_3$;

$$a_2 = c_2 + v_2 + s_2 = v_1 + v_2 + v_3;$$

$$a_3 = c_3 + v_3 + s_3 = s_1 + s_2 + s_3; \text{ and}$$

$p_1, p_2,$ and p_3 represent "price-value" coefficients.

To close the system, Bortkiewicz suggested two ways – first setting total price value to total labor value - $\sum (c_i + v_i + s_i)p_i = \sum (c_i + v_i + s_i)$; and second setting $p_3 = 1$ which is equivalent to setting total profits equal to total surplus, choosing the second approach, Bortkiewicz arrived at the following conclusions. First "price-values" are not equal to one thus implying that prices are not equal to labor values. Hence total price value is not equal to total labor value. However, if $c_3 / v_3 = C / V$ then equality would exist. Secondly, while total profits equals total surplus value (by definition), the rate of profit differs from the surplus rate of profit. Bortkiewicz pursued this point by arguing that Marx incorrectly argued that, given the rate of surplus value, the rate of

profit was regulated by the organic composition of capital. He did so by constructing the following examples:

a. That given a constant c_1/v_1 and c_2/v_2 , variations in C/V via variations c_3/v_3

Will not affect the rate of profit. This is because non-basic commodities and their production methods have no effect on the rate of profit (except determining its limit, as noted above).

b. That given C/V , variations in c_1/v_1 and c_2/v_2 will cause the rate of profit to vary.

Thus Bortkiewicz concludes that neither the organic composition of the third sector or of the economy as a whole has any effect on the rate of profit; rather the rate of profit is determined solely within the basic sectors. Consider the following examples:

(1) Let the value calculations be the following

	c	v	S	Value of Product	C/V
Sector I	225	90	60	375	2.5
Sector II	100	120	80	300	.8333
Sector III	50	90	60	200	.5555
Total	375	300	200	875	1.25

Now let us set up the price-value model

$$\text{Sector I } (225p_1 + 90p_2)(1 + r) = 375p_1$$

$$\text{Sector II } (200p_1 + 120p_2)(1 + r) = 300p_2$$

$$\text{Sector III } (50p_1 + 90p_2)(1 + r) = 200p_3$$

Now letting $p_3 = 1$, we can solve for $p_1 = \frac{32}{25}$, $p_2 = \frac{16}{15}$, and $r = 0.25$ with the price-value table

taking the following form:

	c	v	Profit	Price of Product
Sector I	288	96	96	480
Sector II	128	128	64	320
Sector III	64	96	40	200
Total	480	320	200	1000

From this we can derive the following conclusions:

- (i) The transformation of values into prices does not disrupt (in this example) the simple reproduction of the economy. [the columns and rows add up]
- (ii) Total profits (200) equals total surplus value (200).
- (iii) Profits in each sector do not equal the surplus value in each sector.
- (iv) Total “prices” (1000) does not equal total value (875).
- (v) Rate of profit (1/4) does not equal the rate of surplus value (2/3).
- (vi) While we have a transformation of values into prices – which is what we were interested in the first place – prices are not equal to values.

Let us now consider the claim that, keeping c_1/v_1 and c_2/v_2 constant while varying c_3/v_3 , r will not be affected. Using the above example as a backdrop, let us consider a different value – price model in which c_1/v_1 and c_2/v_2 remain the same while c_3/v_3 is different.

c	v	s	Value of Product	C/V
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Sector I	300	120	80	500	2.5
Sector II	80	96	64	240	.833
Sector III	120	24	16	160	5
Total	500	240	160	900	2.0833

Now let us set up the price-value model

$$\text{Sector I } (300p_1 + 120p_2)(1 + r) = 500p_1$$

$$\text{Sector II } (80p_1 + 96p_2)(1 + r) = 240p_2$$

$$\text{Sector III } (120p_1 + 24p_2)(1 + r) = 160p_3$$

Now letting $p_3 = 1$, we can solve for $p_1 = 32/35$, $p_2 = 16/21$, $r = 1/4$. Thus variations in c_3/v_3 does not affect the rate of profit.

Let us now consider the claim that given C/V , variations in c_1/v_1 and c_2/v_2 will cause the rate of profit to vary. Again using the first example as a backdrop, let us consider the following value-price model in which C/V is the same while c_1/v_1 and c_2/v_2 differ (and c_3/v_3 is the same).

Value Calculations					
	c	v	s	Value of Product	C/V
Sector I	205	102	68	375	2.0098
Sector II	20	168	112	300	.119
Sector III	150	30	20	200	5
Total	375	300	200	875	1.25

Now let us set up the price-value model

$$\text{Sector I } (205p_1 + 102p_2)(1 + r) = 375p_1$$

$$\text{Sector II } (20p_1 + 168p_2)(1 + r) = 300p_2$$

$$\text{Sector III } (150p_1 + 30p_2)(1 + r) = 200p_3$$

Now letting $p_3 = 1$, we can solve for $p_1 = .831, p_2 = 1.453, r = .453$ thus variations in c_1 / v_1 and c_2 / v_2 affect the rate of profit.

The significance of the transformation problem for our purposes lies in the fact that it keeps alive interest in the classical surplus models, albeit at a very low level. On another level, the transformation problem is not really a problem if one is solely concerned with transforming value into prices. On a third level which is the one everybody is concerned about – the transformation problem appears to undermine the explanatory power of the labor theory of value to explain relative prices and the rate of profit. This last point will be alluded to again.

Rosa Luxemburg and the Accumulation of Capital