Henry George and Philip Wicksteed's "Coordination of the Laws of Distribution"

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Abstract: By 1884, Philip Wicksteed had become an avowed admirer of Henry George, whose *Progress and Poverty*, had been published in 1879. In 1894, Wicksteed published his seminal monograph, *An Essay on the Coordination of the Laws of Distribution,* which formalized and clarified concepts of marginal productivity, and introduced the constant returns (linear homogeneous) model under which, when all factors earn their marginal products, they exhaust the total product. Wicksteed's title surely reflects George's chapter on "The Correlation and Co-ordination of the Laws of Distribution," and his model does not at bottom contradict George. However, the *Essay* does not mention George or the classical economists notably Ricardo. It explicitly rejects the classical division of factors into land, labor and capital—laying the foundation of modern neoclassical economics in which all factors are symmetrical so we might as well just use two, capital and labor. Finally, Wicksteed conflates two meanings of the word "surplus", to claim there exists no taxable rent.

I. Introduction

I first encountered Philip Henry Wicksteed (1844-1927), in Mason Gaffney's "Neoclassical Economics As a Stratagem Against Henry George" (Gaffney 1994). (pp 63-65) Gaffney presents Wicksteed as a friend and admirer of Henry George. According to George's biographer, Barker, (Barker 1991) when Wicksteed first read *Progress and Poverty,* (George 1962 [1879]) he wrote to George, it "has given me light I vainly sought for myself". Wicksteed corresponded with George, was on the platform at a lecture he gave in England in the summer of 1883, and coached George Bernard Shaw on George's economics. Gaffney cites Wicksteed's seminal monograph, *An Essay on the Coordination of the Laws of Distribution* (Wicksteed 1894) as "formalizing, in more elegant form, an insight from his friend George."

Gaffney continues, "in the process, Wicksteed wrote that land and labor are coordinate and symmetrical, and none yields a surplus more than any other. He was expressing a mathematical insight, not an anti-Ricardian dogma. He was saying that distribution exhausts the total product when every factor, including land, is paid its marginal product. He showed that the same laws of distribution may be established regardless of whether land or labor is arbitrarily treated as the variable. It is a valuable insight, and fully compatible with recognizing land rent to be a taxable surplus." P 64

When I finally read Wicksteed's "Coordination of the Laws of Distribution", in an electronic version edited and published online by the London School of Economics, I was puzzled. The work neither mentions George nor seems in any way to support his ideas. Rather, it establishes a template for what will become neoclassical economics: a world in which all factors are equal, so we might as well use just two of them, labor and capital. It's a world of "constant returns" production (linear homogeneous in modern language)—there are no economies or diseconomies of scale, no fixed costs, lumpy factors, joint products, positive or negative externalities, public goods, or depreciation of capital. All factors are separable and infinitely divisible. There is no

monopoly or monopsony. Factors of production are given, having no costs of production or supply functions. The *Essay* is also—especially for its era—intimidatingly mathematical.

Before plunging into a discussion of the essay, let me backtrack to the laws of distribution as seen by the classical economists, and modified by George.

II. The Classical Economists

The best-known "classical" economists are Adam Smith (1723-1790; *Wealth of Nations,* 1776); Thomas Malthus (1766-1834, *Essay on the Principle of Population*, 1798-1826); David Ricardo (1772-1823, *Principles of Political Economy and Taxation*, 1817, 1821); and John Stuart Mill (1806-1873, *Principles of Political Economy*, 1848-1865). Continuing the classical tradition with their own twists were Henry George (1839-1897, *Progress and Poverty*, 1879); and Karl Marx, *Capital*, 1867+, English translation, 1890).

## III. The Classical Economic System

The classical economists recognized three "factors" required in all production: land (shorthand for all natural resources), labor and capital. The factors corresponded to three social classes: landowners, workers, and capitalists. Landowners collect "rent", workers receive "wages", and capitalists earn "interest" on funds they "advance" to pay wages before production is completed. These funds are therefore called the "wage fund" (or "wages fund"). The classical economists wanted to figure out what share of real national income ("wealth" in their terminology) went to each class.

David Ricardo (Ricardo 1996 [1818]) (and some predecessors) came up with an ingenious explanation of rent, based on agriculture. Assume we can identify "marginal land"—land that's just barely worth cultivating. No one would pay rent for such land. The production of that land must just equal the cost of cultivation: wages plus interest. Therefore, rent on better quality land must equal the difference between output of that land, and output of marginal land. Think of it this way: if you're a farmer, how much more would you be willing to pay to cultivate good land

Figure 1
Basic Ricardian System

as opposed to marginal land? Obviously, the difference after all costs. That's rent. It's pure, unearned income, merely for the fact of ownership. That's the "Law of Rent".

But what about wages and interest? In his famous "corn model", Ricardo assumed wages were at "subsistence" –just enough to keep workers and their families alive. By elimination, that left interest, which had to be the production of marginal land minus the wages needed to cultivate it. On an annual basis, the rate of interest became
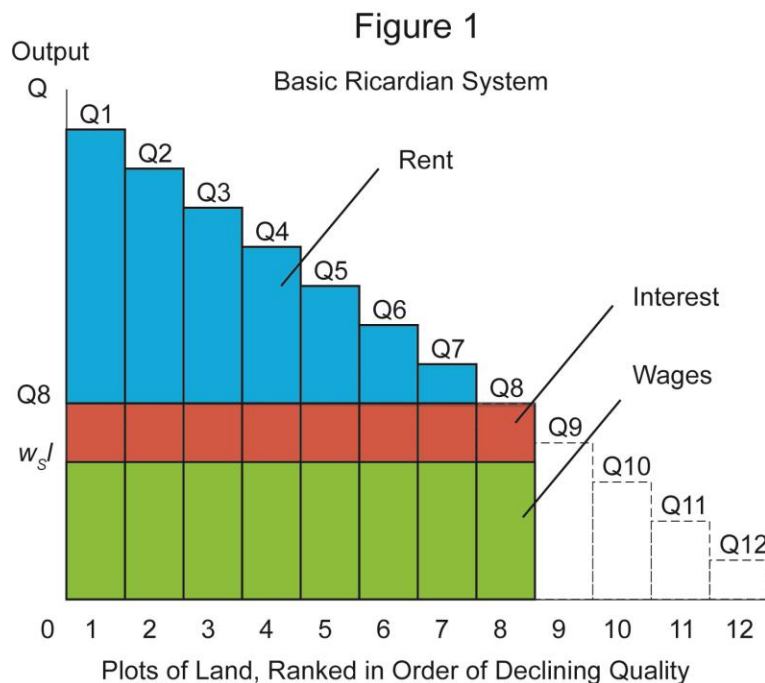
the annual amount of interest divided by the annual wage bill.

IV. The Basic Ricardian System

Figure 1 shows 12 plots of land, of quality ranging from high to low. Assuming the application of a unit of labor, "l" to each plot, the plots can produce output Q_1 through Q_{12}. If plot number 8 is the "marginal" plot of land, and the subsistence wage is w_s, then $w_s l$ is the wage bill on the marginal plot and $W = 8w_s l$ is the wage fund. Since there is no rent on the marginal plot, interest must be Q_8- $w_s l$. That gives us the interest rate: $i = \dfrac{Q_8 - w_s l}{w_s l} = \dfrac{Q_8}{w_s l} - 1$. So, given w_s, the interest rate is determined on marginal land. As shown in Figure 1, the landlord gets the rent (blue), the workers get the wages (green) and the capitalist gets the interest (brown).

V. Weakness of the Ricardian System

The Ricardian system depends on our knowing the subsistence wage, w_s. Alternatively, it depends on our knowing the annual wage bill, or wage fund, W, and dividing it by L, the total labor supply, to get a fixed wage, w' (which may be greater than subsistence). However, as both Smith and Ricardo clearly recognized, "subsistence" is a very vague concept, dependent more on habit and culture than any absolute nutritional standard. Moreover, it may increase as an economy's prosperity increases. Dividing W by L doesn't improve precision, as both W and L also change over time.

The Ricardian system also doesn't recognize that not only must capitalists advance wages to workers—the wage fund—they must also advance rent to landlords, who usually demand payment ahead of production. That makes it more complicated to estimate interest, since we need to know not only the annual wage bill, but also the annual rent bill.

Figure 2
Ricardian System Modified by George
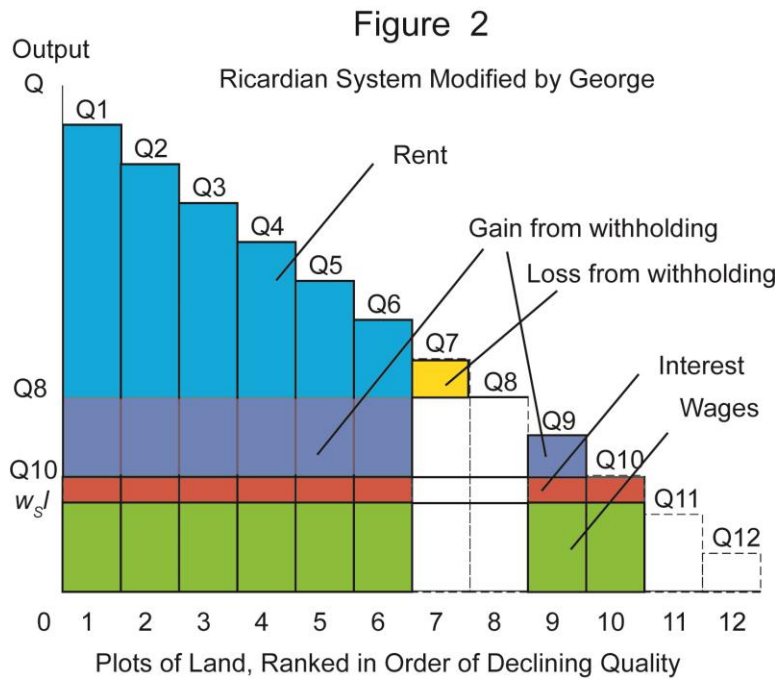
VI.   George's Modification of the Ricardian System.

George did not assume a given subsistence wage, or a wage derived from dividing W by L. Instead, he said that the wage is determined by what a man can earn by working with minimal capital on land that is freely available, that is, marginal land. That's so, George says, because no man would voluntarily work for hire if he could earn as much or more working for himself. To put it more formally, the wage is determined by the marginal product of labor and capital on land at the extensive margin, and at the intensive margin on above-marginal land. By arbitrage, this

simultaneously determines all wages. In making this argument, George originated the marginal productivity theory of wages, picked up by the neoclassical economists who followed.

Moreover, George says, *the quality of marginal land is not a given*, as Ricardo assumes. Rather, when large landholders keep tracts of good quality land out of use, or in low use, they force the margin of production out onto lower quality land, at once increasing rent and lowering wages. In modern terms, the greater the concentration of land ownership, the worse the quality of marginal land available to the poor. This pattern is quite obvious in Latin America today, where giant haciendas occupy the best land, often just for grazing cattle, while the peasants scratch out a living on steep eroding hillsides.

VII.   Consequences of Land Withholding—Figure 2.

Figure 2 is identical to Figure 1, except that we assume that a single landlord owns the eight highest quality plots of land. That makes him a land monopolist. He does the logical thing for a monopolist; he holds land out of use. In this case, he holds plots 7 and 8 out of use. Look what happens. Labor is forced out onto plots 9 and 10, and the combination of wage and interest is forced down from Q_8 to Q_{10}. Workers and capitalists lose. But the landlord gains. In this diagram, he gains (Q_8-Q_{10}) on plots 1 through 6, and loses only the bit of rent he would have gotten on plot 7. The output of the economy falls by $(Q_7+Q_8) - (Q_9+Q_{10})$—so workers and capitalists lose more than the landlord gains. (The owner of plot 9 also gains from when wages are forced down; his previously sub-marginal land now earns a bit of rent!)

However, we will get the same result if each plot belongs to a different owner. All that's needed is for one or more of the owners of better quality land to hold some out of use, whatever the motivation.

VIII.   Land Withholding, Speculation, and Inequality,

Living in San Francisco in the 1860's and '70's, George witnessed something the British classical economists could never have imagined: the California land rush. Firsthand, George saw how Southern Pacific Railroad and east coast absentees snapped up large tracts of fine land and held it off-limits to incoming settlers—forcing them to accept poorer quality, more remote land. In San Francisco itself, he saw the same phenomenon: valuable land held out of use in the form of vacant lots or lots with only "miserable shanties in the midst of costly buildings." George called the land withholders "speculators," for quite surely they acquired land expecting its value to increase dramatically as population poured into California.

However "speculation" doesn't explain land withholding. Most of the withholders are not monopolists in the sense of deliberately keeping land out of use. Even if they bought land for speculation, why is it, as George says, they "cannot or will not use or improve" the land themselves? Why not, while they wait for the price to rise, get some income by renting to someone who will use it? Moreover, the world is full of valuable idle land that does not belong to speculators. So speculation can't be a universal explanation.

Withholders have one key trait in common: they are rich enough to afford withholding. They can't be bothered to manage their property, often because they are absentees, or they actually prefer to keep the land open. Think of medieval lords of the manor galloping through their forest preserves in hot pursuit of deer or boar—while their gamekeepers hang peasants caught poaching rabbits.

George's "remedy", the tax on land value, captures land rent. It goes right to the root cause of withholding: it raises the cost of keeping good land idle. It also goes right to the root of inequality in land ownership—which is what made George so dangerous to the establishment.

IX. George on the "Correlation and Co-ordination" of the Laws of Distribution

In Book III, Chapter 7, "The Correlation and Co-ordination of These Laws", George restates the laws of rent, wages and interest as he re-conceptualizes them, "The True Statement", compared to his interpretation of earlier versions "The Current Statement" (p 219)

The Current Statement	The True Statement
RENT depends on the margin of cultivation, rising as it falls and falling as it rises.	RENT depends on the margin of cultivation, rising as it falls, and falling as it rises.
WAGES depend upon the ratio between the number of laborers and the amount of capital devoted to their employment.	WAGES depend on the margin of cultivation, falling as it falls and rising as it rises.
INTEREST depends upon the equation between the supply of and demand for capital; or, as is stated of profits, upon wages (or the cost of labor), rising as wages fall, and falling as wages rise.	INTEREST (its ratio with wages being fixed by the net power of increase which attaches to capital) depends on the margin of cultivation, falling as it falls and rising as it rises.

George mistakenly assumes that capital always assists labor, hence interest moves with wages. (Ricardo had it right: interest can also move against wages, making capital fully independent of labor.) But what's more important, George recognizes that rent, wages and interest are *determined simultaneously*:

> "The law of interest and the law of wages which we have substituted for those now taught are necessary deductions from the great law which alone makes any science of political economy possible—the all-compelling law that is as inseparable from the human mind as attraction is inseparable from matter, and without which it would be impossible to previse or calculate upon any human action, the most trivial or the most important. This fundamental law, that men seek to gratify their desires with the least exertion, becomes, when viewed in its relation to one of the factors of production, the law of rent; in relation to another, the law of interest; and in relation to a third, the law of wages. And in accepting the law of rent, which, since the time of Ricardo, has been accepted by every economist of standing, and which, like a geometrical axiom, has but to be understood to compel assent, the law of interest and law of wages, as I have stated them, are inferentially accepted, as its necessary sequences. In fact, it is only relatively that they can be called sequences, as in the recognition of the law of rent they too must be recognized. For on what depends the recognition of the law of rent? Evidently upon the recognition of the fact that the effect of competition is to prevent the return to labor and capital being anywhere greater than upon the poorest land in use. It is in seeing this that we see that the owner of land will be able to claim as rent all of its produce which exceeds what would be yielded to an equal application of labor and capital on the poorest land in use." P 219

X. William Stanley Jevons and Alfred Marshall

In his *Essay*, Wicksteed cites two predecessors, Jevons and Marshall. He does not cite George— or Ricardo.

In 1871, before *Progress and Poverty* (1879), William Stanley Jevons published an influential little book, *The Theory of Political Economy*. (Jevons 1888). Jevons was one of three writers to develop concepts of marginal utility, and to formalize and mathematize economics. (The other

two were the Austrian, Carl Menger in 1871; and the Frenchman Marie-Esprit-Leon Walras, in 1874.) Jevons' treatment of rent corresponds to the classical concepts found in Ricardo and George; rent is a surplus depending on the quality of land. However, Jevons does not attempt to "co-ordinate" the laws of distribution.

In 1881, Alfred Marshall began work on his textbook, *Principles of Economics*, publishing the first edition in 1890. (Marshall 1920) Marshall's *Principles,* eventually running to 8 editions, would dominate the teaching of economics for the next 30 years. Marshall sought to reconcile classical economics with the new marginal analysis. Despite some public disagreements with George, Marshall actually supported a land tax proposal when it was advanced by British Prime Minister David Lloyd George as part of the People's Budget in 1909. Marshall treats rent much as Jevons, with diagrams showing a surplus above the payment to labor. Marshall also does not seem to "co-ordinate" the laws of distribution—a search for the words "correlation" and "coordination" turned up nothing relevant.

(In his last book, *The Science of Political Economy* (George 1981 [1897]), published after his death in 1897, George takes a few disparaging swipes at both Jevons and Marshall.)

XI.　Wicksteed' Preface to the Co-ordination of the Laws of Distribution

Wicksteed may well have selected his topic from *Progress and Poverty*, but his treatment is quite different.

Wicksteed starts out in his "Prefatory Note":

> "Recent economic studies have displayed a marked tendency towards a complete recasting of the Theory of Distribution; but I am not aware that any satisfactory attempt has been made to state what may be called the new theory of Distribution in its entirety; and still less have its relations to the old theory been defined. Where does it confute it, and where does it systematise, develop, and force into consciousness what it already implied? In this essay I have tried, without any claim to originality, to mark out the field which such an enquiry must cover, and at the same time to offer the rigorous demonstration of some of the fundamental propositions of the new theory." (p. 3)

He proceeds to justify a mathematical approach on the reasonable grounds that:

> "In investigating the laws of distribution we are in a field of enquiry in which experience shews that there is great danger of our making extremely definite assumptions and arriving at extremely definite conclusions half unconsciously. These assumptions and conclusions are sometimes capable of being stated in mathematical language without becoming one whit more definite than they were before, but with the desirable result that they are made more consciously and therefore more warily. For example, the bare statement that [p.4] "the product is a function of the factors of production" when thrown into this mathematical form at once challenges our direct attention, and makes us aware of the decisive character of the unspoken assumption upon which the very conception of an objective basis for the Laws of Distribution rests." (p. 3)

He continues,

> "But further, we shall find in the course of our investigations that the usual statement of the Law of Rent assumes the following proposition:--
>
> The Product being a function of the factors of production we have
>
> $$P = f(a, b, c, ...)$$
>
> and the form of the function is invariably such that if we have:
>
> $$\Pi = f(\alpha, \beta, \gamma, ...)$$

we shall also have:

$$\nu\Pi = f(\nu\alpha, \nu\beta, \nu\gamma, ...)$$ "(p. 3)

Whoa there! So "the unspoken assumption upon which the very conception of an objective basis for the Laws of Distribution rests" is that ***production is linear homogeneous!*** That is, production is scale-free! That's a very strong assumption. It eliminates economies and diseconomies of scale, positive and negative externalities, monopolies and monopsonies, lumpy inputs, joint products, public goods… It eliminates land as a natural monopoly, justifying the single tax on land. In fact it eliminates cities, which played such a central role in George's world.

Also, what does Wicksteed mean by the Law of Rent? Does he mean Ricardian rent as accepted and illustrated by Jevons and Marshall? Or something else? We'll see.

XII. Wicksteed's Propositions on Distribution

Starting out his essay, Wicksteed makes the correct and reasonable point that if we are to coordinate the laws of distribution, we must put the product of each of the factors of production into the same form, so that the shares can be added up. So "if an objective measure of the service rendered by each factor in its marginal application can be discovered there will seem to be at any rate a possibility of coordinating the claims based thereon".

He then proceeds by analogy to the "law of exchange value", under which

> "…we may say that the total satisfaction (S) of a community is a function (F) of the commodities, services, etc. (A,B,C) which it commands; or $S = F(A, B, C)$ .And the exchange value of each commodity or service, if purchasable, is determined by the effect upon the total satisfaction of the community which the addition or the withdrawal of a small increment of it would have, all the other variables remaining constant. Thus the claim upon the community which the command of any commodity or service, K, enables a man to enforce, is determined by the ratio $\dfrac{dS}{dK}$ (which expresses the exchange value of a unit of that commodity or service), and the exchange value of the whole stock of it is $\dfrac{dS}{dK} \cdot K$. In fact $\dfrac{dS}{dK}$ is the marginal efficiency or significance of K as a producer of satisfaction." (p. 6)

Wicksteed moves from distribution of "satisfaction" to distribution of a product, something which is "external to the claimants, something not themselves, which is actually sliced up and divided among them."

> "Each factor being remunerated not in accordance with the nature of the service it renders, but in accordance with the (marginal) rate at which its unit is rendering such service, and a practical method of testing and estimating that rate having been discovered, it remains to inquire, whether from the known properties of F, we can deduce the property $\dfrac{dP}{dA} \cdot A + \dfrac{dP}{dB} \cdot B + \dfrac{dP}{dC} \cdot C + ... = P$. For it can be shown that the formula $\dfrac{dF}{dK} \cdot K$ really defines the share of the product which will fall to any factor K, and if it can be further shewn that when each of the factors has received its share the whole product is exactly accounted for, we shall then have accomplished our task of co-ordinating the laws of distribution." (p. 7)

So how is he going to show this? Or is he just going to assume it?

He proceeds:

"The general law of distribution, then, which we have now advanced and which we shall proceed to discuss, simply amounts to this: -- That the share in the product which falls to any factor, no matter what be the character of that factor or of the service which it renders is determined by the amount per unit which the concern, as a whole, would find it pay to allow to that factor sooner than have a portion of it withdrawn from co-operation. So stated the theorem may seem self-evident. And so indeed it is. Everyone knows that if a man "is not worth his salt" he is discharged, that if an employer cannot profitably keep all his hands at work he dismisses some of them (unless actuated by motives other than those usually described as "economic"), that if a machine is expected to "eat its head off" it is not bought, that unless I expect a piece of land to pay its own rent I do not take it for industrial purposes, and…so on. It may seem that little is to be gained by putting such truisms into mathematical form. But I think it will be found otherwise on investigation. The law of value, too, resting as it does on the law of indifference and the phenomena of marginal utility, amounts to nothing in the world by the assertion that the purchaser will not give more than he must for an article, and will in no case give more for it than he thinks it is worth to him. This was of course well known to everyone, and is constantly assumed in every economic treatise of whatsoever date; but nevertheless its exact expression in mathematical language has made an epoch, and is making a revolution, in economic science. For it is one thing to be practically familiar with a principle and to assume it in simple cases as a matter of course, and it is another thing to grasp it so consciously and so firmly as never to lose hold of it or admit anything inconsistent with it, however remote from familiar experience and however complicated and abstract may be the regions of enquiry in which we need it as our clue. Thus too in the present instance. The law of distribution which we are to examine is too obvious and self-evident not to be constantly assumed by economic writers, but if they assume it in one sentence they commonly ignore or contradict it in the next. It has seldom been clearly or consciously formulated and firmly held through the remoter deductions of economic speculation. And it is only by a few recent writers that this has been done at all. " (p. 8)

"Obvious and self-evident" indeed! It's just built into the assumption of linear homogeneity. It's all very appealing if we don't look too closely.

Wicksteed proceeds to posit that (presumably assuming a perfectly competitive economy) that for every factor of production, be it a "particular kind of labor" or "land of given capacities" or simply "pick-axes", there's a simple relationship:

$$\frac{dP}{dK} = w = \frac{dP}{dK}$$

Where P is an individual entrepreneur's product, **P** is the "total communal product", and K is any factor and w is the "rate of remuneration" per unit. (p. 9)

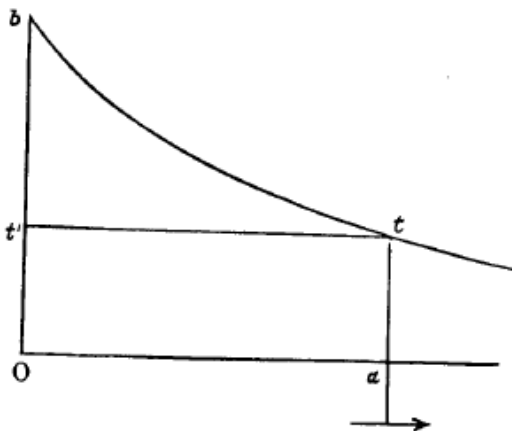### XIII.   Wicksteed on the Law of Rent

Fig. 1.

Wicksteed proceeds to address

"the theory of rent, in what is generally called the "second form of statement." In the exposition of this law the product is regarded as a function of land and " capital," capital being regarded as embracing labour and all else that is needed to make the land productive. All the constituents of this generalised "capital" are regarded as reduced to their expression in money. Land is taken as constant, and capital-plus-labour is added in successive doses, each dose (at any rate after a certain point) yielding a smaller return than the previous dose. That is to say, land being constant, the product is regarded as a function of capital-plus-labour, and the first differential coefficient of this function (within the limits usually considered), is taken to be positive, and the second differential co- efficient,…(at least after

a certain value of x has been reached) is regarded as being negative."

Graphically this means that the function is represented by an area the higher boundary of which, at any rate for the portion specially considered, is a declining curve. (Fig. 1).

This means that the return to the last dose of capital-plus-labour is smaller than the return to the previous doses. But it must be adequate, or the dose would not be administered ; and if adequate for the last dose it is, by the "law of indifference", adequate for all the rest; and therefore the return to the last dose fixes the rate which will satisfy capital- plus-labour, and the excess or "surplus " return to the earlier increments constitutes the amount that the land owner is in the position to claim as rent." (p. 10)

So on Fig. 1, the x axis represents the quantity of uniform "capital-plus-labour", the y axis represents the marginal product of "capital-plus-labor" applied to a fixed quantity of land. By the assumption of linear homogeneity, the curve is proportional to the ratio of land to "capital-plus-
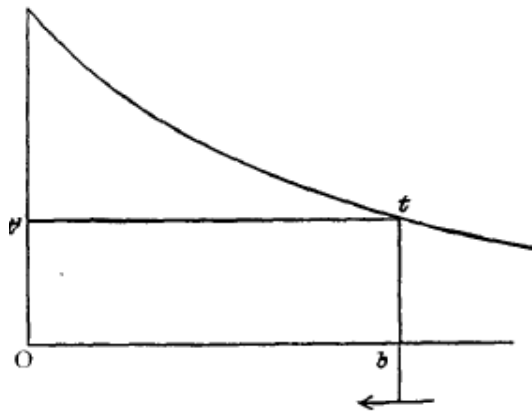

Fig. 2.

labour". (Which means it goes to infinity at the origin, as Wicksteed recognizes. (p. 11)) Line "*at*" is the "last dose" which must equal the rate of compensation. The rectangle *Ot'ta* is the compensation to "capital-plus-labor", and the area under the curve, *bt't* is the compensation to land.

Now Wicksteed does something really clever: he flips over the graph, as in Fig.2. He puts land on the x axis, and on the y axis he puts the marginal product of land on a fixed quantity of "capital-plus-labour." Now *bt* becomes the rate of compensation of land, and the total compensation of land becomes *Ot'tb*. The compensation for "capital-plus-labour" is now

the upper area under the curve of Fig. 2. He now takes several pages of mathematics to show that the upper area in Fig. 1, rent to land, equals the lower area in Fig. 2, also rent to land, and vice versa for "capital-plus-labour." Of course this result is built into the assumption of linear homogeneity.

XIV.   Wicksteed Addresses the Plausibility of His Assumptions

Having demonstrated the symmetry of land and "capital-plus-labour" in "the second form of the law of rent", Wicksteed finally addresses the plausibility of his assumptions.

"These are first that if production P can be written:

$$\Pi = \Psi(A, B, C, ...)$$

we shall also have: $m\Pi = \Psi(mA, mB, mC, ...)$

and second that "it is possible and legitimate to express a perfectly heterogeneous aggregate of factors in terms of a single unit." (p 23)

As to the first assumption, linear homogeneity in modern language, Wicksteed now proceeds with the following line of reasoning.

"[W]riters on rent… are avowedly considering the mere material product…Now it must of…course be admitted that if the physical conditions under which a certain amount of wheat, or anything else, is

produced were exactly repeated the result would be exactly repeated also, and a proportional increase of the one would yield a proportional increase of the other." (p. 24)

But, he continues, this won't do, because we have omitted nonphysical factors of production, such as "good-will" or "connection". These we must include. (p. 24)

"The question we are examining then, is this: If every one of the abilities, efforts, materials and advantages which contribute to production were severally increased in an identical ratio, would the product also be increased in that ratio?" (p. 24)

The answer again is "no". That's because, not only would

"the factors of production [be] doubled or trebled, but also … the area of operations should be capable of corresponding enlargement…, or in other words that there should be a fresh supply of people who want, or can be made to want, the commodity or service in question on the same terms as those who now enjoy it. And to assume this is obviously unwarrantable." (p. 24)

To escape this box, he moves to the level of the whole society:

"For the truth is that the real or "social" product is the total satisfaction accruing from the processes of industry to the whole community, including both the customer and the manufacturer; [p.35] and in this sense the body of customers and their desire for the product, themselves constitute factors of production. If these factors, like the others, receive a proportional increment then obviously the conditions are exactly repeated, and the product too will receive a proportional increment." (p. 25)

But now he finds another problem: the "material product" and the "social product" are not equivalent to the "commercial product" of a producer. For a producer,

"while some of the factors of commercial production are devoted to making the physical product, others are devoted to making, finding, or conquering from other producers, persons who want the physical product; and anything which would increase the share of the public in the social product, and decrease the share of the producer in exactly the same degree, would be regarded by the producer as pure loss; and it would indeed be a dead deduction from the commercial product." (p. 25)

Thus,

"the current assumption that a proportional increment of all the factors of production will secure a proportional increment of the product appears to be legitimate if we are speaking either of the physical or of the social product, but to be unwarranted exactly where we wish to make use of it, viz., where we are speaking of the commercial product." (p. 25)

Moreover,

"We may go further and say that in case of an actual or virtual monopoly the assumption in question is manifestly false. For it is clear that the demand for any commodity is not indefinitely elastic; and that if each unit of physical product is backed by the same amount of pushing and other such factors of commercial production, the response will be slower as the amount increases." (p. 25)

He gets out of this corner by assuming perfect competition. In that case, an individual producer can have little effect on the price, from which he concludes after some simple math, that "the proposition is approximately true for small increments." As he puts it, for small values of n, if

"$\Pi = \Psi(A, B, C, ...)$

we shall also have:

$(1+n)\Pi = \Psi((1+n)A, (1+n)B, (1+n)C, ...)$ "

And from this he derives the familiar linear homogeneity formula:

$P = \Psi(A, B, C, ...)$

gives, for small values of n,

$$P + nP = \Psi(A + nA, B + nB, C + nC, ...)$$

$$P + nP = \Psi(A, B, C, ...) + \frac{dP}{dA}nA + \frac{dP}{dB}nB + \frac{dP}{dC}nC + ...$$

or multiplying by 1/n

$$P = \frac{dP}{dA}A + \frac{dP}{dB}B + \frac{dP}{dC}C + ...$$

"That is to say, under ordinary conditions of competitive industry, it is sensibly or approximately true that if every factor of production draws a remuneration determined by its marginal efficiency or significance, the whole product will be exactly distributed.

Q.E.D. (p. 27)

XV. Wicksteed Notes Some Exceptions and Reaches a Conclusion

Wicksteed notes the important exceptions of monopoly and economies of scale, only to brush them off:

"But it must be noted that we have not raised any commanding presumption that industries concentrated in a few hands come under this law.

The failure fully to confirm and generalise a property in the productive functions which would yield an admirably compact and complete co-ordination of the laws of distribution need not discourage us. Its suggestions as to the line of attack we must follow in dealing with monopolies, and with the true socialising of production, are so magnificent in their promise that we are more than consoled for the want of completeness in our immediate results.

One or two points may still be touched on in this connection. If, for example, the size of the business is itself an important consideration, then the fact will express itself in some such way as by the presence of some one or more factors (perhaps representing some special quality of managing capacity, or some kind of machine or building) which can only be added 01 subtracted in relatively large units, such as the whole working year of a high-class business man, or an enormous engine. This would introduce a serious discontinuity into an important factor and a serious indeterminateness into any empirical attempt to

evaluate $\dfrac{dP}{dK}$ for this particular factor. But this is only a specially striking instance of the difficulty which is always present in economic investigations, and which has been faced perfectly…frankly already." (p. 27)

Wicksteed proceeds to justify his second assumption.

"It concerns the legitimacy of treating all the factors except one selected factor as capable of being measured and expressed in one complex unit. Now the legitimacy of this may be deduced from the proposition we have just proved. For that proposition at once confirms and completes our conception of a quantitative relation between the services rendered by the several factors, each being measured by its effect on the product. And since this measurement may be supposed as precise as we please, it becomes a legitimate and intelligible hypothesis to assume that a general command of factors of production, expressed in terms of money, will be so specialised that no service will be secured at more than its worth, that is to say at a disproportionate sacrifice of any other service…"

We see, then, that when properly safeguarded and generalised the two assumptions usually made in expositions of the law of rent may be legitimately accepted. A small proportional increment of each of the factors of production may be supposed to yield a proportional increment in the product; and we may, if we choose, select any one factor to measure in its proper unit while measuring all the rest in a common unit. And we see further that if these assumptions are made our co-ordinating law of distribution follows. Hence

we may claim for our theory of distribution the support alike of practical experience and of the best elaborated and least assailable portion of the current theory." (p. 28)

He concludes:

> "Let us ask ourselves, then, exactly what it is we have proved, With the proviso that we are dealing only with cases in which the effect of a small increment of all the factors in lowering the market value of the product is imperceptible we have proved that if any periodic product P is shared amongst the factors that went to produce it in such a way that any factor K gets $\dfrac{dP}{dK} \cdot K$ where $\dfrac{dP}{dK}$ is the rate at which under the actual circumstances an increment of K would affect the actual commercial product P, then the product will be just exhausted by the shares. If any factor gets more than the share thus determined some other factor will get less, and if any factor gets less some other factor will get more." (p. 29)

In short, the shares must add up, even if factors don't get their marginal products!

Wicksteed then addresses "speculation" in the conventional sense of making risky investments.

> "[W]hen the representatives of the various factors are dealing with each other and making their bargains one with another, each has his market price based on an estimate, partly experimental and partly speculative, of the value of an increment of the factor in question to the industrial community at large, or $\dfrac{dP}{dK}$. If the speculative element enters largely into these estimates it may happen that no arrangement is possible which will enable each factor to draw what it claims out of a common product…. But these gains and losses may be resolved into (1st) compensation for risk, and (2nd) the share that falls to this special speculating ability, regarded as a factor of production, and receiving its share of the product in accordance with the general formula $\dfrac{dP}{dK} \cdot K$ (which may in some cases be negative). So far as risk-taking is a necessary or useful condition for the conduct of industry it too must be regarded as a factor of production, and its share in the proceeds is regulated by precisely the same law as that which rules elsewhere." (p 29)

In triumphant conclusion, Wicksteed writes:

> "Our law then may be regarded as perfectly general. In is strict form it merely asserts that the sum of the actual $\dfrac{dP}{dK} \cdot K$'s covers the actual product. In this form it is not a law of distribution, but an analytical and synthetical law of composition and resolution of industrial factors and products, which would hold equally in Robinson Crusoe's island, in an American religious commune, in an Indian village ruled by custom, and in the competitive centres of the typical modern industries." (p.29)

XVI.   Wicksteed Eliminates the Surplus

In a footnote to his graph-flipping section, Wicksteed offers: "This will suggest sundry reflections, that cannot be developed here, as to the propriety of calling rent a "surplus," on the strength of a picture having been made of it as a curve-bound area before one had been made of it as a rectangle; and then calling everything else of which it is found convenient to make a picture with a curvilinear boundary "rent" also; e.g., "rent of ability" "consumer's rent," etc." (p. 14) In this, Wicksteed is of course quite correct. We can't just call the upper area under the curve a surplus. In this kind of diagram, it's arbitrary which factor goes above and which below.

But what does that have to do with the original Law of Rent, which says rent depends on the difference between a given quality of land and marginal land? In Fig. 1, the upper area bounded by the curve is rent or "surplus" –because *at,* the "wage" for "capital-plus-labour", is set by opportunities on the extensive and intensive margins. If there's an infinite supply of uniform

quality land, the wage will be so high as to leave nothing for rent. Alfred Marshall makes just this point in the first part of his chapter on distribution. (*Principles*, VI.I.14-15).

Wicksteed makes some final "miscellaneous notes and reflections" that cast further doubt on whether, ten years after meeting George, he retains his initial enthusiasm.

Note (b) reads in part:

> "(b) The customary pictures of rent as a curve-bound surface, together with the style of reasoning based upon them, have fostered an inveterate delusion that there is somewhere a huge "surplus" that may be cut into. Seeing that everything we ever investigate appears to give higher returns to the first than to the later increments, the imagination is vaguely haunted by great "surplus" accumulations,…away back at the origin, that are not touched by the "marginal" distribution. Now the first result of our investigation is to shew, with perfect clearness, that there is no such surplus at all. The marginal distribution accounts for the whole product, and though you can make any factor yield a higher rate per unit by diminishing the supply of it, you can only do so by making some of the rest yield a lower rate per unit." (p. 30)

Wicksteed is correct about there being no "surplus"—provided you take factors of production as given, without asking where they came from. Moving on to note (c):

> (c) The idea that a "surplus" remains over and above the marginal distribution, has been fostered by a habit of confusing heterogeneous factors, alike in diagrams and in reasoning….
>
> "Or again a curve has been drawn of successive Qualities of land with their successively diminishing returns to "the same amount of capital and labour " (as if they ever got the same amount!) and since the picture looks like the one we have been dealing with (of product as a function of increasing ratio between other factors and land), and is also called a "curve of rent" the conclusions drawn from either of these pictures are then indifferently applied [p.47] to both." (p 32)

Now that's a direct swipe at the illustration I did above of the Ricardian Law of Rent. Wicksteed nails down the point in (d) and (e) by directly attacking the Ricardo's Law of Rent, without mentioning Ricardo:

> (d) Such foolish questions as "does rent enter into the cost of production?" could never be asked, if the true law of distribution were kept in mind. Of course rent does not enter into the costs of production of the man who does not pay rent, and of course it does enter into the costs of production of the man who does pay it. But the whole question seems to be an inheritance from the old "cost of production" theory of exchange value. The argument seems to be: "The exchange value of wheat is determined by its cost of production. But the man who pays rent sells his wheat at the same price as the man who does not. Therefore rent does not enter into the cost of production"! In reality of course, the product is a function of certain factors of production. The cost of production is the price paid to secure the co-operation of these factors. If two men produce the same thing but one of them avails himself of factors which the other does without, then different elements enter into the cost in each case; rent, for example, entering into the costs of one, but not of the other. It is really ludicrous to discuss gravely whether the absence of a certain item in one man's bill can be taken as removing it from the expenses of another man, on the ground that their total expenses are the same. It is extraordinary that the "cost of production" theory should have survived so rude a shock as it received from the investigations of the law of rent. "Rent is not the cause but the effect of the exchange value of the product" we read in our books. Precisely so, and since the law of rent is also the law of wages and the law of interest, it is equally true that "wages are not the cause but the effect of the exchange value of the product." And so too with interest. The economists have always seen that this fact was not inconsistent with the power of a combination of landlords, under given circumstances, to raise the…exchange value of produce by standing out for higher rent; and so neither is it inconsistent with a similar power of combinations of men to raise the exchange value of the product by standing out for higher wages.

Wicksteed is absolutely correct here in that rent, wages and interest all derive from "the exchange value of the product." He is legitimately correcting misguided statements of the Law of Rent. And just as the rent of superior land reflects its greater productivity compared to marginal

land, the greater wages of superior workers reflect their greater skill compared to marginal workers. Moreover, he is correct in observing that just as a combination of landlords can stand out for higher rent, so can combinations of men stand out for higher wages.

The problem lies not in what Wicksteed says, but in what he doesn't say, and what he seems to assume. He seems to assume we can take his "innumerable" factors of production as given. But rent, unlike wages and interest, is a "surplus" precisely because land has no cost of production. Through government, society grants and protects landowners' titles to natural resources. Through the market, and by building infrastructure, society creates the value of those natural resources, with no input from the owner. (No input, that is, save "rent-seeking" lobbying of government.) That makes rent a surplus society can recover by taxation without impairing the owner's incentives to put land to its "highest and best" use. In fact the "income effect" of such taxation actually spurs laggard landlords to action—to use the land or sell to someone who will. By railing against illusory surpluses in misleading diagrams, Wicksteed diverts attention from very real and taxable surpluses.

In note (e) Wicksteed reinforces the misleading impression by again emphasizing that all factors compete for returns, and once we break down labor into subclasses, no one is more deserving than any other:

> "(e) From the social point of view it is impossible not to notice the significance of the fact that the return per unit to any factor is raised by the freedom with which the other factors are devoted to production, but lowered by the freedom with which it gives itself. As long as we think of labour in the mass and oppose material things, land and machinery, to it, we can only desire to see these latter as freely given and as scantily rewarded as possible; but if we remember that whenever we separate out one kind of labour then many other kinds of labour are included among the factors the increase of which brings about the rise of its remuneration and the fall of their own, it acquires a pathetic significance to reflect that to give self more freely is to give a larger share of the product to others, and retain a smaller share for self. (p. 33)"

So is Wicksteed supporting or repudiating "his friend Henry George"? It's surely no accident that his title echoes George. But in this discussion of "surplus"—which Wicksteed never defines—he conflate two meanings. In its original Ricardian sense, rent is a surplus to the landowner, because it is unearned income. As such, it can be taxed without impairing the owner's incentives. But another meaning of "surplus" is product left over after the factors of production have received their shares. If production is linear homogeneous, then by definition there can be no surplus product left over. Even if production isn't linear homogeneous, Wicksteed says that if one factor gets more, another will get less, exhausting the product. It's hard to believe that Wicksteed, familiar as he was with George's arguments, could make this conflation innocently.

XVII.   Problems with the Linear Homogeneous Model of the Economy

As I noted earlier, in a linear homogeneous economy there are no economies or diseconomies of scale, no fixed costs, lumpy factors, positive or negative externalities, joint products or public goods. Moreover, firm size is necessarily indeterminate. Wicksteed touches on some of these problems, but minimizes them. He allows at one point that, "If any factor gets more than the share thus determined some other factor will get less, and if any factor gets less some other factor will get more." But how does that work? How does a land monopolist demanding more than marginal product for his land force workers to accept less than marginal product? Or perhaps the monopolist changes the market for labor, lowering the marginal product of labor from what it would otherwise have been? Wicksteed doesn't say.

There's another fallacy built into the linear homogeneous model: the assumption that all the factor shares must add up to the total product, that is, must "exhaust the product". Or rather, the idea that all the shares must add up requires the assumption of linear homogeneity. Ricardo's corn model operates from the assumption that shares going to the three social classes, landlords, workers and capitalists, must add up to the total product. That's reasonable (ignoring public goods), since we're talking about *people not factors*. But most people own some of more than one factor.

Take Robinson Crusoe. He owns his island, some simple tools, and his personal labor supply. If there are economies of scale in his operations, so the shares to land, labor and capital add up to more than one—so what? He gets the whole product, no more, no less. After Friday arrives, Crusoe can pay Friday his marginal product. But the rest of the product is Crusoe's, compensation for his land, labor and capital. If these shares add up to more than his take-home after paying Friday—so what?

In a real economy, at the upper end, large resource owners must deploy their own labor to manage their assets. And they operate with a silent partner—the government that protects their titles. If a resource owner enjoys large economies of scale so that his factor shares add up to more than his take-home—so what? They're all going to the same person.

Note at this point that Henry George did not claim that the shares going to land, labor and capital must add up to the total, only that they are "co-ordinated." An increase going to landlords means a decrease going to workers, though not necessarily the same amount. In fact, an increase to landowners should mean a more than proportional decrease to workers due to the decline in productivity.

In two early papers, "Marginal Productivity as the Basis of Distribution in Economics" (1900), and "On the Problem of Distribution" (1902), Knut Wicksell wrestles with the implications of Wicksteed's monograph. (Wicksell 1969). Wicksell resolves the problem by suggesting that in competitive industries, firms have increasing returns at small scale, and decreasing returns at large scale. At the inflection point, they have constant returns. Under perfect competition, the firms will settle at this point, where they will earn zero profits, and payments to factors at their marginal product will indeed exhaust the product. (p. 123) This is a cute solution, one that also appears, unattributed, in my grad school text, *Microeconomic Theory* by Henderson & Quandt (Henderson 1971) (p. 83). And it makes reasonable sense: Firms may enjoy technological economies at small scale, but these are eventually trumped by diseconomies of management. But that still doesn't explain the real world observation that very large and very small firms in the same industry often manage to operate side by side for generations.

Wicksell's solution also doesn't resolve what happens in the rest of the economy where increasing returns lead to monopoly and monopsony. If a labor monopsonist in a company town pays workers less than their marginal product, how does that affect wages in the competitive constant returns sector of the economy? One would expect it to drive wages down, lowering the marginal product of labor in that sector. Then what? As Wicksteed writes, "If any factor gets more than the share thus determined some other factor will get less, and if any factor gets less some other factor will get more." But which factors, where?

XVIII.   Conclusion

Wicksteed may have started out as an admirer of Henry George in 1884. By 1894, when he published his *Essay*, he seems to have sailed off in another direction. He makes a valuable contribution to clarifying the theory of marginal productivity. Beyond that, he appears to have yielded to the Siren call of a beautiful and seductive model, one that seems to promise for economics the same satisfying simplicity and symmetry as Newton's laws of motion and gravity. Neoclassical economists have been following that Siren ever since.

BIBLIOGRAPHY

Barker, C. A. (1991). Henry George. New York, Robert Schalkenbach Foundation.

Gaffney, M. (1994). Neo-Classical Economics as a Stratagem Against Henry George. The Corruption of Economics. F. Harrison. London, Shepheard-Walwyn**:** 29-163.

George, H. (1962 [1879]). Progress and Poverty: An Inquiry into the Cause of Industrial Depressions and of Increase of Want with Increase of Wealth...the Remedy. New York, Robert Schalkenbach Foundation

George, H. (1981 [1897]). The Science of Political Economy. New York Robert Schalkenbach Foundation.

Henderson, J. M. a. R. E. Q. (1971). Microeconomic Theory: A Mathematical Approach. New York, McGraw-Hill Book Company.

Jevons, W. S. (1888). The Theory of Political Economy, Library of Economics and Liberty.

Marshall, A. (1920). Principles of Economics, 8th ed. London, Macmillan and Co., Ltd.

Ricardo, D. (1996 [1818]). Principles of Political Economy and Taxation. Amherst, NY, Prometheus Books.

Wicksell, K. (1969). Selected Papers on Economic Theory. New York, Augustus M. Kelley.

Wicksteed, P. H. (1894). An Essay on the Co-ordination of the Laws of Distribution. London, London School of Economics.