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Political Economy of Economic Value

Ajit Sinha

1 Introduction

Classical economists were mainly concerned with the *dynamics* of an economic system. For example, Adam Smith was interested in understanding the 'nature' and 'causes' of growth in the per capita real income, which led him to the problem of how to compare the real national incomes at two points of time, since it is made up of heterogeneous goods and services. Instead of taking the path of some kind of 'index number' solution, Smith used this problem to seek the answer in the *ultimate cause* of value. Since then the problem of the 'measure of value', i.e., the *scale* to measure value of a commodity, got entangled with the problem of 'ultimate cause' of value in classical economics. In general, classical economics analyzes production as a relation between labor and nature. The flip side of production is appropriation of income. The income so produced is necessarily appropriated by or divided among population according to the position they occupy in the process of production. This led classical economists to ask the question: how the changes in production affect the distribution of income and if the distribution of income is affected by changes in production then does it have any effect on the measure of value and in turn the measure of income itself? In this paper, I will first briefly discuss how these questions were specifically

A. Sinha (✉)
Azim Premji University, Bengaluru, India
e-mail: ajit.sinha@apu.edu.in

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dealt with by Adam Smith, David Ricardo, and Marx and then discuss how Sraffa was able to solve the problem of the 'measure of value' by disentangling this problem from the problem of the 'ultimate cause' of value.

2 Adam Smith: The Distribution of Income or How Production Is Appropriated Determines Value of Commodities

The story begins with Adam Smith. As early as 1776, Adam Smith explicitly set out to inquire into the 'nature' and 'causes' of the 'wealth of nations'. He argues, against the Mercantilists, that the true wealth of a nation does not lie in its stock of gold and silver (i.e., the international currency) but rather it lies in the per capita flow of goods and services per year. He goes on to claim that the 'cause' of wealth does not lie in the surplus of real balances in international trade and capital inflows but rather in its laborers' ability to produce goods and services. Thus the state policies should be geared to supporting the growth of real income rather than increasing the surplus in balance of trade. Then arises the question of what government policies facilitate growth in a nation's real wealth and what policies hinder it? This brings Adam Smith to the problem of comparing wealth of a nation over time. Since real wealth is a vector of heterogeneous goods and services, in general comparing two such vectors would require a homogeneous measure of wealth. Since Adam Smith had already rejected the measure of wealth in terms of money, aggregation of all the goods and services produced in a year in terms of its money value was not satisfactory to him. And he correctly argued that money-commodity is a commodity whose value fluctuates over time as the value of any other commodity, therefore it cannot be a reliable measure for comparing the real wealth over time. An additional problem with choosing precious metals as the Standard of value was that it was mainly produced outside of the British economy and brought in only through international trade. Thus changes in productivity or other factors in precious metals producing economies could affect the value of the precious metal and thus the measure of British wealth independently of any changes taking place in the British economy. This is where Adam Smith confronts the problem of a Standard of value, that is, a scale that measures wealth (or aggregate income) that itself remains unaffected by price movements over periods of time. This 'invariable measure' must lie outside the commodity set as all commodities are liable to price movements over time.

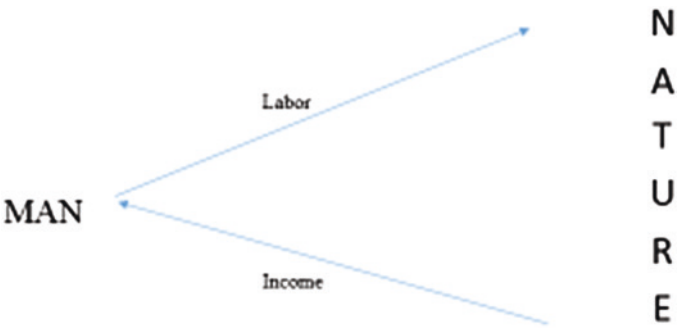

Fig. 1 Man and nature

This problem takes Adam Smith to the idea of direct primordial production relation between man and nature as depicted in Fig. 1. The top arrow represents Man's laboring activity against nature and the bottom arrow represents his appropriation of nature as product of his labor.

In other words, the top arrow in the figure represents the 'real cost' or 'real price' paid by the laborer for the income received. For Adam Smith, income that is produced and appropriated belongs to the commodity set and the commodities have values but the labor that produces the income remains outside of the commodity set but provides a fixed Standard for measuring values of the commodities produced. He argues that if a hunter 'A' kills two deer in a day's labor and another hunter 'B' kills one beaver in a day's labor then it is 'natural' that A and B will exchange deer and beaver in the proportion of one beaver for two deer:

> In the early and rude state of society which precedes both the accumulation of stock and the appropriation of land, the proportion between the quantities of labour necessary for acquiring different objects seems to be the only circumstance which can afford any rule for exchanging them for one another. If among a nation of hunters, for example, it usually cost twice the labour to kill a beaver which it does to kill a deer, one beaver should naturally exchange for or be worth two deer. It is natural that what is usually the produce of two days or two hours labour, should be worth double of what is usually the produce of one day's or one hour's labour. (Adam Smith [1776] 1981, p. 65)

Now, in this economy of two people, the national income after a day's labor turns out to be a vector of two deer and one beaver. If we choose beaver as our Standard of value then the national income turns out to be two beaver and if we chose deer as our Standard of value then it would be four deer.

Adam Smith, however, argues that the exchange of deer for beaver and vice versa between A and B represents 'command' over each other's labor. A's possession of two deer is as good as a command over one day's labor of B and B's possession of a beaver is as good as a command over one day's labor of A. This is equivalent to the amount of labor A must perform to get a beaver and vice versa for B:

> Labour was the first price, the original purchase-money that was paid for all things. It was not by gold or by silver, but by labour, that all the wealth of the world was originally purchased; and its value, to those who possess it and who want to exchange it for some new production, is precisely equal to the quantity of labour which it can enable them to purchase or command. (pp. 47–48)

This is what Adam Smith calls 'real' value of commodities. Now, suppose productivity doubles in both industries. Thus, one day's labor of A produces four deer and B produces two beavers in a day. Thus, the vector of national income after a day's work consists of four deer and two beaver. Now, if both A and B still receive two deer and one beaver after a day's work and the rest is appropriated by two capitalists, say C and D, then, in terms of command of labor, two deer or one beaver will still command a day of labor, so the national income also doubles to four days of labor, i.e., both A and B will have to work two days each now to be able to buy all the national income produced. So we can see that as long as the income of the laborer or real wages per day of labor remains fixed, Smith's Standard correctly accounts for changes in the real national income. However, instead of a rise in productivity, if we had considered a scenario where wages were halved to one deer or half beaver for a day's labor then again the national income would rise to four days of labor commanded even though the real income has remained the same. But Adam Smith denies that. He argues that from the point of view of the laborer (either A or B) his expenditure or 'sacrifice' has remained the same, i.e., one day of labor. In the first case, it buys him two deer or one beaver and in the second case, it buys him one deer or half beaver. So it is the prices of deer and beaver that have doubled. Thus the rise in national income is due entirely to price changes and not real changes:

> Equal quantities of labour, at all times and places, may be said to be of equal value to the labourer. In his ordinary state of health, strength, and spirits; in the ordinary degree of his skill and dexterity, he must always lay down the same portion of his ease, his liberty, and his happiness. The price which he pays must always be the same, whatever may be the quantity of goods which he receives in return for it. Of these indeed, it may sometimes purchase a

> greater and sometimes a smaller quantity; but it is their value which varies, not that of the labour which purchases them. At all times and places that is dear which it is difficult to come at, or which it costs much labour to acquire; and that cheap which is to be had easily, or with very little labour. Labour alone, therefore, never varying in its value, is alone the ultimate and real standard by which the value of all commodities can at all times and places be estimated and compared. It is their real price; money is their nominal price only. (pp. 50–51)

> But though equal quantities of labour are always of equal value to the labourer, yet to the person who employs him they appear sometimes to be of greater and sometimes of smaller value. He purchases them sometimes with a greater and sometimes with a smaller quantity of goods, and to him the price of labour seems to vary like that of all other things. It appears to him dear in the one case, and cheap in the other. In reality, however, it is the goods which are cheap in one case, and dear in the other. (p. 51)

Thus to measure the real changes in the national income one must separate out changes in the national income caused by changes in wages from changes in real goods and services. The invariable Standard of measure of value for Adam Smith is the labor-time that a *fixed* real wage commands.

After establishing the invariable Standard of value in the labor commanded measure of a fixed real wage, Adam Smith goes on to explain how the exchange-ratios of commodities are determined. Above we have noticed that Adam Smith claims that '[i]f among a nation of hunters, for example, it usually cost twice the labour to kill a beaver which it does to kill a deer, one beaver should naturally exchange for or be worth two deer'. So it appears, that the exchange-ratios between commodities are 'naturally' determined by the proportion of labor-time it takes to produce the respective commodities; i.e., it is the technique of production, or the top arrow of Fig. 1, that determines the exchange-ratios of commodities. But we have also noticed that Adam Smith's measure of value is defined as the sacrifice in terms of labor-time that the laborer must make to acquire the commodity. The first measure refers to *production* whereas the second measure refers to an *exchange* between the laborer's payments in terms of his or her sacrifice of labor-time against his or her income (i.e., real wages). Now, 'In the early and rude state of society which precedes both the accumulation of stock and the appropriation of land', the two measures—one in terms of the labor-time needed to produce the commodity, i.e., labor as an activity, and the other in terms of labor-time needed to be sacrificed by the laborer to acquire the commodity, i.e., labor as a payment in exchange for wages—coincide. In this case, the

value of one deer is half day's labor and the value of one beaver is one day's labor. But now, as in our above example, suppose the productivity of hunters A and B doubles but they continue to receive two deer and one beaver after a day's labor respectively and handover two deer to the capitalist C and one beaver to the capitalist D respectively as their profits for advancing them two deer and one beaver as their wages. Adam Smith argues that once total income no longer goes to the laborers, the coincidence of labor used in production and the labor-time commanded by the income of the laborer will diverge and the theory of value based on labor-time used in production no longer remains valid—it should be kept in mind that this proposition is valid under the condition that total income is appropriated by the laborers according to equal wages for homogeneous equal labor. However, once a capitalist class and a class of landlords emerge and the rule for appropriation of the output or the distribution of total income changes then according to Adam Smith, the rule for the determination of values of commodities must also change. In this altered situation, Adam Smith proposed that the determination of value could be made by simply adding up given wages, profits and rent. In our above example, the total income in terms of 'command of labor' is four days of labor. Out of which the workers receive two days of labor and the capitalists receive two days of labor and the rate of profits is 100%. Now, if the rate of profits and real wages were known then we could derive the total value of the national income produced in one day and its distribution between the two classes. Now, look at one deer. To produce one deer, A now takes 1/4 days of labor for which the capitalist C must advance 1/2 deer as wages (given two deer is the wage for a day). At 100% rate of profits, the capitalist C must receive 1/2 deer as profit as its share in one deer. Now adding up the value of wages and profits generated in the production of one deer gives us $1/4 + 1/4 = 1/2$ day's labor, which turns out to be correct. We can extend such reasoning by increasing the productivity of the hunters further to 8 deer and 4 beaver a day and add one unit of privately owned forest (land) by E and F needed for the hunting of deer and beaver. If E and F demand four deer and two beaver in exchange for the rent of land then again we can reduce the value of one deer to $1/8 + 1/8 + 1/4 = 1/2$ day's labor. All these exercises are nothing but income accounting identities. This tells us that the real value of a commodity can be resolved into income as in this case it turns out to be equal to wages plus profits plus rent:

> In every society the price of every commodity finally resolves itself into some-one or other, or all of those parts; and in every improved society, all the three enter more or less, as component parts, into the price of the far greater part of commodities. (p. 68)

Our example, however, is too simplistic. In this case, A and B do not need any produced means of production or raw materials for hunting either deer or beaver. But in general, one would expect that killing of deer and beaver would require some weapons and raw materials to trap the animals, etc. In that case, the value of one deer or beaver must also contain the value of means of production and raw materials that have been used up in production of one unit of deer and beaver. Adam Smith argues that those means of production and raw materials used up in the production of one unit of output are also produced and have therefore, in turn, have produced income and so their values can also be resolved into income categories and the value of the means of production and raw materials used up in their production can again, in turn, be resolved into income categories going back and back in production chain. He believed that this chain must end up with the primordial production relation, which is a direct relation between man and nature. Thus, the value of a commodity can be finally reduced to a long chain of pure income such as wages plus profits plus rent:

> In the price of corn, for example, one part pays the rent of the landlord, another pays the wages or maintenance of the labourers and labouring cattle employed in producing it, and the third pays the profit of the farmer. These three parts seem either immediately or ultimately to make up the whole price of corn. A forth part, it may perhaps be thought, is necessary. In the price of corn, for example, one part pays the rent of the landlord, another pays the wages or for replacing the stock of the farmer, or for compensating the wear and tear of his labouring cattle, and other instruments of husbandry. But it must be considered that the price of any instrument of husbandry, such as labouring horse, is itself made up of the same three parts; the rent of the land upon which he is reared, the labour of tending and rearing him, and the profits of the farmer who advances such a rent of this land, and the wages of this labour. Though the price of the corn, therefore, may pay the price as well as the maintenance of the horse, the whole price still resolves itself either immediately or ultimately into the same three parts of rent, labour, and profit. (p. 68)

Given that value can be resolved into wages, profits and rents, Adam Smith went on to argue that the *rates* of wages, profits and rents are determined in the dynamic context of economic growth and are known at any given moment independently of the knowledge of the values or prices of commodities. For example, at any given moment real wages are high or low depends on whether the economy is thriving or stagnant or declining. A thriving economy with a high rate of growth would require high rate of growth of population and hence higher real wages so that more children of the working class survive. Furthermore, the subsistence wage for the worker,

which is associated with zero rate of growth of population, is not a biological minimum but itself changes with historical trend in wages and the culture: 'By necessaries I understand not only the commodities which are indispensably necessary for the support of life, but whatever the custom of a country renders it indecent for creditable people, even of the lowest order, to be without' (Smith 1981, pp. 869–870). Thus given these rates at one moment, the values of commodities can be calculated.

3 David Ricardo: Value Is Determined by Expenditure of Labor and Is Not Affected by Changes in Distribution of Income

David Ricardo (1951 [1821]) criticized Adam Smith for both his choice of a Standard of measure in 'labor commanded' and his 'adding up' theory of value. Ricardo argued that Smith had simply replaced a single commodity, gold or silver, as the Standard of measure with real wages as his Standard, but real wages also fluctuate over a long period of time like gold or silver and therefore there is nothing 'invariable' about this measure either. He also claimed that Adam Smith's theory of value is logically flawed. He argued that Adam Smith cannot simultaneously claim that, on the one hand, the value of a commodity ultimately *resolves* into wages, profits and rent and, on the other hand, that rates of wages, profits and rents are given independently of value, since value of a commodity (or the national income) must put a constraint binding on the third distributional category; for example, if the shares of the national income that goes to wages and profits are independently determined then the share that goes to rent must be whatever is left and cannot be determined independently of prices. Thus there can be no determination of value by *adding up* independently given rates of wages, profits and rent.[1]

Ricardo also criticized Adam Smith for moving away from relating the theory of value with labor as an activity or technique of production to income distribution. He argues that Adam Smith was wrong in suggesting

[1]In Sinha (2010a, b) I have argued that Adam Smith's so-called 'additive theory of value' does not ignore the constraint binding on the system. Smith takes both wages and the rate of profits as given but treats rent as the residual. Also see Sinha (2010a, b) for my more expansive defence of Adam Smith against Ricardo's criticisms.

that the hypothesis that exchange-ratios of commodities are determined by the labor-time ratios spent in producing the respective commodities no longer holds once a non-laboring class arrives on the scene and demands a share in income produced. He showed that Adam Smith's original hypothesis remains intact even if a positive rate of profits arises as long as the techniques of producing commodities have the same direct to indirect labor ratios, i.e., the industrial ratios of their total direct labor employment to total physical capital used in production, measured by the labor-time needed to produce them. Hence it is not a new share in national income that causes the original hypothesis to be modified. However, the hypothesis requires modification because in general there is no reason to assume that the ratios of direct to indirect labor-time for all the techniques of production would be the same for all the industries in the economy. And if that is the general case, then the requirement of equal rate of profits across industries for the long-term solution of the equilibrium or 'natural prices' must bring about a deviation in exchange-ratios from their labor-time ratios. This is because when the technical ratio of direct to indirect labor-time across the industries are equal then an equal percentage fall in wages would release proportionately equal income per unit of capital in all the industries to be distributed as profits. Thus the rate of profits in all the industries will remain equal without affecting the prices. However, if the technical ratios of direct to indirect labor are unequal across industries then an equal percentage fall in wages would release proportionately unequal income per unit of capital resulting in unequal rates of profits across industries, if prices remain the same. Hence prices must be affected if the long-term equilibrium condition is to be maintained.

Even after acknowledging this, Ricardo, however, was not ready to abandon the labor theory of value. He argues that even though the equilibrium exchange-ratios deviate from their labor-time ratios, it could be argued that the *ultimate cause* of *changes* in exchange-ratios can be traced back to changes solely in the techniques of production or the labor-times needed to produce the commodities. In other words, Ricardo wanted to deny that changes in the distribution of the national income or the net output produced have any impact on the exchange-ratios of commodities. Ricardo, however, could see that the same cause that necessitates the modification in exchange-ratios of commodities from their labor-time ratios must also necessitate changes in the exchange-ratios of commodities when the rate of profits or wages rise or fall. So, how could he argue that it is solely the changes in techniques that explain the changes in exchange-ratios of commodities? Ricardo thought that the effect of changes in distribution on exchange-ratios

of commodities is only *apparent* and solely due to the fact that we have to use an arbitrary commodity as a Standard to measure the changes in the exchange-ratios of commodities. He hypothesized that if we could find or theoretically construct a commodity that is not affected by changes in the distribution of income then it could be shown that exchange-ratios of commodities would remain unchanged in the face of changes in distribution of income when it is measured against this particular 'invariable' measuring Standard. At one stage Ricardo identified the search for an invariable Standard of value with the true theory of value itself: 'Is it not clear then that as soon as we are in possession of the knowledge of the circumstances which determine the value of commodities, we are enabled to say what is necessary to give us an invariable measure of value?' (Letter of Ricardo to McCulloch, dated 21 August 1823, Ricardo 1955, p. 358).

This proposition of Ricardo is however logically false because changes in the distribution affect relative values of commodities and thus logically there cannot be any commodity against which the relative values of commodities could remain constant in the face of changes in distribution. Evidently, Ricardo had finally come to this realization, as in a letter to James Mill, written six days before his untimely death on September 11, 1823, he wrote: 'I have been thinking a good deal on this subject lately but without much improvement—I see the same difficulties as before and am more confirmed than ever that strictly speaking there is not in nature any correct measure of value nor can any ingenuity suggest one, for what constitutes a correct measure for some things is a reason why it cannot be a correct one for other' (Ricardo 1955, p. 372, dated 5, September 1823).

We have seen that Adam Smith's project was to 'inquire' into the 'nature' and 'causes' of the 'Wealth of Nations' and in the course of this inquiry he found that he needed an invariable measure of value to measure changes in real wealth over time. This led him to inquire into the ultimate cause of value, which, according to him, is the *sacrifice* or 'price' that a laborer must make or pay to acquire his or her income. From here on, he developed a theory of value or what he called 'natural prices' that was nothing but accounting of national income, given rates of wages, profits and rents independently of prices. David Ricardo's project, on the other hand, was to inquire into the *laws* that regulate the distribution of income with the progress in the 'Wealth of Nations'. He argued that without the knowledge of the true doctrine of rent, for which he credits Malthus and Edward West, 'it is impossible to understand the effect of the progress of wealth on profits and wages …' (Ricardo 1951, p. 5). With the help of his theory of differential rent, Ricardo tried to establish that the increase in the wealth and population of a

nation leads to a rising trend in rent of land at the cost of rate of profits on capital. Now, if value could be determined by adding up wages profits and rent, as Ricardo interpreted Adam Smith's theory to be, then this proposition may not be true, as a rise in rent could lead to a rise in the prices of all commodities leaving the rate of profits and wages unchanged. However, if the labor theory of value is true then extension of cultivation on less fertile land must lead to a fall in the rate of profits, if wages are held constant. On the other hand, leaving the rent constant, it can also be shown that a rise in wages must lead to a fall in the rate of profits and vice versa. For Ricardo, labor is the ultimate cause of value, but not as the 'sacrifice' or price paid by the laborer but rather as the productive activity. Thus, value should be independent of changes in distribution but changes in value due to changes in technique must have implications for distribution, since it is value that constrains the relations between distributional variables. When Ricardo realized that, in the general case, prices of commodities are not given by their labor-time ratios, he thought that this was still not fatal to his project as what he needed was the ultimate cause of *change* in the values or prices of commodities, since his inquiry was focused on the effect of changes in value on distribution due to rising difficulties in the production of agricultural goods. But once he realized that even in this case effects on values of changes in distribution cannot be removed, he blamed it on the arbitrary nature of the Standard in which values or prices are measured and entertained the idea for some time that an 'invariable' Standard, i.e., a Standard that is not affected by changes in distribution, will simply remove all the distortions caused in prices by changes in distribution.

Piero Sraffa (1951), however, has a different interpretation of Ricardo's problem of the 'invariable measure of value'. In his highly influential 'Introduction' to Ricardo's *Principles*, which was written in collaboration with Maurice Dobb, Sraffa argues that Ricardo in around 1814–15 was working on the basic principle that 'it is the profits of the farmer that regulate the profits of all other trade' (Sraffa 1951, p. xxxi). According to Sraffa, Ricardo assumed that in agriculture both capital (including seed and wage advances) and products were the same goods, and thus a rate of profit in agriculture could be determined on the basis of the physical data without any need for a theory of value. And since in a competitive market equal rate of profits must prevail, the prices of manufactures and other commodities have to be so adjusted as to allow the same rate of profits on their capital investments. In this framework, an inverse and proportional relationship between the rate of profits and the real wages can be directly observed through the microcosm of the agricultural sector. Apparently, Malthus had

objected to Ricardo's reasoning on the ground that '[i]n no case of production, is the produce exactly of the same nature as the capital advanced. Consequently we can never properly refer to a material rate of produce. … It is not the particular profits or rate of produce upon the land which determines the general profits of stock and the interest of money' (letter dated August 5, 1814, quoted in Sraffa 1951, pp. xxxi–xxxii). In the face of such criticism Ricardo had to abandon his 'corn model', which opened him up to the problem of aggregating heterogeneous commodities, as the measure of capital required some devise to homogenize a heterogeneous collection of goods. This led Ricardo to search for a general theory of value, which would then allow him to get a measure of the produce and capital in terms of their values. Thus the problem of value had to be solved before the question of distribution could be dealt with, as Ricardo in the early stages of the preparation of the *Principles* wrote to James Mill, 'I know I shall be soon stopped by the word price' (Letter dated 30 December 1815, *Works VI*, p. 348, quoted in Sraffa 1951, p. xiv). Now, the labor theory of value establishes that prices are determined by technique alone and are not affected by changes in distribution. Hence, if labor theory of value could be defended as a legitimate theory of value then it can be shown that wages and profits must be inversely and proportionately related as the size of the net output remains constant when it is cut in different proportions. However, as we have seen above, Ricardo had to admit that in the general case values do get affected by changes in distribution and therefore, in general, he could not establish that the size of the net output remains constant when distribution changes. It is Sraffa's contention that Ricardo maintained that such changes in the size of the net output due to changes in distribution arises solely because we take an arbitrary commodity as the Standard to measure prices and that commodity is also affected by the changes in distribution as other commodities are. He thought that an 'invariable measure of value' should insure that the size of the net output remains constant as prices change due to changes in distribution. Though this proposition is true for a 'standard system' with the 'Standard commodity' as the measure of value, it is not true for any real system that is not in standard proportion even if the Standard commodity is used as the measure of value (see the section on Piero Sraffa below for an understanding of the standard system and the Standard commodity).[2]

[2]See Sinha (2010a, 2016, 2017) for my critique of Sraffa's position.

4 Karl Marx: The Classical 'Natural Prices' or Values Are Displaced Labor-Values Because Profits Are Displaced Surplus-Values

Most of the controversies between Ricardo and the leading economists of his time such as Malthus and J. B. Say can be interpreted as a defense of Adam Smith against Ricardo. Much later, Marx (1977 [1867], 1991 [1894]) follows in the footsteps of Ricardo, but with his own major innovation. Marx thought that Ricardo unnecessarily got bogged down by the problem of 'invariable measure of value'. He maintained that the question of the deviation or rather the *difference* between the equilibrium exchange-ratios or 'natural prices' and the 'labor-time' ratios are more important than the question of the *cause* of *changes* in the exchange-ratios. For Marx, *human labor* is the *substance* of economic analysis, because economics is all about 'necessity' or alienated *human labor*. Thus, he goes on to distinguish the concept of 'value' from the classical concept of prices or 'natural prices' or what he calls the 'prices of production'—in the classical tradition values and 'natural prices' were used as synonyms, values were always defined in exchange relation with the given Standard of measure. However, 'Value' of a commodity, according to Marx, represents nothing but the total direct and indirect labor-time used in producing it. Thus 'value' is an absolute, and not a relative, concept and there is no confusion about its unit of measure—it is the unit of *time*, as hours or days of labor, etc. On the other hand, the concept of 'natural prices' or the 'prices of production' is a relative concept and does require the unit of some other commodity to represent itself.

Marx argues that the link between labor-time and exchange-ratios of commodities cannot be established directly unless one analyzes the *origin* of profits. He maintained that though political economy (i.e., both Smith's and Ricardo's theories) raised the problem of the origin of prices and found the correct solution in labor, it failed to raise the problem of the origin of profits because of its class character. He pointed out that political economy always takes the existence of a positive rate of profits as a fact of life without any further analysis of where it comes from. To analyze the origin of profits, Marx starts from his absolute category of 'value' of a commodity. He then divides the value of a commodity into three distinct components: $c + v + s$, where c, v and s represent the value of the means of production used in producing the commodity (i.e., the indirect labor-time—Marx called it the 'constant capital'), the value of wage goods advanced to the workers, which

Marx called the 'variable capital' and the difference between the total labor-time worked and the value of the wage goods advanced, which Marx called the 'surplus value', respectively. Thus the direct labor-time is divided into two parts: one part represents the wage advances and the other part represents the labor performed over and above the value of the wage basket received by the workers—it is similar to the division of a serf's labor-time: one part on his own land for himself and the other part on the landlord's land for the landlord. However, this surplus-labor does not convert directly into profits where it originates. He argues that the price ratios or the exchange-ratios of commodities deviate from their labor-value ratios in a systematic way, which could be explained on the basis of his value analysis.

According to Marx, the total surplus produced in the economy is equal to the sum of all the surplus-values produced in individual industries. This total surplus is then divided among the individual industries according to an equal rate on their individual capital investments such as $(c_i + v_i)$, where i represents the industry i. Thus $\Sigma s_i / \Sigma(c_i + v_i) = r$ (say) defines the average rate of profits in the system and the 'price of production' of a commodity is then defined by $p_i = (c_i + v_i)\ (1 + r)$. Given these prices of production, the 'natural prices' of classical economics only represent the ratios of prices of production of any commodity against the price of production of the commodity produced by the average 'organic composition of capital', i.e., $\Sigma c_i / \Sigma v_i$ (or C/V), of the system, which has the same rate of profit both in the value system as well as in the system of prices of production and therefore has no reason to deviate from its value. Thus, in the general case, the prices of commodities will systematically differ from their value ratios though they could only be derived from the labor-values of commodities, as the rate of profits could only be derived from surplus-values. In the above calculation, the sum of profits must come out to be equal to the sum of surplus-values and the sum of prices of production must come out to be equal to the sum of values. Thus competitive mechanism seems to only displace individual profits from their surplus-values and individual prices of production or 'natural prices' from their labor-values and create an *appearance* that disguises the true *essence* of the system, since the *essence* of the system is contained by the *average commodity*, which is produced by the *average industry* made up of average direct to indirect ratio of the system as a whole.

Some years later, Bortkiewicz (1949 [1907]) pointed out that Marx's argument was flawed, since the measure of capital in terms of labor–time $(c_i + v_i)$, as Marx had used to derive his average rate of profits, is illegitimate once it is admitted that exchange-ratios deviate from labor–time ratios. This is because capital goods are produced commodities and therefore if their

prices deviate from labor-values as outputs then the same prices must apply to them when they are used as inputs. As a matter of fact, Marx himself had realized that there was a problem of this nature with his method of connecting labor-values of commodities with their prices of production through the average rate of profits derived on the basis of labor-value calculations:

> The development given above also involves a modification in the determination of a commodity's cost price. It was originally assumed that the cost price of a commodity equaled the *value* of the commodities consumed in its production. But for the buyer of a commodity, it is the price of production that constitutes its cost price and can thus enter into forming the price of another commodity. As the price of production of a commodity can diverge from its value, so the cost price of a commodity, in which the price of production of other commodities are involved, can also stand above or below the portion of its total value that is formed by the value of the means of production going into it. *It is necessary to bear in mind this modified significance of the cost price, and therefore to bear in mind too that if the cost price of a commodity is equated with the value of the means of production used up in producing it, it is always possible to go wrong*. (Marx [1894] 1991, p. 264, emphasis added)

Marx, however, could not come up with a solution to this problem and once it is admitted that the measure of capital must also be in terms of prices of production, Marx's average commodity as the Standard of measure derived on the basis of labor-values or the average organic composition of capital loses its relevance.

5 Piero Sraffa: For Any Given System of Production, Distribution of Income Is Independent of Values or Prices but Prices Are Dependent on Distribution of Income

Sraffa (1960) rejects the idea that one can *ultimately* reduce productive activity to the primordial act of production by going back and back in time. The reason for it is that if a produced commodity is used as means of production in producing any commodity then no matter how far back we go in time there always will remain some *commodity residue*, and so pure man versus nature situation cannot be theoretically conceived. The relevance of commodity residue becomes all important when we try to understand how the rate of profits on capital and wages are related, given a produced net income.

It is clear that if one could reduce production to the primordial man versus nature relation then all capital investments can be reduced to a long-dated series of wage payments and thus in this scenario the rate of profits must become infinite when wages are reduced to zero; however, if the commodity residue is taken into account then the rate of profits must reach a finite maximum when wages are reduced to zero given that some positive nonwage capital always must exist in physical form. Sraffa hypothesized that the finite maximum rate of profits of any given system of production that uses other commodities as means of production must remain constant when the rate of profits and wages vary. In other words, Sraffa hypothesized that the ratio of net output to total capital of any given economy must remain constant in the face of changes in prices due to changes in wages or the rate of profits:

> What is demanded of a model is that it should show a constant (constant with respect to variations of r) ratio between quantity of capital & quantity of product. If this can be constructed and proved to be general, a number of important "consequences" follow. (Sraffa Papers, D3/12/16: 14, dated August 1942, quoted in Sinha 2016)

Let us suppose we *observe* a simple three commodity economy after a cycle of production (a 'harvest' or an annual cycle with equal rotation time for all the industries), which is given by:

90 t. iron + 120 t. coal + 60 qr. Wheat + 3/16 labour → 180 t. iron
50 t. iron + 125 t. coal + 150 qr. Wheat + 5/16 labour → 450 t. coal
40 t. iron + 40 t. coal + 200 qr. Wheat + 8/16 labour → 480 qr. Wheat

Totals	180	285	410	1

In this case, the net output of the system is given by (165 t. coal + 70 qr. wheat) and the total capital investment by (180 t. iron + 285 t. coal + 410 qr. wheat). Clearly, at this stage the maximum rate of profits of the system, which is equal to Net Output/Capital ratio (let's call it *R*), cannot be determined without the knowledge of prices; since the ratio (165 t. coal + 70 qr. wheat)/(180 t. iron + 285 t. coal + 410 qr. wheat) is a ratio of heterogeneous goods. Let us assume that all the industries receive their profits equal to the average rate of profits of the system, say *r*, which is an unknown. This can be represented in equation form as:

$$\begin{aligned}
(90p_i + 120p_c + 60p_w)(1+r) + 3/16\,w &= 180p_i \\
(50p_i + 125p_c + 150p_w)(1+r) + 5/16\,w &= 450p_c \\
(40p_i + 40p_c + 200p_w)(1+r) + 8/16\,w &= 480p_w, \\
\hline
(180p_i + 185p_c + 410p_w)(1+r) + w &= 180p_i + 450p_c + 480p_w
\end{aligned} \tag{I}$$

where p's are the prices of respective commodities, r is the average rate of profits of the system and w is the wage rate. The system has five unknowns and three equations. Since prices are relative, one can choose any of the three prices and put it as the measuring Standard by putting its value equal to one, say e.g., $p_w = 1$ or any combination of commodities such as $(165p_c + 70p_w) = 1$. Thus we have now four independent equations and five unknowns. If we take the value of w given from outside in terms of the measuring Standard adopted then we can solve for a unique set of all positive prices and the average rate of profits r (this result is ensured by Perron-Frobenius theorem). Notice that when we take $w = 0$, the solution of r that we obtain is equal to the maximum rate of profits of the system R, which is associated with a particular set of prices. Let us take $(165p_c + 70p_w) = 1$ as our measuring Standard, thus the range of w is from 0 to 1. Now, as we go on changing the value of w from 0 to 1 in the above equation-system (I), we generate a series of different set of p's and r's as our solution sets. We notice that as the set of p's changes with changes in w, the ratio of Net Output to Capital: $(165p_c + 70p_w)/(180p_i + 285p_c + 410p_w)$, or R, keeps changing as well. Thus it apparently refutes Sraffa's hypothesis, which was that the ratio of Net Output/Capital must remain constant with respect to changes in r or w. As we shall see below, Sraffa, however, succeeded in showing that his hypothesis is indeed correct and the result we observe above is simply due to the arbitrary nature of the Standard of measure we have selected.

We have seen that Ricardo had already established that if industrial ratios of direct to indirect labor were uniform for all the industries then changes in the rate of profits will have no impact on the relative prices of the commodities and the labor theory of value would correctly predict those price ratios. However, when the industrial ratios of direct to indirect labor happen to be unequal across industries then changes in the rate of profits would affect the price ratios to maintain the requirement of a uniform rate of profits in the system. The same reasoning holds for Sraffa's system of equations as well. If the industrial ratios of direct labor to means of production were equal for all the equations then every fall in wages (starting from $w = 1$) would release just enough revenue in each industry to pay for profits at an

equal rate without having to disturb the prices. However, if the proportions of the means of production to direct labor are not equal for all the industries then by the same logic prices *must* be affected. Because at the old prices some industries would have surplus of revenue and some deficit after paying the rate of profits at the uniform rate and therefore, prices *must* change to remove these surpluses and deficits from the equations. It should be noted that the determination of equality or inequality of proportions can be made by measuring means of production by taking their values at any wage (say, $w = 1$), since when proportions are the same then changes in wages have no impact on the prices and thus on the proportions so measured. From this, it follows that if the proportions are not equal at one wage, they will not be equal at any wage.

The mathematical reasoning of the necessity of movements of prices with respect to changes in wages, when the proportions of means of production to labor are not uniform, reveals an important fact: since these 'surplus' and 'deficit' industries are results of differing proportions of means of production to labor, there would be a *critical* or *balancing* proportion of means of production to labor for which no 'surplus' or 'deficit' would emerge; i.e., if an industry that used this 'balancing proportion' of means of production to labor then in this industry the 'cause' of change in prices due to change in wages would be absent. The important point about this 'critical proportion' is that if it is a balancing proportion at one set of prices then it must remain 'balancing proportion' for all the set of prices throughout the range of w from 1 to 0. This is because by definition a fall in wages releases in this industry exactly the amount needed to be transferred to profits to pay for the new general rate of profits on the *initial prices*, i.e., the 'price effect' of a change in wages is absent in this industry.[3]

To prove this, Sraffa showed that any empirical input–output data of basic goods,[4] as we have taken above, can be converted to a Standard system by simple algebraic manipulation. For example, if we rescale the coal industry by 4/5 and the iron industry by 4/3. We obtain a rescaled equation-system (I), which is a Standard system:

[3]This is similar to Marx's idea of the industry with average organic composition of capital, which will show no deviation between values and the prices of production. This idea of Marx, however, could not do the job because, once it is admitted that prices of production deviate from values, it is the prices of production that must be used to measure the organic composition of capital of individual industries, which would change in all sorts of ways as wages change and thereby bring about changes in the average organic composition of capital itself.

[4]A basic good is a good that goes directly or indirectly in the production of all goods.

$$
\begin{aligned}
&(120p_i + 160p_c + 80p_w)(1 + r) + 3/16\, w = 240p_i.\\
&(40p_i + 100p_c + 120p_w)(1 + r) + 5/16\, w = 360p_c\\
&(40p_i + 40p_c + 200p_w)(1 + r) + 8/16\, w \;\; = 480p_w,\\
&\overline{(200p_i + 300p_c + 400p_w)(1 + r) + w \qquad = 240p_i + 300p_c + 480p_w}
\end{aligned}
\tag{I'}
$$

The Standard system (I') is *unique* to the equation-system (I).[5] Now, in our Standard system (I'), we find that the value of the Net Output/Capital ratio is well defined in physical terms, independently of the knowledge of prices; since (40 t. iron + 60 t. coal + 80 qr. wheat)/(200 t. iron + 300 t. coal + 400 qr. wheat) = 1/5 or 20%, no matter what *p*'s happen to be. We call this Standard Maximum Rate of Profits, R^*. Now, if we take our Standard net output $(40p_i + 60p_c + 80p_w) = 1$ as our Standard of measure and give wages as fraction of this composite commodity, which Sraffa calls the Standard commodity, we will trace out value of all the *r*'s associated with all the values of *w* from 0 to 1 independently of the knowledge of prices. This relationship is given by: $r = R^*(1 - w)$, where R^* remains constant with respect to changes in *w* and *r*. This shows that given *w*, *r* can be determined independently of prices as the value of R^* is known and remains constant with respect to changes in *w*.

Two consequences follow: (i) since equation-system (I') is derived from simply rescaling the equations of equation-system (I), both the equation-systems are algebraically equivalent. And therefore, the relationship, $r = R^*(1 - w)$, must also hold for the equation-system (I), i.e., $r = R(1 - w)$, so long as the Standard of measure for prices and the wages are taken to be the Standard net product as above, and (ii) given that the average rate of profits of the empirical system must be equal to the average rate of profits of the Standard system and that this relationship must be true for all the rescaled system of the Standard system (the empirical system is just one rescaled system of its unique Standard system), it follows that all the industrial rates of profits must always be equal; i.e., the condition of equal rate of profits is not necessarily a condition of equilibrium or the center of gravitation of the system. Now, given *w* we can calculate *r* or given *r*, we could calculate *w* and plug

[5] See Sraffa (1960) for a proof of this proposition.

these values in equation-system (I) to derive the set of prices that are compatible with the given r and w determined independently of prices.[6]

Thus with the help of the Standard commodity as the Standard of measure, Sraffa establishes Adam Smith's fundamental proposition that the distribution of income is determined independently of prices and these given rates of distributional variables put constraints on prices to be such that the national income accounting must come out to be consistent with the *given* distribution of the national income. Sraffa also showed that there is no need to either assume an equilibrating mechanism or an existence of an equilibrium to prove this proposition. An objective input–output data along with either given wages in terms of the Standard commodity or the rate of profits has sufficient information to determine prices in the system.

Now, the Standard commodity as a Standard of measure remains invariable in the face of changes in prices brought about by changes in wages or the rate of profits. However, these changes in wages and the rate of profits are not the real changes that bring about the real changes in quantity demanded and supplied through the mechanism of price movements as a consequence. They are simply the whole range of rates of profits and wages that can be determined together independently of prices, given the input–output data and one of the two distributive variables anywhere in its entire range of possibilities. Thus this Standard is only a theoretical construct which is designed to show that the problem of income distribution can be separated from the problem of value or price determination.

Now, can the Standard commodity play the role of the Standard of measure or the money-commodity in the real world? The answer, in my opinion, must be: no. The Standard commodity is derived from a given set of industrial input–output data with a fixed amount of total labor employment in the system. Any small change in the technique of production of one or more basic goods or in the total employment of labor in the system must change the Standard commodity. Since the real economy is almost always going through some changes in its use of techniques and/or labor employment, the given Standard commodity must turn into an ordinary measuring Standard for the changed system or one will have to create a new money-commodity for every production cycle. But this is simply not possible because one of the fundamental characteristics of money is to be a means of deferred payments. Thus it is not possible to conceive that wages can be taken as 'given'

[6]For a mathematical proof of the above proposition and a detailed exposition of Sraffa's system, see Sinha (2016).

in terms of the Standard commodity in the real world. This, in my opinion, is the reason why Sraffa drops the idea of taking wages as 'given' and proposes instead to take the rate of profits of the system as 'given' (see Sraffa 1960, p. 33). The purpose of taking wages as 'given' in the early part of the analysis was to show that the average rate of profits of the system is a 'non-price phenomenon' and that a consequence of it is that all industrial profits must be uniform:

> … The rate of profits is embedded 'in the things' and no manipulation of prices could ever affect it. [There could be no more tangible evidence (convincing proof) of the rate of profits [being, as] a non-price phenomenon (effect)]. (D3/12/53: 32, 1955, quoted in Sinha 2016, p. 148)

Once this purpose is accomplished, there is no need to continue with this assumption, which has meaning only in theory but not in empirical world. The rate of profits, on the other hand, is simply a pure ratio per unit of time, and hence its movements over periods of time can be compared directly in the empirical world. Thus for every new production cycle we can work out its R and given r, we can calculate its wages w from the equation, $r = R(1 - w)$, which by definition is in terms of its relevant Standard commodity. No matter what money-wage happens to be in the system, that money wage must be equal to the wages derived in terms of its Standard commodity.

We have seen above that Ricardo was mainly interested in analyzing the relation between r and w in a dynamic context when the economy is going through structural changes—in his case, when total labor employment in the system is rising and productivity of agricultural sector is declining with the productivity of manufacturing sector remaining the same. Through the help of his 'labor theory of value' Ricardo argued that the result of such structural changes in the economy would be a rising rent and a falling rate of profits with a given fixed real wages. On the basis of Sraffa's analysis, we can say that the share of total profit in the net output or the total income at any given moment can be given by r/R. Changes in R represents changes in the structure of the economy in so far as its productivity is concerned.[7]

[7]Here productivity of the system refers to net output/capital ratio, i.e., the rate of surplus produced in the system and not in terms of productivity per unit of labor. In Sraffa's system wages are not considered as part of capital, they take part in receiving a share of the surplus or the net output produced. Pasinetti (1981, pp. 104–106) has developed a dynamic Standard commodity, which measures the changes in average productivity per unit of labor for an economy growing at full employment with structural changes and consequent changes in prices. A comparison of the two productivity measures may prove to be interesting.

In the case of Ricardo's example, R must be falling and therefore, for every given r, the share of profits in the total output must be rising and the share of wages must be declining. Similarly, if the productivity of the system is increasing, i.e., R is rising, then for every given r the share of wages in the total income must be rising.

6 Conclusion

In this paper we have argued that the theories of value or prices in the classical tradition were mainly concerned with the problem of how prices of commodities relate to the distribution of income in a dynamic context. Now, price is a relative concept, it relates to the ratio of exchange between two commodities, whereas income is an absolute concept in the sense that one need not think of it to exist only in a relation of exchange with something else—it can simply be conceived as a collection of one or several commodities. But when Adam Smith confronted the problem of comparing the changing income over time, he realized that income needs to be expressed in some homogeneous unit and measured by a scale, which itself must remain constant over time. This led him to think of the production of income itself in terms of an 'original' exchange relation between labor and nature. This 'original' exchange relation, he thought, provided him with the natural unit of measure for income, which remains independent of variations in the exchange relations between commodities over time. He further reasoned that since total income produced must be equal to its total division among various recipients of income and that total income is nothing but aggregation of single units of commodities, the value of those commodities must also 'resolve' into its aliquant parts of the same distribution of income. Adam Smith's contention was that the *rates* of the division of income at any moment are known data, as they are determined in a long-term dynamic or growth context. Thus *rates* of the distributional categories such as wages, profits and rents are determined independently of what the values of commodities happen to be at any moment. The causation in the dynamic context works from changes in the rates of distribution to values or 'natural prices' of commodities.

In opposition to Adam Smith, Ricardo tried to establish that values of commodities are determined by the technique of production alone and it was independent of changes in distribution of income. He maintained that Adam Smith's idea of the primordial production relation provides the unit and the method to measure the changes in technique of production but

not the Standard of measure for value. In the case of Ricardo, the causation in the dynamic context runs from changes in technique of production to changes in the rates of income distribution. However, when Ricardo was confronted with the problem that, in general, values cannot be determined without the knowledge of the rate of profits, he still wanted to prove that *changes* in the 'real' value can solely be explained by the changes in technique. It is to prove this hypothesis that Ricardo looked for an invariable measure or Standard of value—i.e., a Standard that is not affected by changes in distribution. He thought, though incorrectly, that if it could be shown to be true for the Standard then it could be shown that it is also true for all the commodities if they are measured against such a Standard.

Marx's main objective was to prove that the origin or the source of profits was in the exploitation of labor. Though Ricardo wanted to establish that prices are determined by technique and are not affected by how the pie is cut, Marx wanted to establish that how the pie is cut is determined independently of prices. In this context, Marx acknowledges that changes in how the pie is cut will affect the prices but it cannot affect the total value of the net national income. This hypothesis of Marx crucially rests on the idea that there is an 'average' commodity produced by the 'average' organic composition of capital of the system, which will show no deviation between value and prices and hence if this commodity is used as the Standard of measure for all other prices then the value of total net output will remain constant independently of how the pie is cut between the capitalists and the workers.

Throughout these developments, the idea that all productive activities can finally be represented in terms of labor alone and therefore, labor is the primary factor of production played a central role. Sraffa took a momentous theoretical step forward by highlighting the importance of 'commodity residue'—as the title of his book proclaims, once you introduce commodity as a means of production then there can be no linear regression that can take you out of the circle of 'production of commodity by means of commodity'. Hence there is no primary factor of production in the system. In this context, Sraffa showed that for any given system of production, there exist an 'average' industry and an 'average' commodity, which represents the physical property of the system as a whole. If one chooses this average commodity as the Standard of measure for wages and prices, then the productivity, as well as the rate of profits of the system, can be reckoned from the physical data alone without invoking prices to homogenize heterogeneous commodities. Thus the question of productivity and the distribution of income can be separated from the question of values or prices of commodities. On the other hand, these value or prices of commodities are dependent on the given

distribution in so far as the reckoning of the rates of profits and wages in terms of prices must come out to be the same as their reckoning in physical terms. The relations between productivity, rates of profits, wages and prices that Sraffa establishes are the logical relations in which these variables must relate to each other at any given moment. The 'average' or the Standard commodity is uniquely defined for one set of given input–output data. In a structurally changing economy Sraffa's Standard commodity cannot be used to compare wages and prices at two points of time. However, we can still compare structurally changing economies on the basis of their changing productivity and the rate of profits in so far as the movement of the shares of income going to the capitalists and the workers are concerned.

References

Marx, K. 1977 [1867]. *Capital*, vol. I. New York: Vintage.

Marx, K. 1991 [1894]. *Capital*, vol. III. London: Penguin Classics.

Pasinetti, L.L. 1981. *Structural Change and Economic Growth*. Cambridge: Cambridge University Press.

Ricardo, D. 1951 [1821]. *The Works and Correspondence of David Ricardo, vol. 1: On the Principles of Political Economy and Taxation*, 3rd ed. Cambridge: Cambridge University Press.

Ricardo, D. 1955. *The Works and Correspondance of David Ricardo*, vol. IX, ed. Piero Sraffa. Cambridge: Cambridge University Press.

Sinha, A. 2010a. *Theories of Value from Adam Smith to Piero Sraffa*. London: Routledge.

Sinha, A. 2010b. In Defence of Adam Smith's Theory of Value. *The European Journal of the History of Economic Thought* 17 (1): 29–48.

Sinha, A. 2016. *A Revolution in Economic Theory: The Economics of Piero Sraffa*. Cham: Palgrave Macmillan.

Sinha, A. 2017. A Comment on Sraffa's 'Classical Economics'. *Cambridge Journal of Economics* 41 (2): 661–677.

Smith, A. 1981 [1776]. *An Inquiry into the Nature and Causes of the Wealth of Nations*, vols. I and II. Indianapolis: Library Fund.

Sraffa, P. 1951. Introduction. *The Works and Correspondence of David Ricardo*, vol. 1. Cambridge: Cambridge University Press.

Sraffa, P. 1960. *Production of Commodities by Means of Commodities*. Cambridge: Cambridge University Press.

Sraffa, P. (unpublished). *Sraffa Papers*. Wren Library, Trinity College, University of Cambridge.

von Bortkiewicz, L. 1949 [1907]. On the Correction of Marx's Fundamental Theoretical Construction in the Third Volume of *Capital*, trans. Paul M. Sweezy. In *Karl Marx and the Close of his System …*, ed. Sweezy. New York: Kelley.