

THE PRINCIPLES OF WAGES

TO MY TEACHER
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AT THE
NETHERLAND UNIVERSITY OF COMMERCE
ROTTERDAM

THE PRINCIPLES OF WAGES

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“Towards the realization of the highest
desires within the limits of possibility.”

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PREFACE

A FEW years ago several objections to the existing theories of imputation led us to an examination of the different possibilities of determining the prices of the agents of production in general and of wages in particular. We did not then carry out that study, as circumstances forced us to break it off and to pay our attention to other things. It was not until the University of Chicago offered a prize for a work on the theory of wages that we resolved to take this interesting matter up again, this time to think it out as far as possible, in order to come to an exact and definite conclusion concerning the subject.

The first thing we did was an examination of as much of the literature on the subject as could be worked through during the time that was available. We must confess that we did not read everything that has been written on the topic. In our opinion no sensible man would do this, so that we are not ashamed of this confession. But what is worse, we even did not read all the good literature on the subject. This we regret but we find an excuse in two facts. One of them is that some good articles and books were beyond our reach. But besides the amount of work a man can do being, like wages, determined by "natural law", it proved to be absolutely impossible even to work through the good or fairly good literature that could be obtained. There is such a huge mass of literature on the subject that only a Methuselah with the energy of a Hercules and the passion for details of a Schmollerian German could achieve the task of working through it.

Being hampered by the scarcity of time and energy, we had to take recourse to the economic mode of proceeding and have tried to create the best possible product with the given

means. We think we have realized this, to a certain extent, by an expedient limitation of scope.¹

The result of this work is shown in the following observations. First we discovered a fact, which many a student must have discovered, that many of our suggestions were not new and had sometimes been published long ago, and often by authors who were practically forgotten.

The second thing we learnt was that there is still much to be done concerning the organization of economic research. It is remarkable how many authors say the same thing without knowing each other's explanations. This, however, means a deplorable loss of energy. In modern times some attempts have been made to fill this gap and to collect the views of the different authors on the subject. Reference is made to these works in several parts of our analysis.² We are indebted to them, because they smoothed our way to some works and articles that, without them, would perhaps have escaped our attention under the circumstances, of which we have just spoken. Some of the views developed in these books, have much in common with some remarks that can be found in the present work. We have, however, not borrowed any essential element of our analysis from them, as we had found all the constituent elements before we read them. In many aspects our analysis differs from their examinations. Our point of view of criticism was also essentially different from theirs. This is why we have resolved to reproduce and criticize those of the prevalent theories of the principles of wages and of the objections to them that we thought worthy of consideration.

Our choice of the theories to be treated and their division into groups is different from the existing mode of procedure and will be justified by our own point of view that is expounded in one of our last chapters.

¹ See Chapter I.

² They are: Dr. W. Mohrmann: *Dogmengeschichte der Zurechnungslehre*, Jena, 1914.

Dr. C. Landauer: *Grundprobleme der funktionalen Verteilung des wirtschaftlichen Wertes*, Jena, 1923.

Dr. H. Hefendehl: *Das Problem der ökonomischen Zurechnung*, Essen, 1923.

We have tried to give critical comparisons of the principles of wages of the different groups of economists. The most important of these critical comparisons concerns the theories of Prof. Clark and Prof. Cassel. As far as we know, our criticism of the theories of Von Böhm-Bawerk and Von Wieser contains new arguments that in our view are of importance. From our point of view, our theoretical conclusion: that the theory of wages of the future must find its basis in the synthesis of the theories of Prof. Clark and those of the School of Walras and Prof. Cassel, is of course the most important element of our study.

We could obviously not follow out all the sequences of thought that we were concerned with to the very end, but we have only done so, as much as was strictly necessary for our purposes. Only too much remains to be done and only international collaboration can help to carry the development of the important theory which was the subject of our study to that perfection which it must ultimately attain.

If this work should prove to be a small contribution to this development, we should think our "toil and trouble" fully rewarded.

We are indebted to Miss Daisy Jordan for reading and correcting the manuscript, and for general stimulus and suggestion to our teacher, Professor Dr. Frans de Vries, who, in barely ten years, has made the Netherland University of Commerce an important centre for the study of economic theory.

Scheveningen,
August, 1926.

INTRODUCTION

IN 1925 a Committee, composed of Professor J. Laurence Laughlin, Chairman, Professor John Bates Clark, Professor Edwin F. Gay, Hon. Theodore E. Burton, and Professor Wesley C. Mitchell were enabled, through the generosity of Messrs. Hart, Schaffner & Marx of Chicago, to offer in 1926 a cash prize of Five Thousand Dollars for the best original treatise on the subject of The Theory of Wages. On October 1st, 1926, over 130 studies were submitted. In due course of examination one essay was found by unanimous vote to be superior to all the others ; but the prize was withheld until the author had time to complete some parts not fully developed. Meanwhile, the Committee were attracted by three treatises sent in, all of about equal merit, but very different in plan, to whom they asked the donors to award Honorable Mention. One of these was The Principles of Wages, by Dr. Willem L. Valk, of Scheveningen, Holland, now published by him in this volume. It is with great pleasure that the Committee herewith express their high regard of the scholarship and economic ability shown by Dr. Valk in this book.

On behalf of the Committee,

J. LAURENCE LAUGHLIN, *Chairman.*

Washington, D.C.

April 6th, 1928.

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CHAPTER I

SCOPE AND AIMS OF THIS STUDY

ALL human action is limited by Nature and so is, therefore, all action for the promotion of human welfare. It is necessary to know these limits, in order to discern the possibilities of social improvement and it is the principal aim of the present work to search for them with reference to the problem of wages.

He, who executes a task of this kind, is hardly considered as an idealist by those, who ardently desire a sudden and radical reform of the foundations of present society. His work is in many aspects less pleasant than the work done by the reckless utopian, who builds up a world of his own, where men and things collaborate to create ideal conditions for an ideal community, where no struggle exists and where misery seems to be forgotten.

To a certain extent the critic's task is also less grateful. The utopian may scorn him and, what is hardly less disagreeable, the realist may eagerly grasp his arguments and abuse them in his struggle against all idealism. But all the same the work must be done and it becomes all the more necessary, when as is really the case, the great majority of those, who occupy themselves with social and political topics are more or less firm utopians or realists.

It is one of the great achievements of Marx that he opposed scientific research to utopianism. We do not intend to discuss the way in which he did this. Modern analysis may have discovered that there was utopianism in Marxism, but the antithesis itself is justified and should never be forgotten.

Beautiful utopian schemes, projected by talented authors, may have some, or even great artistic value. From the point

of view of the betterment of actual social conditions, however, they will always remain for the greater part "news from nowhere".

And, although it is not an evil that from time to time a work of art is created that diffuses a brilliant illusion over the group of people, who admire it, it may become one, as soon as a belief in this imaginary world takes hold of the great mass of the consciously or unconsciously discontented, who, as a rule, are apt to be more credulous than critical.

It appears thus that a constructive illusion may become destructive, and it follows from this that a destructive criticism may be constructive in its effects.

Besides, he who succeeds in detecting the bounds of the possibilities of social improvement, has also found the limits of the impossibilities of this kind, and, instead of an intoxicating illusion, which must necessarily be followed by a cruel disillusion and which perhaps in the long run destroys more happiness than it creates, he gives the world a detailed map, on which the different paths that can be trodden and the aims to which they lead, can be found.*

The choice of the aims themselves, however, does not belong to the realm of science and it is here that the student of social science finds, in his turn, the limits of his possibilities as a scientist.

This general reasoning, relating to all striving for social improvement, may be applied to the wages question. High wages and low prices for the commodities consumed by the labourers, are desired, not only by the labourers themselves, but also by many friends of the labourers. Some of them are more or less convinced that there are no limits to the possibility of working these two levers, in order to secure better conditions for the labouring class.

Others, less credulous than these, but still apt to give way to dangerous illusions, acknowledge that capitalism sets limits to their endeavours, but argue that this is the fault

* Just as Kant gave philosophy a firm basis by determining the limits of human knowledge, the modern economist can do the same with regard to human action for social improvement. This is why a modern German author entitles a book on this subject which he recently published: *Kritik der sozialen Verunft*.

of the capitalist system and that, as soon as socialism will have triumphed, these limits will melt away like snow on a beautiful spring day.

The wages question in a socialist community is a problem in itself. In the last decades some remarkable studies have been published about it. Although we cannot devote much attention to the question in this study, we cannot omit the exposition of the reasons why we exclude this problem from the scope of our work. These are that those recent studies have led us to the conviction that no considerable improvement of the labourer's conditions can be obtained by a sudden reconstruction of our system of economic organization because

Firstly, also in a socialist community the labourer cannot get the full product of labour and there also a reduction must be made from the total product in order to make continuity and even progress possible.¹

Secondly, the most burning question, relating to the introduction of socialism, the problem of the system of values, with which the socialist community must work, is not solved and it is an open question, whether it *can* be solved and whether any organization of economic life can dispense with the system of prices of consumer's goods as well as of means of production, that is the result of free exchange, based on private property and which is the basis of all calculations in our complex capitalist business-life.²

The present study is therefore limited to the wages question in a capitalist society, and even within these bounds it is confined to *the analysis of the principles underlying the determination of wages.*

The best economists and especially the best modern economists have devoted their attention to this burning and

¹ Compare G. Cassel : *Das Recht auf den vollen Arbeitsertrag.*

² Compare L. Mises : *Die Wirtschaftsrechnung im sozialistischen Gemeinwesen, Archiv für Sozialwissenschaft und Sozialpolitik*, Band 47.

Prof. F. de Vries : *Economische critiek op de socialistische productieorganisatie*, Rotterdam, 1921.

Prof. L. Pohle : *Kapitalismus und Sozialismus.*

interesting problem and it is, therefore, not superfluous to prove the necessity of such study after the far-reaching researches of these authors. As a matter of fact many of the best thinkers of our days believe that the problem is solved and that no more work of fundamental importance can be done in this direction. The foundations are laid, they argue, and nothing remains to be done but the perfection of the building that has been erected on them.

Though we can, to a certain extent, share this opinion and admire the work of this kind that has already been achieved, we do not believe that there is yet sufficient unanimity concerning the general principles. What is necessary is a sound basis for the successful collaboration of many explorers of our realm. Their scientific efficiency would be increased to a considerable extent, if a general agreement concerning the principles could be attained.

The trend of economics towards facts and actual conditions is without doubt one of the most characteristic features in the development of modern economic science. Economics must go this way sooner or later and many Anglo-Saxon scientists of our time have already been pioneers in this field of facts and figures.

There is something disagreeable in working at the foundations, while others are constructing the roofs. But, as Prof. Schumpeter says, in the history of science, as on a hunting-party, one can sometimes proceed by remaining behind.¹ And, in our view, we are justified, when for the moment we remain behind, because we think that analyzing the principles is not yet superfluous.

This does not mean that a revolution in the principles of economic science is, in our opinion, within the limits of possibility. We agree that the foundations have, indeed, been laid.

But the great question that still remains is : Which out of the existing principles can procure us the best basis for a detailed study on the wages question ? And if there should

¹ *Epochen der Dogmen- und Methodengeschichte, Grundriss der Sozialökonomik*, I., p. 56. Prof. Schumpeter, however, applies this thought to a case, in which it has an unfavourable meaning !

be more than one group of valuable principles, a second question arises : What is the relation between these different groups of principles ?

These questions have been treated too little, and, in our opinion insufficiently. Different schools have laid their foundations and there is a reasonable fear that on these different foundations different buildings will be erected, which in the long run cannot all exist, because there is only one right way of seeking truth and therefore sooner or later critical analysis must erode one or more of these foundations, so that the building which is erected on them, crumbles away and the labour performed proves to be "unproductive" labour after all.

We are, therefore, obliged to make a thorough analysis of the existing principles of wages in modern theory, to compare and criticize them, and, ultimately to choose amongst them, to combine them, where it is possible and to complete them, where it is necessary. The result might be a negative one and it is possible that none of the existing solutions could withstand the test of sharp criticism. But, as we shall see, we are by no means forced to draw such a pessimistic conclusion and we shall find admirable researches before us, the failures among them being not less interesting and instructive than the solutions that will prove the most satisfactory.

The problem of the principles, governing wages is no problem in itself. It is a part of the problem of the principles of distribution. In modern times a distinction is made between *functional* and *personal* distribution.¹ Functional distribution relates to the resolution of the total income of society into wages, interest and profits, and is entirely an economic problem. Personal distribution relates to the incomes of private individuals and is not determined merely by economic factors.

We are here only concerned with wages as an item of functional distribution and even as such we cannot treat the problem exhaustively. Further restrictions of the scope of this work must be made. Among these ranks

¹ See Prof. J. B. Clark : *The Distribution of Wealth*, p. 5.

first *the exclusion of all problems relating to the supply of labour.*

We shall eliminate these by supposing *that the quantity of labour is given*, and ask, according to which principles the wages of this given quantity are determined. It is, however, impossible to treat the problem of wages separately. When supply is analyzed, such a separate treatment is perhaps not inexpedient, because it can be said that the conditions of supply of the different means of production are, to a certain extent, independent of one another. But, when the price of a given quantity of an agent of production is asked for, a closer examination of the problem will show that this price is not independent of the quantities and the price formation of the other agents of production. And, wages being one of the prices paid for the agents of production, it is obvious that the theory of wages cannot be separated from the theories of the prices paid for the other agents of production.

Modern theory is unanimous in considering the prices paid for consumer's goods as the source of the remuneration of all those who have furnished the means of production that have collaborated in creating these consumer's goods. The prices paid for the means of production thus have to a certain extent a derived character. Besides, the owners of the means of production have, as a rule¹, to share the prices paid for the consumer's goods, and these two conditions are the cause that the prices paid for the means of production are, when seen from this side, in symmetrical positions. There must be some general relation between the prices of the means of production and those of the consumer's goods which they create and it follows from this that functional distribution is to a certain extent one indivisible problem. The theory of the principles of wages, as we intend to examine it, can, therefore not be treated as a separate problem, but only as a part of the theory of the principles of functional distribution.

¹ According to some authors there are incomes that cannot be regarded as prices of the means of production. These incomes, however, will not exist under the assumptions that we shall have to make, in order to be able to study the problem in its simplest form.

There is no general agreement on the nature of the relations that exist between the two sets of prices : prices of the means of production and prices of consumer's goods. Earlier authors held that the first set of prices determined the latter. It is clear from what we have said above that we reject this opinion. But there are two other logical possibilities. The first is that the prices of consumer's goods determine those of the means of production, which are derived from them by a process of imputation. This mode of proceeding has sometimes been called the "recurring filiation of value"¹.

The third logical possibility is a *mutual relation* between the two sets of prices, so that it cannot be said that one set determines the other, but only that there is an interdependence of all prices.

We shall examine the theories starting from the second, as well as those starting from the third logical possibility. We must, however, confine our analysis to thinkers of the last fifty years, so that important economists as Say, Von Thünen and Cournot will not figure among those whose theories we are about to consider. No attention will be given to the theories of the Historical School and to the Bargain Theory of Wages. Although the latter still has some adherents, we shall see that a close examination of the theories we do consider logically leads to a contest of that theory². Likewise, we exclude the Wages Fund Theory and the Iron Law of Wages, in order to concentrate our attention on modern theories. And even of these we shall only treat those that from our point of view are of fundamental importance.

Those are the theories of most modern Austrian, English and American economists of importance, who have chosen the second of the logical possibilities just mentioned, and the authors of the Mathematical School, who have chosen the third logical possibility.

¹ "rekurrierende Wertfiliation." The expression is used by Broda in his article: "Die Lösungen des Zurechnungsproblems," Zeitschrift für Volkswirtschaft, 1911. Prof. F. A. Fetter speaks in this respect of the "genealogy of value", *Economic Principles*, p. 353.

² Compare p. 134.

We have already said that our analysis would be confined to the examination of the formation of price of a given quantity of labourers, so that the problems of supply would not be considered. As it is not possible to treat the problem separately we shall have to study functional distribution as a whole, before it is possible to pronounce something of importance on wages especially. This implies that we must not only suppose the quantity of labour to be given, but the same must be done with reference to the quantities of the other agents of production. Further, as little attention as is possible will be given to the intermediary stages of production so that often we shall reason, as if there were nothing but a few agents of production that could immediately create consumer's goods, when they were combined. Sometimes, however, this assumption must be dropped, because it would lead to dangerous conclusions.

Further assumptions must be made. These are, as we shall see, static conditions and perfectly free competition.

The reader is supposed to be familiar with the theory of marginal utility and the theory of prices of consumer's goods, based upon it. Some knowledge of the principles of distribution is perhaps required to follow our reasoning, as we are forced to occupy ourselves with the most intricate problems of distribution, but we have tried to expound the different principles as clearly as possible, beginning with the simplest forms, then passing on to more intricate forms in order to simplify them afterwards as much as possible by analyzing them and reducing them to their constituent elements.

We shall now begin by examining some theories which still have much influence in Europe: those of some of the best economists of the Austrian School.

CHAPTER II

AUSTRIAN THEORIES OF IMPUTATION, BASED ON THE LOSS-PRINCIPLE

THE Austrian thinkers, who have dealt with the question which we are considering, treat the problem of the prices paid for the agents of production in the same manner, as the problem of the prices paid for consumer's goods.

Most of them make a sharp distinction between the process of valuation and the process of price formation. They first derive the (subjective) valuations of the agents from the value of the product and then derive their price from these valuations.

The most simple way of stating their principle of value¹ is to say that the (subjective) value of an article, be it an article serving purposes of consumption or one serving purposes of production, can be measured by the loss of utility which results from its withdrawal. This rule: "Withdraw an article and the loss of satisfaction which results from this withdrawal will show its value" is sometimes called the "passe-partout" of Von Böhm-Bawerk, and indeed, a close examination of his "Positive Theorie" teaches us that this rule is the very foundation of this imposing work, on which every part of it rests.²

Applied to the theory of the value of consumer's goods this rule leads to the theory of marginal utility, for, if we withdraw a unit from a certain quantity of goods, the loss of utility that results from it, cannot be more than the utility attached to the last unit, after the consumption of all the others. When, however, the "passe-partout" is applied

¹ As we shall see, Von Wieser has a different view on the problem.

² The expression is used by Von Böhm in his *Positive Theorie, Kapital und Kapitalrins*, II., p. 189.

to the theory of the value of producer's goods, this rule must lead, as we shall show, to the theory of marginal productivity.

A complication arises here through the fact that no direct utility is attached to the means of production, but that their utility is necessarily a derived one. The Austrians have chosen the second of the logical possibilities of which we spoke in the previous chapter, so that in their view the prices of the means of production are determined by those of the consumer's goods that they create. They were not the first to hold this view. Essentially this second possibility has been seen and grasped by older thinkers and the Austrians, as well as their contemporaries, who expounded doctrines of the same kind in other countries, have had their precursors, of which especially Say and Von Thünen should be mentioned. But their theories are surpassed by the splendid researches of modern times and we shall therefore concentrate our attention on modern thinkers.

The derived character of the utility of a factor of production creates some difficulties which give rise to considerable differences of opinion and this is why the application of the "passe-partout" has caused the existence of different theories, which, though they all have much in common, show considerable differences in details. These we shall have to examine in due time.

As has been already said, the application of the "passe-partout" must lead sooner or later to the acceptance of the theory of marginal productivity. The Austrian economists, however, have not drawn this conclusion, and although their reasoning is much akin to that of the adherents of the theory of marginal productivity, the differences between both groups of authors are so important that a separate treatment proves to be absolutely necessary.

We have resolved to deal first with the Austrians, not because they were chronologically the first to treat the problem which we are examining—for this is not the case—but because in their works we find the sequence of thought, which logically leads to the conclusion that we have expressed, in its first stage and partly in its simplest form, notwithstanding the fact that their way of expounding their

truths often gives their systems the appearance of being very intricate. We consider the theory of marginal productivity as a further stage of the same trend of thought, and, far from intending to give a chronological description of the historical development of the theories with which we are concerned, we only intend to follow the logical development of certain important thoughts in economics and therefore begin with the exposition of the most elementary thoughts, in order to show, how the inadequacy of this stage forces us to examine the more complex forms of the same theories. Then we shall have to examine these and must either follow the thread further, or break it off and search in another direction.

The principle of determining the value of an agent of production by withdrawing it, let us call it after the example of Prof. Joseph Schumpeter, the *Loss-Principle*¹, is already to be found in Gossen's "Gesetze des menschlichen Verkehrs"² and in Menger's brilliant "Grundsätze der Volkswirtschaftslehre". Gossen was earlier, but Menger seems to have worked independently of him. In any case Menger goes deeper and therefore we shall devote our attention mainly to the latter.

After having applied the Loss-principle for the determination of the value of consumer's goods³, he desires to apply it to producer's goods which he calls goods "of a higher order". But here a difficulty arises, because producer's goods are as a rule "complementary goods", which means that a desire is hardly ever satisfied by a single one of them, but that they are able to yield utilities only in association with other goods. It therefore seems that one could never be dependent upon a single article of a higher order, but always on several goods of this kind at the same time.

This difficulty, however, he overcomes by the following reasoning. The quantities, in which the different complementary goods of a higher order can be combined,

¹ Prof. J. Schumpeter: *Bemerkungen über das Zurechnungsproblem*, *Zeitschrift für Volkswirtschaft*, XVIII. He, however, speaks of the "Verlustmoment".

² H. H. Gossen: *Entwicklung der Gesetze des menschlichen Verkehrs*, p. 26.

³ *Grundsätze*, p. 77, et seq. (second edition).

are not determined by an iron law, like the combinations of elements in chemistry, but "goods of a lower order" can be produced in exactly determined quantity and quality from goods of a higher order which stand in very different relations¹ of quantity to one another². Some complementary goods are, according to Menger not even absolutely indispensable. As a rule there is considerable scope for variation of productive elements. A reduction in the quantity of the one of the elements employed may be compensated by the use of a greater quantity of another element. The fact which Menger observes here, the *variation* or *substitution* of productive elements, is practically universally accepted³ and we, therefore, need not dwell upon it⁴.

Even in the case of the loss of an element, which cannot be compensated by substitution of other elements, the whole joint result of production need not be considered as destroyed, because as a rule the remaining elements can be mutually combined and thus another commodity may be created which satisfies another human desire, although probably of less importance than the one which was at first to be satisfied.

From this reasoning Menger concludes that only a fraction of the total value produced depends upon the disposal of a quantity of one out of the different complementary producer's goods and that the value of this quantity can be measured by the difference between the value produced when it is disposed of and that which is created, when it is withdrawn, provided that in both cases the available producer's goods are so used that the value of the result of production is at a maximum⁴.

It is shown thus, that a valuation of producer's goods is possible and that the same principle which governs the

¹ *Grundsätze*, p. 135 (second edition, essentially the same on p. 139 of the first edition).

² Compare however Chapter VI.

³ Gossen knew the Loss-principle, but he did not see the possibility of variation and was thus incapable of solving the problem of the valuation of complementary producer's goods. It is, therefore, not right to say, as Maffeo Pantaleoni said that Gossen had explained the theory of complementary goods and that Menger "added nothing to it" (*Pure Economics*, p. 85).

⁴ *Grundsätze*, p. 157 (second edition).

valuation of consumer's goods, the Loss-principle, can lead to an analogous valuation of complementary producer's goods, *when associated with the thought of variation of productive elements.*

This result of Menger's admirable analysis has already been an important contribution to economic science. It has been the germ of several great achievements, performed by some of the best economists of our time, but after all, it is only a germ, and, considered as a basis of a theory of functional distribution, it does not satisfy the students of economic science, who ardently desire exact knowledge on the quantitative relations in the field of distribution and their nature. It provides a principle, as it were a key, but this only opens the door to a still mysterious domain, in which through a great deal of wandering and searching a road might be found, leading the student to the goal that he wishes to attain. But perhaps this very vagueness has stirred Menger's followers to their brilliant activities.

The number of these is not very great and this is no wonder. For the problem is one of extreme difficulty, and, although it is comparatively easy for us, now that the path is traced before us, to follow the further development of the theory of the valuation of complementary producer's goods, we should not forget that those who were the first to penetrate into these unexplored regions, had no paths before them, but had to make them for themselves after surmounting many obstacles, and their failures are just as admirable as their successful attempts, because, under these circumstances many a false path must be trodden before the right one is found and the fact of following a wrong path to the very end amounts to showing that out of all possibilities this one should *not* be chosen. Such an attempt, therefore, facilitates the work of other thinkers by eliminating one of the existing logical possibilities and by warning them to concentrate their activities upon the remaining narrower field. History is often very unjust in its judgment on unsuccessful attempts and nothing but the history of science can teach us, how useful these achievements have been for the progress of culture. However, even the best scientists show an inclination

to pay a far greater respect to the successful ones and the judgment of the great mass has no other criterion than palpable results. It is forgotten as a rule that in science also mankind has to proceed by round-about production, and that those, who reap the fruit, never could have done so, had not others smoothed their paths and explored the regions in which they wander.

Only little by little has this important problem attracted the attention which it deserves, and even now, only three important Austrians can be mentioned in this respect¹. They are Von Böhm-Bawerk, Von Wieser and Schumpeter. Of these Von Böhm and his pupil Schumpeter have followed the line, traced by Menger, for which reason we shall first examine their theories. In a later part of our study we shall have to analyse Von Wieser's views on the problem and make a comparative study of these two lines of thought.

Von Böhm-Bawerk expounded his suggestions concerning the matter in his imposing work "Kapital und Kapitalzins"². He presents the problem in the same way as Menger and his reasoning is also an analysis of the value of complementary goods. Not only of complementary producer's goods however, for Von Böhm mentions several examples of complementary consumer's goods, such as pens and ink, needles and thread, carriages and horses, etc.³ This fact should be borne in mind, because it is the cause of several peculiarities of Von Böhm's theory. It covers different fields of economic theory and does not serve for the examinations of the valuation of producer's goods only. This manner of procedure has the advantage of a breadth of conception; it might be questioned however whether a joint treatment of these two problems of valuation is appropriate. Are not the differences between the two cases so essential, that a separate treatment seems necessary, at least after a certain stage of analysis is reached? We shall have to deal with this question in examining Von Böhm's proposition.

¹ At least when positive work and not mere criticism is spoken of.

² And before this in his *Grundriss der Theorie des wirtschaftlichen Güterwerts*, Jahrbücher für Nationalökonomie und Statistik, 1886, pp. 56-61.

³ *Positive Theorie*, p. 206 et seq.

One disadvantage of this combination is that it proves to be rather difficult for most students to follow the theory and this is one of the reasons why Von Böhm's theory needed much time to become known and why comparatively little opposition arose against it. It has happened for instance, that economists have considered this part of Von Böhm's theory as an analysis of a less important complication in the theory of valuation and the average student does not perceive that in this difficult and not very attractive part of Von Böhm's book lies the principle of a theory of functional distribution. Von Böhm himself is perfectly aware of this fact, as he says that the theory gives "the clue to one of the most important and difficult problems of our science: the problem of distribution", at least such as it is under existing conditions.¹

His starting point is essentially the same as Menger's. Von Böhm too, measures the value of any article, be it one serving purposes of consumption or one serving purposes of production, by the loss of value which results from its withdrawal, and, as we have already seen, this principle has become known as the "passe-partout" of Von Böhm-Bawerk, although it might just as well have been connected with the name of Carl Menger. A remarkable point in his exposition of these thoughts is that he lays great stress on the fact that very many cases may present themselves, to which this principle may be applied and that valuation can only take place with reference to a concrete case. The whole theory of subjective value, thus hereasons, is nothing but a casuistic analysis of the amount of wealth, which under different circumstances depends on an article.²

The thoughts, developed by Von Böhm in the part of his theory dealing with the value of complementary goods, are a realization of this programme for the special case to which reference is made. Let us follow Von Böhm's expositions.

The total value of a complete group of complementary goods is determined by the marginal utility that it can create. Sometimes, however, each of the constituent elements can be

¹ *Positivus Theoria*, pp. 212-213.

² *Positivus Theoria*, p. 17

replaced by other elements through purchase, production or withdrawal from another, isolated use. When the utility sacrificed by this substitution is smaller than the utility produced, the complementary character of the goods has no influence on their value.¹

Von Böhm now turns to the cases in which the marginal utility created in joint use is the real determinant of the value of the different elements. He states three cases :

- 1st. Each member can only be used together with the others and none of them can be replaced, if lost.
- 2nd. Each member is also capable of creating a utility (though smaller) independently of the others, but still none of them can be replaced, if lost.
- 3rd. Some of the members are also capable of creating a utility independently of the others and can be replaced by other pieces of the same kind.

In the *first case* the value of a separate element is either nothing at all, or the value of the joint product. Which of these two prevails, depends on circumstances. The possession of one of two necessary complementary goods does not in this case yield any value whatever to a subject.² The second complementary article is now in the position of a missing link ; it can make the group complete and thus for the same subject the whole value of the joint product is dependent on the disposal of it.³ For example, a pair of gloves ; each of them separately is practically valueless, but as soon as the second one is added to it, the whole complementary value of the pair is realized. Situation, therefore, decides the fact, whether a complementary article is valued as a missing link or as an isolated worthless piece.⁴

In the *second case* the limits, between which value can oscillate are narrower. A minimum value of each piece is now determined by the " marginal utility which it is capable

¹ *Positive Theorie*, p. 207.

² This was known by Gossen, but he did not go farther, *Entwicklung der Gesetze*, p. 26.

³ Von Böhm calls a piece in this position a " Schlussstück ", *Positive Theorie*, p. 208.

⁴ as " Splitter " says Von Böhm, *Positive Theorie*, II., p. 154.

of creating, when isolated". And the maximum value cannot now be as high as the total value in combined use, because, even when it is in the position of a missing link, this total value is not dependent on the disposal of it. For the other pieces now can be used independently and then realize a certain value, though smaller than the one realized, when they are used in combination with the missing link¹. The maximum value of a piece can therefore in this case be no higher than the marginal utility of the whole group in combined use minus the "marginal utility of the remaining members in isolated use".

In the *third case* substitution is possible with reference to some of the members of the group. These members, thus Von Böhm, can, even when in the position of missing links, never get a higher value than their *substitution-value*², which is measured by the loss of utility in the uses, from which the pieces that serve for substitution, are withdrawn. The limits, between which the value of a piece can oscillate now come very close to one another. For the maximum above which it can never rise is the value that gets lost in the case of substitution and which is equal to the value which depends on some other piece of the same kind and independent of the group. The minimum value is, according to Von Böhm, determined by the next use, to which a superfluous isolated piece of the same kind could be applied.

An example, given by Von Böhm, makes this rather intricate reasoning clearer. He supposes that there are three complementary goods of the same kind: A_1 , A_2 , and A_3 . In isolated use these three goods create respectively the utilities 50, 20 and 10. If one of these goods, for instance A_1 , is combined with other complementary goods, the remaining two will be used to create the utilities 50 and 20. When one of these goods has to be withdrawn from its use in order to replace A_1 , the loss, which would result from this withdrawal would be measured by the figure 20. If, on the

¹ In a later exposition on this subject Von Böhm remarks that the remaining pieces may possibly be mutually combined, or added to other groups, *Positive Theorie*, II., p. 154.

² "Substitutionswert", *Positive Theorie*, I., p. 209.

contrary, the purpose of combining A_1 with other complementary goods has for some reason or another to be given up, and the piece A_1 would have to search for an isolated use, no higher utility than can be measured by 10 would be dependent on it. In this case the value of a piece would still oscillate between 10 and 20, but if the number of pieces should become very great, the difference between the substitution-value and the value of a piece, which through destruction of an existing combination would have become superfluous and thus has to be employed in some subsidiary use would be practically infinitely small.

Von Böhm-Bawerk is well aware that an individual is hardly ever in possession of such quantities. But he now passes on to a market, saying that, when in the example which we have reproduced three sellers are offering the goods to three buyers, the price must be fixed between 10 and 20, but that, when there is an extensive market, at which for instance a thousand complementary goods of the same kind are sold and bought it is practically indifferent, whether a single one is used in combination with other complementary goods or not.

It should be noted that Von Böhm here passes from the subjective valuation of the goods to the formation of their price.

From all this he concludes that the complementary goods, which are liable to substitution by goods of the same kind have practically a *fixed value*.²

What now is the value of the other members of the group which are not liable to substitution? To this Von Böhm answers that when the fixed value of the members that can be substituted is ascribed to them, the rest can be imputed to the members that cannot be substituted. When there are more than one of these they are in the position with which the first two cases deal, so that no new problem arises.

We have devoted relatively much space to the exposition of Von Böhm's views and we have several reasons for doing so. Among these ranks first the high authority of this Austrian author. Although his theory of the valuation of

² *Positive Theorie*, I., p. 211.

complementary goods is far from being universally accepted, it has had a far-reaching influence, especially in continental Europe. The theory has been admired and scoffed at, its author has been praised as much as he has been misunderstood and he has found his followers as well as his opponents.

The number of firm adherents of the theory is very small. We only mention Prof. C. A. Verriijn Stuart.¹ Many authors, however, reproduce his theory in a more or less accurate way, when speaking of the value of complementary goods, but develop different views, when turning to value and price of the agents of production. This is, for instance, the case with E. von Philippovich.² Maffeo Pantaleoni³ develops a theory that he has much in common with the one reproduced above.

Even in America several authors seem to be influenced by Von Böhm, i.e., Prof. S. N. Patten⁴ and Prof. F. A. Fetter⁵. As far as we know, however, not a single one of them bases his theory of the distribution of income on Von Böhm's theory.

Although the theory is accepted in wide circles, it is felt by many economists to be unsatisfactory and the opposition to it is growing, especially of late.⁶

This opposition is, in our opinion, justified to a considerable extent, though for the greater part it is either weak in its arguments or based on misunderstanding.

A criticism of both Menger's and Von Böhm's theories, that is to say of their principles: the Loss-principle and the Thought of Variation of productive forces, must be postponed until later, but here already we must give an answer to the question which arose, when we examined the way in which Von Böhm presents his problem: whether, and in how far

¹ Prof. C. A. Verriijn Stuart: *De grondslagen der volkshuishouding*, p. 148 et seq. This book is written in the Dutch language, but has recently been translated into German.

² Compare E. von Philippovich: *Grundriss der politischen Oekonomie*, I., pp. 249-250 and p. 342.

³ Maffeo Pantaleoni: *Pure Economics*, p. 213 et seq.

⁴ Prof. S. N. Patten: *The Theory of Economic Dynamics*, pp. 121-125.

⁵ Prof. F. A. Fetter: *Economic Principles*, I., pp. 34-45 and 140.

⁶ Compare Prof. A. Weber: "Der Anteil Deutschlands an der national-ökonomischen Forschung seit dem Weltkrieg", a contribution to the work: *Die Wirtschaftswissenschaft nach dem Kriege*, Festgabe für Lujo Brentano zum 80 Geburtstag, München, 1925, p. 27.

a joint treatment of the theory of valuation of complementary consumer's goods and producer's goods is appropriate.

Although far from denying that the two problems have many points in common, we believe that the combined treatment has a serious drawback. For there is a considerable difference between the two cases, which lies in the fact that complementary consumer's goods can be used, as a rule, separately, while complementary producer's goods of a certain kind must practically always be combined with other complementary producer's goods in order to create utilities. Sometimes an isolated use can be made of them, but the utility, yielded by them under these circumstances, is so small that it cannot be taken into consideration when a valuation of producer's goods is undertaken. Von Böhm acknowledges this fact in a later study on this subject, the brilliant paper on "Macht oder ökonomisches Gesetz", the last work he wrote.¹

But when this is the case, the second and third cases of Von Böhm's theory of the valuation of complementary goods *are not available for complementary producer's goods*. It follows from this that Von Böhm's theory does not offer an adequate basis for a theory of functional distribution, and that, whatever may be the merits of his reasoning with reference to complementary consumer's goods, it cannot be accepted for the case of complementary producer's goods. In so far as it reckons with values in isolated use. For a theory of the valuation of producer's goods must take it for granted that under the pressure of self-interest, the best uses are made of the goods that can be disposed of. And under existing conditions, we can say that many producer's goods are only efficient when combined with others, and that even in the cases in which they can be used separately, this use does not practically come into consideration, because the value they can add to the welfare of the individuals who perform the valuation, when used in combination with other producer's goods, is much greater than the value it creates, when used separately. This fact is proved by experience and we can take it for granted.

¹ *Zeitschrift für Volkswirtschaft*, 1914.

If we would pursue Von Böhm's line of thought and for the case of producer's goods would substitute for every isolated use another complementary use, the second and third cases of Von Böhm's exposition would change their character entirely. But then they would not solve the problem. In the third case, for instance—and this is by far the most important case—the value of a certain complementary article, serving purposes of production would be determined by the value of another article, used in combination with other complementary goods and which would be withdrawn from this combination in the case of substitution.¹

But as soon as we ask what determines the value of this article, the problem arises anew and it appears that the difficulty is only removed and not surmounted. Thus, the theory is only an accurate analysis of a very complicated fact that sometimes may occur, but which need not be considered in introductory handbooks on economics.

All the same Von Böhm's theory, and in fact Menger's theory also already, gives the principles which are necessary for solving the problems. *The Loss-principle and the Thought of Variation together form an adequate basis for its solution.* However a closer examination of the material will lead us away from the Austrians and bring us into contact with the English and American economists and their *theory of marginal productivity*. This will prove to be a step further, but involves no complication. On the contrary, we shall see that to penetrate deeper into this intricate web will lead to a comparatively simple theory, a phenomenon which seems to be an outcome of a general rule in scientific work.²

There is a strong reason for supposing that Von Böhm was drawn towards the theory of marginal productivity. This can be inferred from his references to it, especially in the later periods of his life. But it may also be observed in the

¹ In fact it would oscillate between two values, as we have seen, but this second value resulting from a complementary use also, this preciseness would not essentially change our reasoning. Compare Von Wieser's objections to Von Böhm's theory, reproduced in Von Böhm's *Positive Theorie*, II., p. 155.

² Compare A. Marshall: "The Old Generation of Economists and the New," *Quarterly Journal of Economics*, 1896-7, p. 118. Confusion must precede wisdom, says a well-known Dutch philosopher.

trend of his own thoughts. When disputing with Von Wieser, who formulates the same objection that we have brought forward, viz., that the separate values of the complementary goods are—in reality—again complementary values, so that Von Böhm bases his reasoning on the very truth, he is seeking and thus reasons in a circle, he answers in a way that points in the direction of the theory of marginal productivity¹. However, he does not attain to it and still works with separate values, thus evading an exhaustive answer to Von Wieser's fundamental objection.

Prof. J. Schumpeter takes essentially the same position as Von Böhm-Bawerk, at least in his earlier work.² He too, deduces the subjective value of complementary agents of production from the value of their products. He lays stress on the fact that the value of these agents is a reflection of the value of many uses in different trades, so that the value with which one has to reckon, when he uses certain quantities of agents in producing one thing, that is to say his cost of production is the value that these agents have in their other uses, from which they must be withdrawn to a certain extent, in order to make the production of the article considered possible. This is the notion of cost, known in America as opportunity-cost or displacement-cost³. He works with value-curves and thus deduces the value-curves of the complementary agents from those of their different products. As the value, sacrificed in producing an article is the greater, the more units of an agent have to be withdrawn from other uses, the supply curve is only the value-curve of the agents with reference to their other uses, but inverted.

He, too, applies the Loss-principle and the thought of

¹ It is sometimes said that there is little difference between Von Böhm's theory and the theory of marginal productivity. This, however, is not our view. Compare Prof. Montemartini's article on the "Theory of Marginal Productivity," *Zeitschrift für Volkswirtschaft*, 1891, pp. 467-8 and Von Böhm-Bawerk, treating Prof. Clark's theory, *Zeitschrift für Volkswirtschaft*, 1907, pp. 9 and 35.

² For Prof. Schumpeter's earlier views on the problem see *Das Wesen und der Hauptinhalt der theoretischen Nationalökonomie*, pp. 213-259, especially p. 256 ff., and *Bemerkungen über das Zurechnungsproblem*, *Zeitschrift für Volkswirtschaft*, XVIII.

³ Compare Prof. H. J. Davenport: *Value and Distribution*, p. 5.

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substitution and does not attain in the work considered a theory of marginal productivity. The theory differs, however, in some points from the theory of Von Böhm. The most important of these peculiarities we shall encounter when discussing the objections to the basis of these theories. This basis is essentially the same as that on which the theory of marginal productivity rests. This theory we shall examine in the next chapter.

A few years after the exposition of the views reproduced above, Prof. Schumpeter joined the adherents of that theory¹.

¹ Compare Prof. J. Schumpeter: *Theorie der wirtschaftlichen Entwicklung*, Chap. I.

CHAPTER III

THE THEORY OF MARGINAL PRODUCTIVITY

THE most prominent among the names connected with this theory is that of Prof. John Bates Clark. His *Distribution of Wealth* has practically influenced all modern authors on the subject, and, to a certain extent his theory of distribution and especially his theory of wages, based on the theory of marginal productivity, may be considered as paramount.

Prof. Clark begins his analysis of distribution with the same weapons that most of the Austrian economists use. Here, too, we find the Loss-principle and the thought of variation, but the analysis itself is carried much further, and, though going deeper, it is simpler and clearer.

The Loss-principle is demonstrated by Prof. Clark in his exposition of the theory of final utility¹, which he considers as a research for the *specific utility* of economic goods, and is applied to producer's goods in what he considers as a research for the *specific productivity* of the agents of production². Take away one out of many consumer's goods that are interchangeable, and you will only lose the least of the satisfactions that are dependent on any of these goods. Applied to producer's goods this principle leads to the theory of marginal productivity.

"When any man leaves his employer, the test that determines how much he has been worth is applied by ascertaining how much the employer loses in consequence of having his labouring force made by one man smaller"³.
"So far as the men are . . . interchangeable, it makes

¹ *The Distribution of Wealth*, pp. 41-42. The main principles of this theory were published in an article, "The Possibility of a Scientific Law of Wages," Publications of the American Economic Association, 1889.

² *Distribution*, p. 47.

³ *Distribution*, p. 102.

no difference to him which of them it is that leaves his service. If the man who departs has been doing some kind of work that is quite necessary in conducting the business, the employer has only to put in his place the man who has been doing the work that is least needed". . . . "The *effective* importance to his employer of any of these interchangeable men is measured by the *absolute* importance of the one that does the least necessary work".¹

In these few words lies the principle of the prevailing theory of distribution. But it is only the principle and the most admirable portions of Prof. Clark's research relate to the precision and the application of this principle. By stating it, the work is by no means performed and an elaborate task still remains to be done. It is easy to prove that when the "effective importance" of any of some interchangeable men is measured by the "absolute importance of the one that does the least necessary work", the rate of pay for all of them must under certain conditions conform to this standard, but it might be asked: Who is the marginal labourer, who is in this strategic position? Is it the empty-handed labourer on no-rent land? Although acknowledging that "putting a man into such a position is one way of . . . disentangling the product of labour from the product of capital"², Prof. Clark does not share this theory of "squatter sovereignty" over the labour market. According to his view no-rent lands furnish only a minute part of the marginal field for labour. "A larger part", he continues, "is afforded by no-rent instruments of the other kinds; and still a larger part is created by putting the entire stock of rent-paying instruments into uses for which no extra rent is charged"³. The margins indicated by no-rent lands and no-rent machinery are extensive margins, but apart from these there is an intensive marginal field.

This is illustrated by the exposition of the *law of diminishing returns*, which plays an important part in Prof. Clark's analysis. "Producer's goods", he says, "grow less and

¹ *Distribution*, p. 103.

² *Distribution*, p. 89.

³ *Distribution*, p. 93.

less productive, when a series of units of them are supplied". Of the interchangeable men in a mill "the first class does something, that is indispensable, the second, something that is highly important but less so than which is done by the first, etc. The last class does a kind of work that contributes least of all to the productiveness of the business".² We may take this for granted, for, as Prof. Clark himself says, it is "amply attested by experience" and is "one of the undisputed truths of economic science".³

Under the assumptions of a *static state* and *unfettered competition*, we may suppose that an equilibrium is reached and that the agents of production have chosen those opportunities, where the addition, that they make to the product of industry, and therefore their remuneration, is greatest. This means, however, that a certain level of marginal productivity is reached in all industries,⁴ and it means at the same time, that the pay must everywhere conform to this standard. Everywhere there is a line "that it does not pay to pass in adding to the number of workers who are utilizing the really productive appliances of industry". It may be traced "throughout the industrial system", and, "if, in each of the general groups into which society is organized for the purpose of production, as many men as one for every hundred can be added to the working force or taken from it, without necessitating any change in the outfit of tools, machines, materials, etc., that they use, this fact is sufficient to furnish a certain theoretical basis for a law of wages. Any one man in a force of a hundred may, then, leave his own employer without injuring or benefiting the employer; and if he offers his service to another, and demands, as pay, what he will produce for him, he will neither benefit nor injure this second master, in case he gets

² *Distribution*, p. 48.

³ *Distribution*, p. 103.

⁴ *Distribution*, p. 165.

⁴ This corresponds to what is called the second law of Gossen in German and Austrian literature. Compare Prof. Clark's *Distribution*, pp. 18-19 and 44-45. We have avoided the problem of the "sub-groups", because its exposition is not absolutely necessary for our purposes. Compare p. 14 of the *Distribution of Wealth*.

employment from him. There is, it thus appears, what we may call a *zone of indifference*¹ in the field of employment that each entrepreneur controls². And, as we have already said, the products on the zones of indifference of different employments tend toward uniformity, so that there appears to be a *general zone of indifference*³.

Though, under these conditions, there is already some possibility of variation without injury or benefit, it is limited by the existence of concrete capital goods. "A given machine often requires one man to run it, and no more. It is not, then, at every point in a great establishment, that the working force can be enlarged or reduced without any change in the character of the outfit of capital goods", says Prof. Clark.⁴ A considerable gain of elasticity in this possibility of variation is however acquired by him by the introduction of his notion of "*true capital*". "The vast stock of working appliances that the United States possesses can enable more men to work than are now working; but sixty-five billion "dollars" not confined to these appliances, but free to invent themselves in any other things, could give openings to a much greater number of additional workmen. There is a radical difference between the margin of employment that is offered by a particular stock of *capital goods* and the one that is offered by a given *capital*"⁵. This notion makes it possible to assume a perfect mobility of labour. "Unless labour is thus mobile", Prof. Clark continues, "it cannot be brought to an equality of earning power in different industries, and a general or social rate of wages cannot be established." "If capital is freely transmutable in form", he concludes, "labour becomes freely transferable and able to count on an indefinitely elastic field of employment. What a marginal unit of it can produce in this elastic field is the amount that can be specifically attributed to any unit"⁶.

The notion of true capital, then, is defined by Prof. Clark as "a sum of productive wealth, invested in material things which are perpetually shifting—which come and go continually

¹ Italics by us.

² *Distribution*, p. 108.

³ *Distribution*, p. 113.

⁴ *Distribution*, pp. 101-102.

⁵ *Distribution*, p. 101.

⁶ *Distribution*, p. 115.

—although the fund abides"¹. The simile of a water power² is so well-known that we need not reproduce it here. In contrast with the *capital-goods* which must perish and are not fully transmutable, *capital* is permanent and perfectly mobile. It is not an abstraction, disconnected from concrete things but it is thought of as actually embodied in concrete things, a material entity"³.

Labour, too, is thought of as a permanent force, "a fund of human energy that never ceases to exist and to act". "Men are perishable as are capital-goods, but labour is as permanent as is capital. The problem of wages has to do with the continuous earning power that the imperishable agent, labour, possesses and will possess"⁴. The forms of labour steadily change, but as a "material entity" labour is permanent. Prof. Clark concludes that there are *two permanent entities*, both of which have "an unlimited power of bodily transmutation: they are changing their embodiment every year and every day"⁵.

When the amount of capital changes, capital changes its forms and labour changes its forms in the same way. "That the relative *amounts* of labour and capital should change, means that the *forms* of both should change: it means that each agent must fit itself to the other's requirements"⁶.

Wages and interest are, according to Prof. Clark, "fixed by the final productivity of labour and of capital, as permanent agents of production"⁷.

Under these circumstances Prof. Clark resumes the application of the law of diminishing returns. He supposes that an imaginary series of workmen are tilling a field and introduces the men into the field one at a time, in order to see what product is virtually created by each of them. He is well aware that in the beginning an increase in the number of

¹ *Distribution*, pp. 119-120.

² *Distribution*, p. 121.

³ *Distribution*, p. 119.

⁴ *Distribution*, p. 157.

⁵ *Distribution*, pp. 158-159. We shall avoid the problem of "synchronization", as we do not think that it is of essential importance for the part of Prof. Clark's theory, that is revelant to our study.

⁶ *Distribution*, pp. 159-160.

⁷ *Distribution*, p. 160.

workmen may cause a more than proportionate increase in the output, but in the end, he says, the law asserts itself and the product becomes smaller as the force becomes larger. At any one time wages tend to equal the produce of the final unit. This principle is static, thus Prof. Clark reasons, although the process of building up the force unit by unit is a dynamic one².

On a single farm the increase of the working force stops where the final productivity equals the general rate of wages, but in society as a whole it is final productivity that determines the rate of wages. It is measured by withdrawing, what Prof. Clark calls a *social unit* of labour " a composite unit, consisting of some labour from every industrial group ", and thus " causing a final unit of labour to vanish from every specific industry " ³. If a hundred men constitute the unit of social labour, while the loss, caused by their departure amounts to two hundred dollars and if they are typical men of equal working powers, two dollars a day make, according to Prof. Clark, one man's natural wages.

A graphic representation of the application of labour in connection with a fixed amount of capital follows³. Prof. Clark then reverses the application of the law by supposing that capital is supplied in a succession of increments, whilst labour is the element that is fixed in amount. Thus he obtains the two graphic representations which are shown on the following page.

Figure 1 represents the application of succeeding increments of labour on a given amount of capital. Figure 2 shows the reverse: the application of succeeding increments of capital on a given amount of labour. The line AB measures in Figure 1 the product of the first unit of labour, in Figure 2 the product of the first unit of capital, whilst the line CD measures in both cases the final productivity of the applied agents⁴.

² *Distribution*, p. 167.

³ *Distribution*, p. 170.

³ We suppose that the reader is more or less familiar with this representation. If not, we must refer him to Prof. Clark's exposition on pp. 182-183 of the *Distribution*.

⁴ *Distribution*, p. 201.

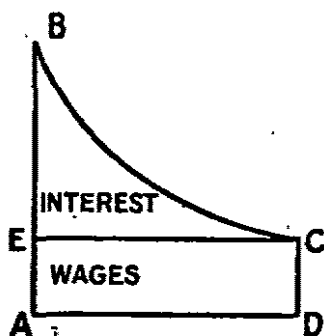


FIG. 1.

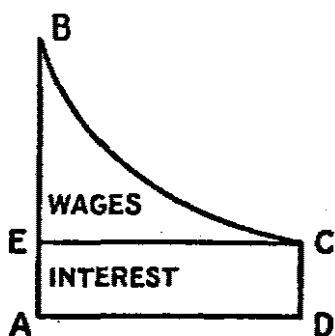


FIG. 2.

It appears that the earlier men and the earlier increments of capital create surplus products, over and above the amounts created by the last man and the last increment of capital¹. The total remuneration of each agent is however measured by the product of final productivity and the number of units available, that is the amount measured in both representations by the area AECD. The sum of the surpluses created by earlier units is measured by the area EBC in both figures. It appears that when labour gets the product of its final productivity and its number of available units (= area AECD in Figure 1), the amount that is left for capital is equal to the sum of the surpluses of the earlier units of labour over and above final productivity and is measured by the area EBC in Figure 1. Likewise in Figure 2 the amount left for labour is a sum of surpluses, measured by the area EBC in that figure.

It is clear that the income of any of the two agents may be seen, either as the product of final productivity and the number of units available, or as the sum of a series of surpluses, a *rent*, as Prof. Clark calls it.

If this is the case, then the surface of the area AECD in Figure 1 must be equal to the surface of the area EBC in Figure 2, and the surface of the area AECD in Figure 2 must equal the surface of the area EBC in Figure 1. For if this were not so, we would get in the two cases two different amounts as a

¹ *Distribution*, p. 193.

remuneration for the same agent and it would appear that the inversion of the law of diminishing returns would destroy the law of final productivity as an adequate basis of the theory of distribution and would not lead to the desired result: the detection of an iron law governing the distribution of wealth.

Prof. Clark takes it for granted that in both cases the same results are attained and that, under static conditions, the area AECD in one of the figures must be equal to the area ECD in the other¹. There is, however, a problem behind this and we shall deal with it in due time.

In many parts of Prof. Clark's work attention is given to the addition of qualities in things as a form of value productivity. An increase in the fund of capital or of labour may also take place in the form of an improvement of quality. But we may pass over the greater part of this portion of Prof. Clark's theory, as, first, we are here only concerned with the principle and have gathered enough material for a critical analysis of this principle, while, in the second place, Prof. Clark acknowledges that an increase in the number of labourers must be seen mainly as an increase in the number of workmen². In relation to capital, however, we cannot avoid its qualitative increase, as the use of the notion of "true capital" renders it necessary. But we have already considered this part of the theory.

The standard of wages, which this theory gives us, is—it must be remembered—a static one³. Prof. Clark declares emphatically that "natural", "normal" or "static" prices are the main object of his studies in the book with which we are concerned. His analysis deals with an imaginary, static, frictionless state⁴, in which profits do not exist⁵ and in which competition is considered as perfectly unobstructed⁶. When competition works imperfectly, prices are only an approximation to natural ones⁷, and under dynamic influences friction causes wages to differ from their static standard. They always however *tend* towards some static standard⁸.

¹ *Distribution*, p. 203.

² *Distribution*, p. 267.

³ *Distribution*, pp. 16 and 19. See also p. vi. of the Preface.

⁴ *Distribution*, p. 72.

⁵ *Distribution*, p. 79.

⁶ *Distribution*, p. 77 and Preface, p. vii.

⁷ *Distribution*, p. 102.

⁸ *Distribution*, p. 406.

Another peculiarity of Prof. Clark's theory and which has caused very many misunderstandings is that he calls the marginal product of a given quantity of interchangeable agents of production the amount of wealth *created* by each unit of this agent¹. In the beginning of his book he propounds a thesis which the book is to prove that "where natural laws have their way, the share of income that attaches to any productive function is gauged by the product of it"². Under these circumstances labour "tends to get, as its share, what it separately produces, and capital does the same".

"Unravel the web of the social product", he says, "tracing each thread to its source, and you will have solved the problem of distribution"³. He speaks, as we have seen, of the *specific productivity* of each of the agents of production as the basis of wages and, again, sometimes calls this the "*virtual product*" of labour⁴.

There is a danger in this phraseology and we shall see in the next chapter the serious consequences of it. Many see in Prof. Clark's system nothing but an elaborate justification of the present social order. Although his system contains the cardinal argument in favour of individualism, in our opinion it can and must for theoretical purposes be examined apart from political discussion. The main argument of Prof. Clark's theory is purely theoretical and this phraseology, although dangerous, need not lead us away from the theoretical path into the realm of political discussion.

Our chapter would not be complete if we did not mention some other names in connection with the theory of marginal productivity. In the first place *Alfred Marshall* should be mentioned. Although other reasonings may also be found in his work, the main principle of his theory of distribution is the principle of marginal productivity. We cannot deal as exhaustively with Marshall's theory, as we have done with that of Prof. Clark, as the object of our study is not the genealogy of the theory of marginal productivity, but rather a critical comparison of its main contents with other current theories.

¹ Preface, p. 1.

² *Distribution*, p. 3.

³ *Distribution*, p. 21.

⁴ *Distribution*, p. 53.

It is sufficient to refer to Marshall's Principle of Substitution¹ and his theory of the "net product" on the "margin of indifference"². According to him, a business man "estimates as best he can how much *net product* (i.e., net addition to the value of his total product) will be caused by a certain extra use of any one agent; *net* that is after deducting for any extra expenses that may be indirectly caused by the change and adding for any incidental savings".

This observation of extra expenses and incidental savings is not found in Prof. Clark's theory. It is, however, not required, in that theory, because the net product is already isolated by the introductory reasoning, which precedes Prof. Clark's exposition of the theory of marginal productivity. It is especially the notion of true capital, with its indefinite capacity for changing its forms, which helps Prof. Clark to surmount the obstacle of these extra expenses and incidental savings.

It is remarkable that Prof. A. C. Pigou, though using the term marginal net product³ after the example of Marshall, follows Prof. Clark to a certain extent in the exposition of its meaning, when he defines it as "the difference between the aggregate flow of physical product", for which a certain "flow of resources, *when appropriately organized*, is responsible" and "the aggregate flow of physical product for which a flow of resources differing from that flow by a small (marginal) increment, *when appropriately organized*, would be responsible"⁴.

It is not feasible to mention all adherents of the theory, for, as we have already said, it has practically won the world. Among earlier writers the great precursor Von Thünen should be mentioned⁵, whilst, among the contemporaries of Prof. Clark Knut Wicksell⁶, Stanley

¹ *Principles*, V., III. 3.

² *Principles*, V., VIII. 2 and 3.

³ Virtually he speaks of a "marginal social net product".

⁴ *The Economics of Welfare*, pp. 117-118.

⁵ Prof. Clark declares that he was not influenced by him, before writing his book (*Distribution*, Preface, p. vii.). Marshall doubts, whether he has been influenced by Von Thünen. Compare *Memorials of Alfred Marshall*, edited by A. C. Pigou, p. 412.

⁶ See *Ueber Wert, Kapital und Rente*, Jena, 1893, Preface, p. xiii.

Jevons¹ and perhaps P. H. Wicksteed² and Stuart Wood³ have a claim on independent research in this direction. Among modern authors most American economists follow the line drawn by Prof. Clark⁴, whilst in continental Europe Prof. Aftalion, Prof. Schumpeter and a growing number of other thinkers defend the theory. Prof. Schumpeter's change of opinion was a remarkable fact that has much influenced the course of thought in this realm. Other important names, not directly connected with the development of the theory, but rather with the criticism of it, will be mentioned in the following chapters.

Notwithstanding the fact that the number of adherents is steadily growing, the theory has still a great many opponents and there are still many obstacles in its way. We shall therefore make an attempt at a critical analysis of the theory, which will be at the same time a critical analysis of the principles of the Austrian theory of the valuation of complementary producer's goods, which, as we have seen, rests partly on the same foundations.

¹ Compare *The Theory of Political Economy*, p. 217 (fourth edition) and his *Brief Account of a General Mathematical Theory of Political Economy* (Appendix to the book just mentioned), which dates from 1862 and in which the elements of a rough theory of final productivity may be recognized, p. 313 of the fourth edition of the *Theory*.

² Wicksteed seems to have given a theory of marginal productivity in his *Essay on the Co-ordination of the Laws of Distribution*, London, 1894. In the Preface to his *Common Sense of Political Economy*, however, he declares that he makes no claim to originality or priority with respect to anything that this book contains.

³ Stuart Wood published his views on the problem of wages in his contribution: *The Theory of Wages*, to the Publications of the American Economic Association of 1889.

⁴ Compare Prof. F. A. Fetter: *Economic Principles*, I., pp. 211 *et seq.* Prof. E. R. A. Seligman: *Principles of Economics*, p. 352. Prof. H. R. Seager: *Introduction to Economics*, p. 260, and Prof. T. N. Carver: *The Distribution of Wealth*, pp. 78-79 and p. 153 *et seq.*

CHAPTER IV

OBJECTIONS OF MINOR IMPORTANCE

It is expedient to divide the objections that have been made or can be made to the theory of the value of complementary producer's goods and the theory of marginal productivity into a group of objections which remain on the surface and those which are fundamental. It might be asked whether it is worth while to expose and to criticize the minor attacks. In our opinion, however, this is the case and we have two reasons for taking the trouble of analysing this not very interesting part of economic theory. First, it is our intention to collect all the material concerning the struggle for the principles of the modern theory of distribution, at least in the realm that our study covers, but in the second place some of these objections are still maintained and an importance is sometimes attached to them which in our view is not justified by the situation.

The most dangerous of these objections are those which are aroused by the fatal phraseology, used by most American economists, who expound the theory of marginal productivity. When they say that a natural law, if working without friction, "would give to every agent of production the amount of wealth which that agent creates"¹, that under these circumstances "labour tends to get what it separately produces"², that a certain part of the product is "traceable to each factor"; and to any of the workmen of a given group³, then, it becomes conceivable that a suspicion has arisen that the whole theory is nothing but a justification of the present order and this also renders the fact comprehensible, that this

¹ Prof. Clark : *Distribution*, Preface, p. v.

² Prof. Clark : *Distribution*, p. 21. Compare also *Essentials of Economic Theory*, pp. 143-144.

³ Prof. E. R. A. Seligman : *Principles*, pp. 352 and 417.

reasoning has met with a storm of opposition. The opponents may be classed under two heads: those who deny the possibility of any imputation of a part of the product to a certain quantity of an agent of production and those who only deny that the imputed value may be called the product of the given quantity of the agent considered. The objections of the first group are of a more important kind and will be treated in due time. The second group of objections is theoretically less important, because in our opinion the matter is one of phraseology and in itself not worthy of any far-reaching scientific discussion. It has, however, become a matter of some importance because of its consequences and this is why some of the ablest economists of our days have given some attention to it.

Among the opponents are some of the firmest adherents of the theory of marginal productivity, which shows, how little fundamental this question is. Thus Prof. F. A. Fetter, who remarks in his *Economic Principles*: "The phrase 'labour produces' is always misleading, for it suggests that the whole product is the result from the combined action of the uses of materials and the services of labour. The total value is reflected back and imputed to the various agents in due proportion. The phrase used should always be "labour helps to produce"'. "There is no such thing as a separate determinable physical productivity that is due to labour. Only more or less of the value of the product may, under the conditions of the market, be imputed to the various factors of production"².

He declares emphatically that his analysis of distribution "involves no ethical judgment of a competitive wage-scale one way or another"³.

It is especially against the justification of the present order, which is believed to exist behind the phraseology, that most of these protests are directed.

¹ Prof. F. A. Fetter: *Economic Principles*, I., p. 210.

² Prof. F. A. Fetter: *Economic Principles*, I., p. 218. On these grounds the theory is combated by Prof. F. W. Taussig, *Principles of Economics*, II., Chap. 51, § 4.

³ *Economic Principles*, I., p. 214, Note 1.

"What under the ordinances of competition one gets", writes Prof. H. J. Davenport¹, "gives no safe report of what under the ordinances of God he deserves", and the same appearance of an ethical justification in the theory causes Th. Veblen to exclaim: "In effect, this law of 'natural' distribution says that whatever men acquire without force or fraud under the competitive conditions is their equitable due, no more and no less, assuming that the competitive system, with its underlying institution of ownership, is equitable and 'natural' "².

In criticizing these remarks we must remember Prof. Clark's distinction between "functional" and "personal" distribution. A certain method of compensating the agents of production might be right, whilst the distribution of the agents themselves among the people, which is not determined by any economic law might be wrong. Therefore, to say that each agent gets, under certain circumstances, what it produces does not involve a judgment of the distribution of property and that of the economically valuable human qualities among the people³. But, all the same, it seems better to avoid the dangerous phraseology⁴, and to say instead of "labour gets what it produces", "any one out of a group of interchangeable labourers gets the value that depends on the disposal of any unit out of this given group". This is one of the very few things in which we prefer the manner of procedure of Menger and Von Böhm to the one prevailing among American economists. But, as we have already said, we cannot see a question of cardinal importance in this matter and therefore we shall leave it and turn our attention to other points.

Another objection is that wages and interest are *only under ideal conditions* equal to the marginal productivity of labour and capital. We do not think that this is really an

¹ Prof. H. J. Davenport: "Wage Theory and Theories", *Quarterly Journal of Economics* 1918-1919 p. 283.

² Th. Veblen: *The Place of Science in Modern Civilisation*, pp. 206-207

³ Prof. Clark himself declares that "whether labour gets what it produces or not" is "a question of fact" and not of ethics, *Distribution*, p. 8.

⁴ Compare Prof. Aftalion: *Les trois notions de la productivité*, pp. 10-11 and Prof. R. T. Bye's contribution to *The Trend of Economics*, p. 281.

objection to the theory. For those, who teach it, are well aware that the thesis can only be upheld, when certain rigid assumptions are made. "What would be the rate of wages, if labour and capital were to remain fixed in quantity, if improvements in the mode of production were to stop, if the consolidating of capital were to cease and if the wants of consumers were never to alter?" asks Prof. Clark¹, and he continues: "The question assumes, of course, that industry shall go on, and that, notwithstanding a paralysis of the forces of progress, wealth shall continue to be created under the influence of a perfectly unobstructed competition". It is clear that the assumptions of static conditions and ideally perfect competition are absolutely essential to the theory, as put forward by Prof. Clark and his school. Therefore when it is said that imputed value and distributive share are only equal to one another, when there is "a strong and at the same time atomic competition"², or that the law of marginal utility determines wages, but not in "such a precise way as the Americans apply it"³, then there is no real anti-thesis. For the "Americans" are well aware of all this. What the labourers get, if competition works imperfectly, is, according to Prof. Clark, "merely an approximation to their products"⁴. And when dynamic phenomena appear, wages may differ from their static standard, but still, as we have seen, move towards another static standard.

The only objection that could be maintained in this respect, would be that when the assumptions of ideally perfect competition and static conditions are dropped, only a small part of the difficulties will seem to be solved. This may lie behind the expression of Alfred Marshall, that the theory of marginal productivity "covers only a very small part of the difficulties of the wages problem"⁵. Prof. H. Clay thinks that the theory relies "too much" on the effectiveness of competition,⁶ and J. A. Hobson says that "what are

¹ Prof. Clark: *Distribution*, Preface, pp. vi.-vii.

² Von Böhm-Bawerk: *Positive Theorie*, II., p. 147, Note 2.

³ Von Philippovich: *Grundriss der politischen Oekonomie*, p. 386.

⁴ *Distribution*, p. 102.

⁵ *Memorials of Alfred Marshall*, edited by A. C. Pigou, p. 413.

⁶ Prof. H. Clay: *Economics for the General Reader*, p. 317.

by marginalists regarded as obstructions are real and important parts of the industrial system"¹.

There is an element of truth in these criticisms, but they do not destroy the theory. They only warn us that a theory of wages under the assumptions of perfectly free competition and static conditions still requires completion by dynamic studies. But no one is more aware of this than Prof. Clark himself.

A curious error, caused by a confusion of static and dynamic phenomena, is made by Dr. Warthold Mohrmann. He distinguishes between the "last unit" and the "least productive unit" out of a given group. According to his view the values created by these two units are only equal to one another in cases, in which there are diminishing returns. But in those industries, where the possibility of production on a larger scale exists, the law of increasing returns is found to cause the last unit to be the most productive instead of the least productive².

The error is obvious: under static conditions there is a universal law of diminishing returns, also in the manufacturing industries³. As to the law of increasing returns, it appears only under dynamic conditions. Therefore, this can never be an argument against the theory of Prof. Clark which deals with static conditions. But even under dynamic conditions Dr. Mohrmann's conclusion is wrong. For that some industries yield an increasing return when the size of the business unit increases, does not mean, that every unit of an agent of production added to a business or a whole industry, creates a larger product than the foregoing unit. This is an interesting question, but it lies beyond the scope of our analysis and for the moment we must lay it aside.

It has sometimes been said that the result of production is not yet known at the moment at which the wages are paid.⁴ This objection is of very little importance. For in the static

¹ J. A. Hobson: *The Industrial System*, p. 114.

² Dr. Warthold Mohrmann: *Dogmengeschichte der Zurechnungslehre*, p. 100.

³ Compare our exposition of Prof. Clark's theory in the foregoing chapter.

⁴ i.e., by Dr. Salomea Perlmutter: *Karl Menger und die österreichische Schule der Nationalökonomie*, III., pp. 52 and 54.

state it is known from experience and even in the dynamic state it can in most cases be foreseen with sufficient accuracy. Faulty anticipations of a future value cannot be absolutely avoided, and certain deviations will result from this. An examination of them lies, of course, beyond the scope of our study, as we have restricted it to static conditions.

Of hardly greater importance is an objection brought forward by Prof. O. Neurath¹. According to him increases in human satisfactions *cannot be measured*. It is clear that, if this were true, the whole marginal theory (and not the theory of marginal productivity) would lose its basis. As Von Böhm-Bawerk remarks², our economic activities would be absolutely impossible, if we could not compare our wants and our satisfactions. It is true that one cannot directly measure another man's satisfactions, but we do not require such a measurement. The social system of prices can be derived from a certain number of subjective decisions, based on the comparison of different subjective expectations of satisfactions.

Somewhat more important is an objection, expressed by Von Böhm-Bawerk.³ He calls Prof. Clark's exposition of the theory of distribution "*einstufig*", whilst, according to him, it should be "*zweistufig*". What he means by this is that from the value of the created products first a value must be imputed to the different units of the agents of production. Then a second part of the research must analyse, how on the basis of these valuations for the different units of each agent of production, a price is established for this agent.

We do not believe this objection to be justified. Prof. Clark admits that the different units of a given quantity of an agent of production, applied to a given quantity of another agent of production, yield a diminishing value. If the units are interchangeable none of them will be valued higher than the marginal unit. Therefore, what all of them can get is the value created by the last unit.

This is clear and simple, and it is sufficient. It is really

¹ Prof. O. Neurath expressed this objection in his article, "National-ökonomie und Wertlehre", *Zeitschrift für Volkswirtschaft*, 1911, p. 97.

² *Positive Theorie*, I., p. 248.

³ *Positive Theorie*, II., p. 147.

the deduction of a price out of a certain group of valuations and as such an exposition in two portions. It may be, however, that here also Prof. Clark's phraseology ("labour gets what it creates") has misled Von Böhm-Bawerk. But in that case he should have looked behind the phraseology.

It is often remarked, especially against the Austrian theory of complementary goods, that the *supply* of the agents of production is regarded as fixed. This is done by Dr. Joh. Von Komorzynski¹ and later by Prof. Robert Liefmann², and is admitted to a certain extent by an Austrian economist, Prof. A. Amonn³. It is true that the Austrians do not emphasize the problem of an increase in the supply of an agent of production, but it cannot be said, that they have overlooked it. With regard to labour, however, Von Böhm-Bawerk⁴ takes a certain supply as given and cuts off a further analysis of supply, saying that it is determined by factors which the economist must consider as given. It is obvious that the problem of the so-called "disutility" of labour and its influence on supply and therefore on wages, is behind this. In any case, however, in a first approximation of the problem we may exclude the supply side from the realm of our analysis, and we shall do so, although we do not mean to declare by this that we share the views of Von Böhm-Bawerk on this topic.

The most important of the minor objections to the theory of imputation in general is that of the *impossibility of economic causation*. It is as old as the theory of imputation itself and has been a serious objection until modern times. The progress of modern science, however, has considerably weakened it and this is why we think it right to treat it among the minor and not among the cardinal objections.

Von Wieser has distinguished between *physical causation and economic imputation*⁵. The question of physical

¹ Dr. Joh. von Komorzynski: *Der Werth in der isolierten Wirtschaft*, p. 90-91.

² Prof. Robert Liefmann: *Grundsätze der Volkswirtschaftslehre*, I., 82.

³ Compare *Die Wirtschaftswissenschaft nach dem Kriege*, II., p. 283.

⁴ *Positivs Theorie*, I., p. 226.

⁵ Fr. Von Wieser: *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 208, and *Der natürliche Wert*, pp. 78-79.

causation is, according to him, insoluble. The product is the result of the action of all agents together and therefore if it is asked, how much of it is caused by each of the agents, no answer can be given to this question. This argument is also used against the productivity theory¹. There is no separate (physical) product, traceable to each factor, it is said, but there is only a joint product of all the factors together. This joint product has a certain value and this value is reflected on to the factors of production and a part of it may be traced to each of them².

Before criticizing the authors who consider causation as impossible, we must ask ourselves whether it is expedient to follow the Austrians in their distinction of physical causation and economic imputation. Is it really true that the first problem is insoluble and that the second one may be considered as a different matter, wholly independent of the first?

In our opinion the two notions do not exist independently of one another. If we apply the Loss-principle to one unit out of a group of agents of production of different kinds, which are collaborating with one another, the first to be lost is the physical product or a part of it. And because a certain quantity of physical product gets lost, we lose its value. If it were, therefore, wholly impossible to determine, what would be the loss of physical product if a certain quantity of a certain agent of production were withdrawn, then it certainly might be said that the problem of physical imputation (it is better to avoid the word causation) were insoluble. *But then it should at the same time be admitted that economical imputation would be just as impossible.*

If imputation is taken as the detection of what is dependent on the disposal of a certain quantity of an agent of production, that is, when the Loss-principle, the "passe-partout" of Von Böhm-Bawerk is applied, then it must be considered as physically and economically possible and physical imputation must be considered as a condition for the existence of economic imputation.

¹ That is the earlier theories, which speak of a separate product of each factor, the theories of Say and some of his contemporaries.

² Compare Von Böhm's criticism of the productivity theory in Chap. VI of his *Geschichte und Kritik der Kapitalinsintheorien*.

We, therefore, do not think it expedient to divide our criticism of the authors, who think imputation impossible, into a criticism of those who aim at physical imputation and those who question economical imputation.

We are not alone in this view. Prof. Aftalion says, speaking of the enterpriser: "Quand il embauche un nouveau travailleur, l'entrepreneur qui suppose la valeur que cet ouvrier ajoutera à la valeur totale de la production, doit commencer par supputer le nombre des produits supplémentaires que son emploi permettra d'obtenir. Il fait deux calculs, l'un sur le rendement *en nature* de l'ouvrier, l'autre sur son rendement *en valeur*. Et le premier calcul sert de support au second"¹. And on another page of his short but important study, he says: "la productivité en valeur d'une unité donnée n'est que la valeur du produit physique qui lui est imputable"².

Dr. W. Mohrmann³ and Dr. H. Hefendehl⁴ share this view, which however, is questioned by Dr. C. Landauer⁵.

Some expressions of Prof. Clark point in the direction of an admission. That he sees physical imputation as a condition for economical imputation is obvious from the following quotations from the *Distribution*: "The power of each agent to produce a commodity is one factor and the value of the commodity is another factor; while the working of the two together determines how much of each agent there shall be in each sub-group"⁶.

Those who say that economical imputation is impossible support their thesis by holding that physical imputation is impossible. Their number is great and we are unable to mention them all.

The reader is therefore referred to Dr. Mohrmann's "Dogmengeschichte der Zurechnungslehre", according to

¹ Prof. A. Aftalion: *Les trois notions de la productivité*, p. 7 et seq.

² Prof. A. Aftalion: *Les trois notions de la productivité*, p. 26.

³ Dr. W. Mohrmann: *Dogmengeschichte der Zurechnungslehre*, p. 92.

⁴ Dr. H. Hefendehl: *Das Problem der ökonomischen Zurechnung*, p. 72

⁵ Dr. C. Landauer: *Grundprobleme der funktionellen Verteilung des wirtschaftlichen Wertes*, pp. 80 and 186.

⁶ *Distribution*, pp. 301-302. See also Prof. A. C. Pigou: *The Economics of Welfare*, p. 117 et seq.

Prof. Liefmann "eine Blütenlese wissenschaftlicher Irrtümer"², where he can find the arguments of Roscher, Schäffle, Roesler, Mithoff, Cohn, Bernhardt, Knies, Mill and many others. Most of them are not worthy of much attention. They are for the greater part protests against the earlier, weaker less definite theories of imputation, such as the theories of Say, Jacob, Lotz, etc. It appears that in those days there was a vague consciousness of the Loss-principle, but at the same time an unconsciousness of the thought of variation, which, as we have seen, is essential for the modern theory of imputation. Other writers did not even go so far and spoke of a remuneration of the productive agents after "the importance of their collaboration", without exactly knowing what determined this importance.

And, when the Loss-principle was used, the earlier writers constructed a case in which it leads to rather startling results, the case in which there are two or more agents of production, that cannot be replaced, if lost, the first case of Von Böhm-Bawerk, and in which the withdrawal of one of them means the destruction of the whole product. Roscher's calf, of which no part can be imputed to the bull or to the cow, because the existence of the calf is dependent on the existence of both his parents, is a classic example. Stuart Mill likewise declares the problem to be insoluble, saying: "When two conditions are equally necessary for producing the effect at all, it is unmeaning to say that so much of it is produced by one and so much by the other, it is like attempting to decide which half of a pair of scissors has most to do in the act of cutting; or which of the factors, five and six, contributes most to the production of thirty"³.

As we have already said, it is better to avoid the term causation, and to speak of the product which is dependent on the disposal of a certain quantity of an agent of production. And if we put the question thus, it can be answered. But in the cases of which these earlier writers speak, an application

² Prof. Robert Liefmann: *Grundsätze der Volkswirtschaftslehre*, I., p. 520.

³ J. Stuart Mill: *Principles of Political Economy*, Book I., Chap. I., § 3. Likewise, in modern times Dr. Robert Zuckerkandl: *Zur Theorie des Preises*, p. 345 and Prof. Julius Wolf: *Nationalökonomie als exakte Wissenschaft*, p. 16.

of the Loss-principle means the destruction of the whole joint result of the combined action of the factors. As we have seen, when speaking of Von Böhm's theory, this does not lead to an absurdity. If of two complementary goods, which cannot be replaced if lost, and are not capable of being used separately, one gets lost, the remaining one has no value at all, whilst the other piece, if it were brought back, would complete the group and receive the value of the group, as this is in that case dependent on it. They cannot both receive this value. Always, when the pieces are separately valued, one of them has no value and the other has the value of the whole group, according to circumstances. It is remarkable that even Prof. Clark thinks the problem in this case insoluble¹.

The case is of very little importance, because in real business life there is practically always a possibility of variation and substitution. But the arguments of the earlier writers forced us to seize upon this case and to furnish the proof of the inexpediency of their reasoning with reference to the case.

In modern times it is much more dangerous to say that the problem of imputation is insoluble, because much positive work has been done in this direction, which will have to be refuted, before the assertion of this impossibility has a chance of being accepted. This is why modern contests of the theory of imputation must go deeper, and must criticize the principles of the theories, which we have expounded in the two preceding chapters.

We shall have to consider these discussions in the next chapter². They do not belong to the objections of minor importance. All the same, in modern times also the assertion that economical imputation is impossible is sometimes expressed apart from any deeper criticism, but it follows from the foregoing reasoning that in this case it does not deserve much attention.

¹ *Distribution*, p. 83.

² Some of the authors mentioned among those who hold that imputation is impossible have also given arguments of importance against existing theories of imputation. This is why we shall find some of the names mentioned here, in the next chapters also.

CHAPTER V

OBJECTIONS TO THE LOSS-PRINCIPLE

THE objections that we are concerned with in this chapter and the following, deal with the principles of the theories of imputation that we have treated up till now: the Loss-principle, the thought of variation and the thought of marginal loss or marginal productivity, which is the result of the application of the first two principles. We shall therefore divide these objections into three parts: those, concerning the adequateness of the Loss-principle, those, directed against the application of the thought of variation and those, directed especially against the theory of marginal productivity. In this chapter we shall criticize the Loss-principle. This will lead us to an examination of the possibility of variation, which will occupy us in the following chapter. The resulting criticism of the theory of marginal productivity as a whole will follow at the end.

It is clear that the objections of the first two kinds concern the Austrian School as well as the School of Prof. Clark, whilst the criticism of the last kind concerns the American School only.

There are two important objections to the Loss-principle. One of them is that, *when a certain piece is withdrawn from a combination, what gets lost is not only the value of the withdrawn piece, because by the withdrawal the action of the remaining agents is also reduced.*

The other objection, akin to the foregoing one is that when the Loss-principle is applied to all the agents, we should get values for them which would, when added, form an amount that would not be equal to the amount, created by their combined action.

The first of these objections is expressed by very many authors, among whom some earlier writers may be found.

This does not surprise us, as this argument can also be used against the theory of physical productivity, which in earlier days was prevalent. So says J. F. C. Eiselen that it is impossible to say, how much of the value of the product can be ascribed to one force or another and one of the reasons he gives for this is that "every force is increased, when another force joins it"¹.

But in modern times, since the theories of Menger and Von Böhm, this argument has had to be put in a more precise form and has often taken the appearance of a very cogent argument. It has been used by nobody less than Von Wieser against the theory of Menger and Von Böhm. A fair impression of this controversy can be obtained by reading Von Böhm's "Exkurs" on the theory of imputation².

Von Wieser says that the value of a complementary article must not be tested by withdrawing it, because, according to him, it is not the part of the produce that gets lost, when a thing is withdrawn that determines its value, but the part of the produce that is obtained by possessing it³. He distinguishes between the part that is dependent on the collaboration of a productive element, that is to say the Loss-value, and its productive contribution ("der produktive Beitrag"), which is smaller, according to him, because every productive element causes not only its own value but also a part of the value of the others⁴.

This argument is also upheld by Prof. J. H. Davenport, who says that what accrues with the presence of a factor "is partly the expression of the greater significance of the other factors functioning together with it". "What is lost by its subtraction", he continues, "is the breaking up of the group, and is thus a subtraction from the significance of each of the different members of the group, to the extent that the significance of each individual member is reflected to it

¹ "indem jede Kraft durch das Hinzutreten der andern erhöht wird", J. F. C. Eiselen: *Die Lehre der Volkswirtschaft*, p. 212 (quoted from Mohrmann's *Dogmengeschichte der Zurechnungslehre*, p. 26).

² *Positive Theorie*, II., Exkurs VII.

³ *Der natürliche Wert*, p. 32 et seq., or Von Böhm's Exkurs, *Positive Theorie*, II., p. 140 et seq.

⁴ *Der natürliche Wert*, p. 90, or Von Böhm, *Positive Theorie*, II., pp. 143-

by the group relation. Some part if the significance of the subtracted member is itself dependent upon the group relation. The loss attending the breaking up of the group attaches to the subtracted member equally with the other members. All were in the group—were brought in and should remain in—because on the interests of the maximum result it is not well that they be separated¹.

Likewise, Dr. Mohrmann, who argues that when the quantity of one factor increases the efficiency of the other factors is also increased.² He says that, except for very small increments, every increase in the quantity of one factor, makes a simultaneous change in quantity of the other factors necessary³. Prof. Von Zwiedeneck-Südenhorst too holds that the efficiency of a productive element is influenced by a change in quantity of other complementary elements⁴. "Unbedingte Voraussetzung einer solchen Zurechnung", says Dr. Hefendehl, "ist . . . die Annahme, dass bei Vermehrung eines Produktionsfaktors die Wirkungsgröße der übrigen Faktoren konstant bleibt, oder genauer gesagt, das der Ertragszuwachs stets in geradem Verhältnis steht zu der prozentualen Vermehrung des variierten Produktionsfaktors"⁵. And this is, in his opinion, not in agreement with the elementary law of technique. "Bei jedem Produktionsprozess", says Prof. F. von Kleinwächter, "ist . . . die Verschmelzung der von den einzelnen Produktivgütern ausgehenden Kräfte eine so innige, dass man zu der Annahme gezwungen ist, dass jede Änderung in der einen Kraft notwendig auf die übrigen Produktivkräfte zurückwirken müsse"⁶.

The objection seems to be shared by J. A. Hobson. "It is quite clear", he remarks, "that what is added to the

¹ Prof. H. J. Davenport: "Wage Theory and Theories," *Quarterly Journal of Economics*, 1918-19, pp. 284-285.

² *Dogmengeschichte der Zurechnungslehre*, p. 98.

³ p. 105 of the *Dogmengeschichte*. This is akin to David Ricardo's parallelism and is intimately connected with the problem of variation, which we shall treat in the following chapter. See also Dr. Robert Zuckerkandl: *Zur Theorie des Preises*, p. 350.

⁴ Article "Lohntheorie," "Handwörterbuch der Staatswissenschaften".

⁵ Dr. H. Hefendehl: *Das Problem der ökonomischen Zurechnung*, p. 73.

⁶ Prof. F. von Kleinwächter: *Lehrbuch der Nationalökonomie*, p. 458.

product by the entrance of the tenth unit of labour, and what is lost by its exit, is not the measure of the 'bare productivity' of that unit, but of the difference in the aggregate productivity of the whole complex of units of capital and labour. In other words the separatist treatment of productivity breaks down". "The fishermen say 'a fiveman group is better than a four or sixman group'", he continues, "not because of the productivity of any single man, 'marginal' or other, but because they know that this co-operation is the most productive". It follows from this last quotation that Hobson rejects the Loss-principle, not only in the case that different agents of production are co-ordinated, but also when there is only a collaboration of different units of labour.

When this objection is used against the theory of marginal productivity, it cannot be said, as has often been said by authors, who are apt to think of several factors which cannot be replaced, if lost, and are impotent to produce any value separately, that the withdrawal of one element reduces the productive power of the other elements to nil. But it still can be maintained that the withdrawal of the last increment of a factor may reduce to a certain extent the productive power of the different units of the other factors, or even make the production of a whole marginal unit of the produce impossible.

This is for instance done by Prof. Robert Liefmann, who remarks: "Wenn . . . der Besitzer der Grenzproduktivkraft diese aus der Produktion ausschaltet, wird die physische Produktion des Grenzprodukts und damit auch die Wertproduktion unmöglich"³.

Likewise, Prof. Cassel, who argues, like Dr. Mohrmann, that marginal productivity is equal to nil, when the increase of the quantity of an agent of production is not accompanied by a corresponding increase of the quantities of the other factors. "Gilt es einen Graben zu graben, wird man durch Einstellung eines neuen Mannes keine merkliche Vermehrung

¹ J. A. Hobson: *The Industrial System*, p. 108.

² J. A. Hobson: *The Industrial System*, p. 108-109.

³ Prof. R. Liefmann: *Grundsätze der Volkswirtschaftslehre*, I., p. 525.

der Tagesproduktion erzielen, wenn man dem neuen Manne nicht zugleich einen Spaten gibt"².

We have remarked that Prof. Clark has seen this difficulty⁴, but that he thinks it can be eliminated by the introduction of his "true capital". This "true capital", as we remember can change its forms. If we have a hundred men and a hundred spades, and we suddenly have to use one man more, then instead of in those hundred spades of a given size, we can embody our capital in a hundred and one spades of a smaller size.

This unlimited power of capital to change its forms is essential to the theory. Prof. Clark himself describes what would happen if a number of workmen were withdrawn and capital goods would remain unchanged. There would be some tools left that could not be employed, and the loss, caused by the departure of the men would not only amount to the value of the product of the labourers, which are gone, but there would be a further loss of "so much of the products as was attributable to the tools that the men were using"³. But the introduction of a perfectly mobile capital changes everything.

Therefore, Prof. Cassel's criticism does not destroy Prof. Clark's theory. It might be asked, however, whether this use of the notion of true capital is justified, but this is a question that we shall answer in the following chapter.

We have now given examples enough and must ask, how much importance must be attached to the objection. In our opinion, it has *in itself* comparatively little importance. For, if we say: to withdraw a productive element and to detect, what loss results from this withdrawal is not equal to determining the value of this element, because the withdrawal also reduces the productive power of the remaining elements, *then this may mean two different things. In the first place it may mean that the amount that gets lost in consequence of the withdrawal may not be called its value or its product. In the second place, it may mean that by this method of imputation, too*

² Prof. C. Cassel: *Theoretische Sozialökonomie*, p. 160.

³ See p. 27.

⁴ *Distribution*, p. 170.

much is ascribed to the unit, which is taken away, and that this imputed value contains a part of what should be imputed to other factors. And we shall see that the first interpretation is of little value, whilst the second leads to the other argument that we shall treat in this chapter. We shall find then, that the essential value of this objection is that it is a first attempt of approximation to that second objection, the most fundamental objection that can be expressed against the theory of marginal productivity.

The first interpretation of this objection, however, can easily be combated. We have protested already against the use of expressions like "the product of a productive agent" and "causation". And we have also said that if we were only aware that nothing was meant but a firm application of the Loss-principle, the arguments, especially directed against these expressions would have lost their power. Because, when this is the case, we consider as the value, as the product of a certain quantity of an agent of production that part of the joint product of all the agents together that gets lost when this quantity is withdrawn. And there is no fault to be found in this mode of proceeding. This is especially the case with Von Böhm-Bawerk and Prof. Clark, who always use the Loss-principle when searching for the value of any article. Only when value is to mean something else than what gets lost, when a thing is withdrawn from or added to a certain stock of goods, the objection gains in importance. Von Wieser has a notion of value, different from the one used by Von Böhm-Bawerk and Menger. Therefore it might be that on the basis of his notion of value he would be able to furnish arguments against the Loss-principle. His arguments, however, are very weak, as far as they concern the question that is now occupying us.

We therefore think that Von Böhm is right, when he argues that Von Wieser's distinction between the Loss-value of a thing and its value, when "quietly possessed" cannot be maintained. To this dialectic antithesis no real antithesis corresponds, he exclaims. What gets lost, he continues, when we have to part with an article, is always and necessarily equal to what we obtain by possessing it. There is no other

principle, by which the value of a productive agent can be detected².

When the Loss-principle is applied to certain quantities of agents of production, a discussion may arise, whether the amount that gets lost may be called the product of the withdrawn quantity, but, as we have shown in another part of this work, this is a matter of phraseology, not worthy of much waste of energy. It may, therefore, in any case, not be considered fallacious to work with the Loss-principle. But one might ask: Is it expedient to do so?

We need not hesitate to give an affirmative answer to this. *For, what we want to know is how much enterprisers are willing to give for certain quantities of a productive agent, and this is, no doubt, dependent on the amount with which the value of his produce would increase, if he added these quantities to his stock of productive goods. And whether this increase must be considered as the product of these quantities only, or also partly as the product of the stock of productive agents, to which they are to be added, is a question of minor importance which does not touch the kernel of the theory of imputation, that is based on the Loss-principle.*

We may therefore repeat that this objection to the Loss-principle is *in itself* of comparatively little value. But, as we have said, it leads to another objection which must be considered as much more dangerous.

The objection that we have just considered originates in the fact that under certain conditions a withdrawal of a certain quantity of an agent of production causes a very serious loss. But, if certain quantities of the other agents are withdrawn, it is possible that likewise a very heavy loss will result from this. *If now, the losses caused by these withdrawals are accumulated, will their sum then not be greater than the total value, created by the withdrawn quantities of agents when collaborating?* It is obvious that, if this question had to be answered affirmatively, we should have an absurdity before us, for the sum of the amounts, given as a remuneration

² *Positive Theorie*, II., p. 141. See also Dr. E. Broda: *Die Lösungen des Zurechnungsproblems*, *Zeitschrift für Volkswirtschaft*, 1911, p. 357 ("ohne Verlustgedanke keine Wertmessung").

to the possessors of the different agents of production can never exceed the value of their total produce. If it did so, the enterpriser would soon have to stop his business, for every transaction would cause him a loss. *If, therefore, there were a truth underlying this objection, then the whole theory of marginal productivity and the Loss-principle on which it is based would seem to be incapable of procuring a key to the problem of functional distribution, a thing they have always claimed and still claim.*

It was again Von Wieser who first formulated this objection, and concerning this problem also we have an interesting discussion between him and Von Böhm-Bawerk before us¹.

When we have three productive elements, thus Von Wieser, producing jointly a value of 10 units of value, and by taking any of them away we should lose 4 units, then the three elements together would have a value of 12 units, which is an absurdity, as their joint product, which is the source of their value, only amounts to 10 units of value. Von Böhm-Bawerk answers to this that the fact that any element, when taken away, has a value of 4 units, does not mean that they have together a value of 3×4 units. The source of this difference between Von Wieser and Von Böhm-Bawerk is, according to the latter, their difference of opinion concerning the valuation of a stock of goods. According to Von Wieser each of the units of a stock have the same value and the total value is equal to the product of the marginal utility and the number of units². According to Von Böhm any one of these units has a value equal to the value of the marginal unit, but, when considered together, they satisfy wants of different intensity and therefore their total value is equal to the sum of a series of satisfactions, differing in degree, that is to say all the satisfactions which are really dependent on this total stock of goods.

¹ *Positive Theorie*, II., p. 132 et seq.

² *Der natürliche Wert*, p. 24. Compare also his *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 192. Further Dr. Oskar Kraus: *Zur Theorie des Wertes*, p. 105 et seq., Prof. J. Schumpeter: *Bemerkungen über das Zurechnungsproblem*, *Zeitschrift für Volkswirtschaft*, 1911, p. 123 and Dr. C. Landauer: *Grundprobleme der funktionellen Verteilung des wirtschaftlichen Wertes*, p. 105.

This may be applied to the valuation of a group of productive agents and then it appears that in the case, discussed by Von Wieser the different pieces *may only alternatively be valued at their loss-value and not cumulatively*¹.

We have seen, when we examined Von Böhm's theory of the value of complementary goods that he really does not value all the elements at their loss-value. In the first case his decision is that one of the goods has a value equal to the satisfaction created by the combined action of the two together and that the other article is worthless². In his second and third cases the values of separate uses had a determining influence on the valuation of the complementary goods. We have shown, however, that these separate values have practically no influence under modern conditions and then there is no other standard of value than the loss of product, caused by the withdrawal of a quantity of productive elements out of a group.

Must we then accept the conclusion that a sum, perhaps exceeding the value of the joint product, measures the value of the agents? One author, Prof. Joseph Schumpeter, has accepted this view. In his theory of the value of complementary goods he says that the curves of value, which he has deduced for the agents of production cannot be added. But he thinks that this does not matter. For these curves are only value curves, and they are only the basis for a formation of prices. And these prices are formed in such a way that they enable a distribution (*Aufteilung*) of the value of the product among the agents of production³. A similar reasoning can be found in Von Böhm's exposition. According to Von Böhm there is a great difference between "economic imputation" and distribution (*Aufteilung*) of the produce value among the different collaborating agents of production. The shares in distribution, Von Böhm admits, must, when added, not exceed the value of the total produce. But the

¹ *Positive Theorie*, II., p. 136. Although we have some objections to the reasoning as a whole, Von Böhm's conclusion can be accepted or criticised apart from it, so that we avoid a criticism of this reasoning.

² See p. 16.

³ Prof. J. Schumpeter: *Das Wesen und der Hauptinhalt der theoretischen Nationalökonomie*, pp. 248-249.

imputed values, which are subjective valuations, may partly cover one another¹. They are, however, the basis of a second process, the process of price formation, which determines the actual shares of distribution².

We do not consider this reasoning adequate. For, if price is determined by marginal valuations, and practically Von Böhm as well as Prof. Schumpeter hold this view³, and, if the marginal valuations of the different agents of production, when added, exceed the value that is available for distribution, then also the prices formed, that is to say the distributive shares, must, when added, exceed this value⁴.

Von Böhm has added an interesting remark. Under particular casuistic assumptions he says, the shares of distribution must be wholly, or at least nearly equal to the imputed values. What is meant by these "particular casuistic assumptions" is said in a curious note which we have already met with, and appears to be a "strong and atomic competition"⁵. But it is clear that here Von Böhm destroys his own assertion that, while the sum of the imputed values exceeds the total value of the produce, this is not the case with the distributive shares. For, what he considers as "particular casuistic assumptions", are exactly the assumptions that must be made, when a static standard of functional distribution is sought. And this must be sought, as under dynamic conditions, incomes still tend towards a static standard and this is therefore the indispensable key to any further study.

We have seen that Prof. Clark makes these assumptions and that in his system imputed values (that is in this case marginal productivity) equal distributive shares. This must mean that Prof. Clark's theory of marginal productivity is liable to the same objection that has been directed against the

¹ "sich überdecken".

² *Positive Theorie*, II., pp. 146-147. See also pp. 156-157.

³ We say "practically", because, as is well-known there are some subtle differences in this respect between Von Böhm and most Anglo-Saxon authors. In connection with our problem these differences, are, however, of no importance.

⁴ It appears that Dr. Hofendehl shares this view. Compare his *Problem der ökonomischen Zurechnung*, p. 68.

⁵ *Positive Theorie*, p. 147.

other theories of imputation, based on the Loss-principle, and that here also the sum of the imputed values must exceed, or perhaps, which is equally possible, remain below the value available for distribution. In any case there seems to be no warrant that the sum of the imputed values shall exactly equal the value, which can be disposed of for the purposes of distribution. Prof. Clark declares, as we have seen¹, that this equality exists, saying that when one agent is remunerated on the basis of marginal productivity, the rent that remains for the other factor must be equal to that agent's remuneration on the basis of marginal productivity.

We shall have to examine this in due course, but first we shall study another serious objection to the theory of marginal productivity, concerning the limitation of the possibility of variation. It will appear that this study smoothes the path for a deeper and decisive criticism of the principal objection examined in this chapter.

¹ p. 31.

CHAPTER VI

THE LIMITATIONS OF THE POSSIBILITY OF VARIATION, ESPECIALLY WITH REFERENCE TO THE MOBILITY OF CAPITAL

THE value of the theory of imputation in general and of the theory of marginal productivity in particular, is to a great extent dependent on a wide possibility of variation. We have met with some objections, expressed by able economists, and in which they denied the possibility of variation, saying that if the last unit of an agent of production is withdrawn, the units of the other agents that were collaborating with the lost unit before its withdrawal, become valueless, as they cannot produce anything separately.

We shall have to examine the validity of this argument and this means that we have to study the problem of variation as a whole. In our opinion it contains three objects of study : the possibility of changing the relations between the quantities of the different elements of production, the question whether the notion of " true capital " and the use, which is made of it in the modern theory of marginal productivity can be accepted, and the problem of the unit of variation.

A study of the first question means an analysis of the problem, of what the adherents of the Mathematical School call the "*technical coefficients*". What is meant by these are the quantities of the different productive elements, required for the production of a unit of product¹. They thus are an expression of the relation in which the different agents are combined. Obviously there are different technical co-efficients for every product. The problem is now whether the relations between the quantities of the different agents of production are to be considered as constant or as variable relations. This problem of the technical co-efficients should be studied with reference to every branch of production, but

¹ See Chapter XII.

this would be a very elaborate task and would exceed the scope of this study. If we cannot do this, we can at least distinguish the logical possibilities in this respect and then test whether any real phenomena in economic life correspond to them.

In our opinion the logical possibilities are three: either there is no possibility of variation at all, or there is a perfect freedom of variation, or there is a more or less limited possibility of variation. In the last case it must of course be examined between which limits variation is possible.

The first possibility is very seldom found in real economic life. It does exist, although there is not a single case in which none of the means of production can be varied. But there are cases in which some of the constituent parts cannot change the relation in which they are combined. This is the case in some chemical industries in which certain quantities of a chemical can only be combined with certain definite quantities of another chemical.

But these cases are very rare, and, as we are here especially concerned with the variation of the productive agents and not with the intermediary goods, we shall find in this case, as a rule a certain possibility of variation. This possibility is however very limited¹.

We have already met the objection that when the quantity of one out of many collaborating agents of production is increased, the quantities of the other collaborating agents should be increased in due proportion. This parallelism has been taught, as we have already said by Ricardo. Ricardo applied it to the case of labour, collaborating with capital, however from a different point of view. We must now ask, does there really exist such a rigid parallelism in the application of the different factors of production? Is it really true that the withdrawal of the last unit of one agent causes a last unit of the other agent(s) to be valueless and a whole

¹ This is admitted by Prof. Clark on page 101 of his *Distribution*. See also V. Pareto: *Manuel d'économie politique*, p. 328; Dr. C. Landauer: *Grundprobleme der funktionalen Verteilung*, p. 160; Dr. E. Broda: *Die Lösungen des Zurechnungsproblems*, p. 365; Dr. R. Zuckerkandl: *Zur Theorie des Preises*, p. 350 and Prof. G. Cassel: *Theoretische Sozialökonomie*, p. 160.

marginal unit of the product to get lost? If this were so, then the theory of marginal productivity would lead to the absurd conclusion that the whole marginal product would be simultaneously ascribed to every one of the marginal units of the collaborating agents and that they would obtain together several times the value of the whole product.

In the case of labour, we may reckon with the men working on the extensive margin. They might be taken away without much loss of the other productive powers. The men tilling no-rent land and using no-rent instruments would make this experiment possible. But the most important field of marginal labour, the zone of indifference which is to be found in all trades would cause some difficulties in this respect. In most industries the departure of a man would, if the best technical coefficients had been chosen, and this we must suppose in studying the problem of variation, mean the loss of the productive powers that were collaborating with him. There are cases in which these productive powers can be used to collaborate with the remaining labourers, but these cases are comparatively rare. The tendency of machinery to grow in importance and to adapt itself to labour, causes the possibility of variation of productive agents without destroying the productive power of other agents, to become very limited. In many industries one man is necessary for each machine. Some machines must be handled by a larger number of persons. But in their construction engineers have reckoned with a definite number of workmen controlling them. If one is added, there is no or hardly any work for him and if one is taken away, it becomes impossible to keep the machine running¹.

There are, however, still many cases in which variation is possible. On some tramways in Holland the functions of driver and conductor are performed by one man and this may be taken as a form of variation, although it should not be forgotten that the labour of a single man, performing two functions is not the same labour as the labour done under previous circumstances by one conductor or by one driver. One might argue that, although one man does what formerly

¹ Compare Prof. Clark's *Distribution*, p. 114.

two men did, the quantity of labour offered has not changed.

It is possible to give several examples of conjunctions in which less important labour could be dispensed with without a great loss of productive power of other agents of production. But even in these cases there would be a loss of this kind and the loss-value of a marginal labourer would not be equal to the product of that labourer alone, but would mean an extra loss of some other productive power. Likewise a variation of the quantity of capital goods would mean a loss of productive human powers.

Under these circumstances it is not likely that the sum of the loss-values of the marginal units of the different agents of production would not exceed the value of the product created by them. And as the price of the product created by intra-marginal units of these agents must be equal to the price of the marginal product, or else a wrong use would have been made of the agents, this means that the theory of marginal productivity, under these circumstances, would lead to a system of distribution under which more would be distributed than is available for distribution, which is an absurdity.

J. A. Hobson gives an example, in which the value that the total stock of one agent only, would, when remuneration took place according to marginal productivity, get, is more than the whole product. "A nine-man farm", he says, "may only yield 140 sheep, so that when the tenth man is added, there are 160 sheep, which equally divided as product or as wages, would give only sixteen sheep per man, not the twenty which the presence of the tenth man seemed to add"^x.

The circumstances assumed by Hobson are, however, not very likely to occur in actual economic life. Besides, as we shall see, in the case when labour is collaborating with land only, the objection with which we are concerned loses its power. The principal obstacle to the theory is the existence of capital goods, which can only be used when collaborating with a definite number of labourers.

Prof. Clark has seen this and, as we have explained in a

^x J. A. Hobson : *The Industrial System*, p. 109.

previous chapter, he has introduced the notion of *true capital*, which enables him to destroy the limitations of variation, with which we have just occupied ourselves, and that even makes it possible for him to suppose an indefinite power of labour and capital to change their forms. We shall have to examine now, whether this mode of proceeding is permissible. It will be obvious from the explanations given above that the theory of marginal productivity as a basis of the theory of distribution stands and falls with the possibility of varying the quantity of one agent of production without damaging the productive power of another agent, and, as we have seen that this possibility does not exist, when the notion of a "true capital", capable of changing its forms indefinitely, is not introduced, this means *that it stands and falls with the possibility of applying this notion*,

The application of such a notion is, of course, not simply erroneous, especially not in a study like the one achieved by Prof. Clark. Prof. Clark is well aware that his analysis is based on certain assumptions and is only true with reference to these assumptions. Now, *we consider the notion of a "true capital", capable of changing its forms indefinitely, as one of these assumptions*, and it therefore would not be permissible to contest Prof. Clark's theory on the ground that, when this assumption is not made, the theory seems not to be in accord with facts. We have already met with an objection which was based on the view that static conditions and perfect competition do not exist and we have not accepted this argument against the theory, because the assumptions are emphatically made and recognized as such. But we have remarked that it might be asked whether these assumptions did not lead us too far from the conditions of real economic life to have much validity as to the knowledge of it. In that case we could reply that they did not and that a tendency to the standard obtained was also present under actual conditions.

We must now ask the same thing with reference to the assumption of a perfectly mobile capital. And, although this does not mean an objection to the formal logic of Prof. Clark's theory, we shall find this time that the assumption leads us so far from reality that the same theory which must

be accepted, when this assumption is made, must be rejected when it is dropped.

The abstract notion of capital is becoming popular in these days. Three of the best economists of our time, Prof. J. B. Clark, Prof. G. Cassel and Prof. J. Schumpeter, adhere to it², and undoubtedly it has great advantages. It has been exposed to serious misunderstandings³, but at last it has made its way. Although we have some objections to the formulations of it, we do not deny its expediency and we should not have made it an object of discussion, if certain of its aspects had not an important bearing on the theory we are just now criticizing and if a peculiar interpretation of it by Prof. Clark had not made it one of the foundations of this theory.

After what has been said above, it is clear that we are considering the quality of capital to change its forms indefinitely. We do not simply deny this and when Prof. Clark says that "the capital that was once invested in the whale fishery of New England is now, to some extent, employed in cotton manufacturing", we have no objections to it. But when, illustrating the problem of variation, he gives an example of the withdrawal of some labourers out of a given group and supposes capital to adapt itself to the new conjunction, so that "the abandoned pick and shovel become by a miracle of transmutation, an improvement in the quality of a horse and cart"³, we must be aware that this is something that can, at least *at the moment*, not happen under actual conditions. It can only happen *in the course of time*, and this is why we agree with the first remark quoted and not with the second one. Capital goods have their periods, as Prof. Clark acknowledges, and they can *in the long run* be replaced by other capital goods, because then they reproduce an equivalent of their own value over and above the net interest they yield, which takes the form of a sinking fund.

¹ Carl Menger had developed a notion of the same kind in his article: "Zur Theorie des Kapitals," *Jahrbücher für Nationalökonomie und Statistik*, 1888, p. 40.

² Compare for instance Von Böhm's criticism of Prof. Clark's theory in the *Zeitschrift für Volkswirtschaft*, 1906-7.

³ *Distribution*, p. 170.

Now, this life-period is very different for the different kinds of capital goods, but it always exists and is sometimes very long¹.

Prof. Clark himself touches on this problem ; he observes that the transformation of capital takes place in the form of a substitution of new instruments for old ones² and at the end of his book he remarks that "static adjustments require much time" and that the abandoning of old methods for new ones is "sometimes a quick process and sometimes a slow one"³. It might be said that a change in method of production is quite a different matter from the adaptation of capital to an amount of labour, somewhat smaller than the amount it used to collaborate with. But the difference can only be a gradual one and so this cannot be accepted as an essential distinction.

All the same, Prof. Clark holds that, although capital goods are not freely transmutable and have their periods, *capital* has not⁴. This is a dangerous point of view. Capital should never be dissociated from its connection with its embodiments and, in our opinion, this is done here. It is not simply erroneous to say that capital as such has no periods, but here it leads to conclusions, which we cannot share. For it is exactly this life-period of capital goods which causes capital *not to be able to change its forms indefinitely at a given moment*. It is only capital that is embodied in a *very liquid form* that can take all kinds of shapes and it is probable that Prof. Clark had this in mind when he said : "The vast stock of working appliances that the United States possesses can enable more men to work than are now working ; but sixty-five billion "dollars" not confined to these appliances, but free to invest themselves in any other things, could give openings to a much greater number of additional workmen"⁵.

¹ With reference to a distinction by Prof. Clark we might say that most active capital goods (buildings, machines, etc.) have a long period, while passive capital goods (materials, etc.) as a rule have a comparatively short period. See p. 144 of the *Distribution*, or p. 20 *et seq.* of the "*Essentials*".

² *Distribution*, p. 275.

³ *Distribution*, pp. 428-429.

⁴ *Distribution*, pp. 127-128.

⁵ *Distribution*, p. 113, already quoted by us on p. 27.

This is perfectly true, but we must not forget *that only a very small part of a country's capital is in such a liquid form and that the greater part of capital is for a considerable time embodied in durable capital goods.*

If a business working with a hundred labourers has to give up ten of these, the capital invested in the business must in the long run change its forms. Let us say that it adapts itself to the new situation in twenty-five years. Must then the loss, caused by the departure of the labourers, be measured by the difference between the produce with a hundred men now and that of ninety men at the moment that capital has adapted itself? Or must it be measured by the difference between the produce with a hundred men to-day and of that with ninety men to-day?

It is obvious that only the loss that has really been suffered comes into consideration, and this is the difference between the produce with a hundred men and the produce with ninety men with the same capital in (practically) the same form. This loss will be enormous and the capital goods that had supported the ten departed labourers, will perhaps be practically valueless. But all the same this loss measures the value of the departed labourers, for, if value means the satisfaction dependent on the possession of a thing, it can only be measured by the application of the Loss-principle under the given conditions. Therefore Von Böhm lays stress on casuistry and he is perfectly right when he says that the whole theory of subjective value is nothing but a casuistic analysis of the amount of wealth which under different circumstances depends on an article¹.

Our conclusion therefore is that the value of a quantity of a productive agent being measured by the loss which results under certain conditions from its withdrawal, this value is something different from the "product" of this quantity, as it is isolated by Prof. Clark with the help of the assumption of perfect mobility of capital; that, if the marginal values of the different groups of agents of production which are determined by the withdrawal of marginal units

¹ See p. 15. Objections of the same kind may, of course, be directed against the use of the abstract notion of labour in this respect.

of these agents, are added, it is not likely that their sum will be equal to the value of the joint produce and that, in consequence, the theory of marginal productivity is no adequate basis for the analysis of functional distribution under actual conditions.

As a theory of *value*, however, it is essentially correct. We must only be aware that the result of our research, forces us to give up this theory of value as a basis of the theory of the *prices* of the agents of production.

This is rather a startling result. Under the influence of Menger and Von Böhm we have become used to the view that the explanation of the theory of prices as a whole contains two phases: a theory of value and a theory, deducting prices from the valuations, which the theory of value has explained. With regard to the prices of consumer's goods we can accept this view. But the complementary character of producer's goods causes their values to furnish no adequate basis for a theory of their prices¹.

It is sometimes said that, while under conditions such as we have assumed in this chapter, the theory fails, it is valid, when the unit of variation is very small. We must still face this question and shall analyse the problem of the unit of variation in the following chapter.

¹ We do not wish to say that a theory of the prices of producer's goods is the same thing as a theory of functional distribution, but there is only a difference in the case of capital goods, which have to reproduce over and above the interest of capital an equivalent of their own diminution in value, and, as here we are directly only concerned with the problem of wages, we may for this special case identify functional distribution with price formation of the productive agents.

CHAPTER VII

THE PROBLEM OF THE UNIT OF VARIATION. TWO IMPORTANT ATTEMPTS TO DEFEND THE THEORY OF MARGINAL PRODUCTIVITY

THE problem of the choice of a unit of variation is of considerable importance with regard to the theory of marginal productivity. For the loss, resulting from the withdrawal of a marginal unit is greatly dependent on this choice. This becomes clear, when we imagine first the withdrawal of the whole available supply of a productive agent and then repeat the experiment with units becoming smaller and smaller till at last they are mere infinitesimal quantities.

It is obvious that when *the whole available supply* of a productive agent is chosen as the unit of variation, its withdrawal means the destruction of the whole produce. Earlier authors often imagined this case and then declared the problem of imputation to be insoluble. Erroneously, however, for this conjunction corresponds to the first case of Von Böhm-Bawerk and if the unit could be chosen in this way, we should have to accept the rule of valuation, given by Von Böhm for this special case, which would, however, not help us much towards solving the problem of distribution.

The case would only then present itself when the total supply of an agent was controlled by monopoly.

It is comparatively easy to ridicule the theory by arguing that if the total supply of an agent is withdrawn the whole produce gets lost, but it is clear that under actual circumstances this choice of a unit does not come into consideration. Prof. T. N. Carver rightly says of the rule of imputation, here considered, that it "applies only to definite units of labour, of land and of capital, since the loss of all the labour, of all the land, or of all the capital would destroy the product altogether". "But this need", he continues, "gives us no

difficulty if we only remember that these factors, in society at large, if not on a single farm, are bargained for in units, and not in the mass².

According to Prof. G. Cassel the view that labour produces the whole product, originates here and there too lies the origin of the claim of the labourers on the whole produce of labour ("Recht auf den vollen Arbeitsertrag")³.

When the units chosen are *smaller than the total supply* of an agent of production, *but still comparatively large*, then the effect of a withdrawal may still be ruinous. If, out of the business, which we spoke of in the previous chapter, we take ten men away, there is, as we have seen, a great loss in the productive power of other agents. And, if the unit of variation chosen be as considerable as that, then the theory of marginal productivity must be given up as a basis of the theory of wages. Objections to the theory have, as a rule taken too little notice of this side of the problem of variation. A certain unit is chosen at random, and when it is shown that under these conditions the theory leads to impossible results, it is thought that it is destroyed. In Prof. Schumpeter's opinion J. A. Hobson and Prof. R. Schüller in their contest against the theory of marginal productivity have selected too large a unit⁴.

But then, how large must the unit of variation be? Is it, in the case of labour several labourers, is it only one labourer or is it a fraction of the labour, done by one workman? Or is there, perhaps a certain freedom of choice?

Prof. Clark gives several examples, which vary considerably in this respect. As a rule, however, he only takes *one man away at a time*, and even when he speaks of a social unit of labour, containing a hundred labourers, this may be interpreted as a withdrawal of one man out of every industrial group.⁴

² Prof. T. N. Carver: *The Distribution of Wealth*, p. 152.

³ Prof. G. Cassel: *Theoretische Sozialökonomie*, p. 159, and an earlier work of the same author on this question: *Das Recht auf den vollen Arbeitsertrag*.

⁴ Prof. J. Schumpeter: *Das Grundprinzip der Verteilungstheorie, Archiv für Sozialwissenschaft und Sozialpolitik*, Bd. XLII., pp. 56-57.

⁴ Compare p. 29. He speaks, however, of withdrawing "some" labour from every industrial group, *Distribution*, p. 170. On p. 174 he chooses a thousand labourers as the unit of variation.

In this case, however, the marginal loss will, under actual conditions, that is, when there is a limited power of capital to adapt itself, still be too great. And in most cases most of the capital goods with which the labourers co-operated will lose their productive power, so that practically the whole produce of this last labourer and his equipment will get lost, if he is withdrawn.

A passage from the "Essentials" possibly points into another direction. There Prof. Clark speaks of a "very small" unit². We must ask, however, *how* small the units can be. Can they, for instance, be *infinitesimal*? The theory might be saved by the use of infinitesimal quantities.

The problem of the possibility of supposing certain economic quantities to be infinitesimal is of very great importance. With regard to the theory of marginal productivity this supposition might make it possible to isolate the product of a marginal unit of labour. For, although the loss of productive power of capital goods could not be neglected, when a whole labourer were withdrawn, it might become possible to do so, when only a very small fraction of the man's labour were withdrawn².

We shall not examine to which results this method leads. We doubt, whether it is theoretically right, but we are sure *that it is wholly inexpedient and does not come into consideration for the explanation of real economic phenomena.*

For we are not free to choose the unit of variation; it is determined by the casuistic circumstances of real economic life and it is never infinitesimal. This is said very clearly by Von Böhm, when he speaks of valuation in general: "Es liegt vielleicht das Bedenken nahe", he says, "als ob auf diese Weise die Werturteile der Menschen jedes festen Bodens beraubt und völlig der Willkür anheimgegeben würden. Man könne eben, je nachdem man eine grosse oder kleine Schätzungseinheit wählt, nach Willkür ein Gut zu einem wertvollen oder wertlosen stempeln. Dieses Bedenken ist nicht begründet. Denn die Menschen können die Schätzungseinheit nicht nach Willkür wählen, sondern

¹ Prof. J. B. Clark: *Essentials of Economic Theory*, p. 157.

² Compare also A. Marshall: *Principles*, p. 393, Note 1.

dieselben äusseren Umstände, die sie überhaupt zu einer Wertschätzung gegenüber einer bestimmten Güterart veranlassen, enthalten in aller Regel zugleich ein völlig zwingendes Gebot darüber, über welches Quantum sie eine einheitliche Wertschätzung zu fällen haben. Habe ich ein Pferd zu kaufen, so wird es mir nicht einfallen, mir ein Urteil zu bilden, wie viel hundert Pferde, oder wie viel alle Pferde der Welt für mich wert wären, und danach etwa mein Kaufgebot zu bemessen; Sondern ich werde natürlich ein Werturteil über ein Pferd fällen. Und so fällen wir kraft inneren Zwanges jederzeit gerade dasjenige Werturteil, welches die konkrete ökonomische Situation erfordert"¹.

And this unit of valuation that the practice of economic life forces us to use in valuing agents of production, is far from being infinitesimal. In the case of labour it is *the labour of one man during a given period*: a week, sometimes a day or half a day, in comparatively rare cases an hour. But in all these cases the withdrawal of a unit will nearly always cause the services of the worker's equipment of capital goods to become practically valueless, as long as the withdrawal lasts².

We might here break off our criticism of the theory of imputation, thus far treated, as it has been shown that the use of the assumptions of infinitesimal quantities and perfect transformability of capital not being permitted, when an exploration of real economic conditions is aimed at, even the most perfect among these theories, the theory of marginal productivity cannot be maintained, because the sum of the values of the different agents of production would exceed the total value, which is available for distribution.³

Although it is not strictly necessary, we shall examine, however, whether *when the difficulty caused by the absence of a*

¹ *Positive Theorie*, I., pp. 170-171.

² This is also held by Dr. C. Landauer, p. 151, and Dr. E. Broda: *Die Lösungen des Zurechnungsproblems*, *Zeitschrift für Volkswirtschaft*, 1911, p. 375. The problem of the unit of land is examined in the following chapter.

³ These views have been criticised by Professor J. Schumpeter in his answer to my article: "Zur Frage der Grenzproduktivität," *Schmollers Jahrbuch*, 1927, p. 671 et seq.

perfect mobility of capital is eliminated, the theory leads to satisfactory results. This we shall do by supposing *that labour is co-operating with land only*. In this case, of course never realized under actual conditions, we may perhaps suppose that a variation in the quantity of one of the agents may cause each of its units to collaborate with a different quantity of the other agent. When a marginal unit of labour is withdrawn from a field of a given area, this area may be equally divided among the remaining men and the marginal productivity of labour can be measured by the difference between the total produce before and after the withdrawal had taken place.

*Prof. A. Aftalion*² has made a very interesting study on this problem with reference to an example given by Prof. T. N. Carver in his *Distribution of Wealth*³.

The example deals with the application of labour on land. Prof. Aftalion now reverses it and with the help of the same figures he examines what would have happened if labour had been chosen as the agent, of which the supply is fixed and land had been applied to it in successive doses. This results in the following two tables :

I.—Table, representing the case, when marginal productivity of labour is determined directly, while the share of land is seen as a rent.

Unités employées.	Produit total.	Produit marginal par ouvrier.	Part totale du travail.	Part totale de la terre par différence.	Part de la terre par are.
100 ares, 1 ouvrier ..	500	—	—	—	—
100 " 2 " ..	900	400	800	100	1
100 " 3 " ..	1.200	300	900	300	3
100 " 4 " ..	1.400	200	800	600	6
100 " 5 " ..	1.500	100	500	1.000	10

² Prof. A. Aftalion : *Les trois notions de la productivité et les revenus*, p. 16 *et seq.*

³ Prof. T. N. Carver : *The Distribution of Wealth*, p. 163.

II.—Table, representing the case, when marginal productivity of land is determined directly, while the share of labour is seen as a rent.

Unités employées.	Produit total.	Produit additionnel.	Nombre d'ares ajoutés.	Produit marginal par are.	Part totale de la terre.	Part totale du travail par différence.	Part par ouvrier.
5 ouvriers, 100 ares ..	1.500						
5 " 125 " ..	1.750	250	25	10	1.250	500	100
5 " 166 $\frac{2}{3}$ " ..	2.000	250	41 $\frac{1}{3}$	6	1.000	1.000	200
5 " 250 " ..	2.250	250	83 $\frac{1}{3}$	3	750	1.500	300
5 " 500 " ..	2.500	250	250	1	500	2.000	400

From a superficial glance at these tables it would appear that the share of one of the agents, determined in one table by marginal productivity and in the other as a rent, is equal in both cases. But, as Prof. Aftalion rightly remarks, the figures have moved in the second table so that what is found as a rent in the first table is found in the second table as a marginal value, *however not in the corresponding group, but in the following one, which contains more of the agent considered*¹.

Prof. Aftalion concludes that an income has a different magnitude when determined as a rent and when determined as a marginal value and that the sum of the imputed values exceeds the value of the total product². But, according to him, this is only a "small error in the calculation"³, which might perhaps be neglected, when very small units of variation were to be chosen. He tries to prove this by an interesting explanation, but as we have already enough material for a critical examination of the case, we shall not consider his further discussion.

Before proceeding we shall examine what Prof. Aftalion has done. It appears that he does not in both cases work with the same quantities of the different agents. But he

¹ p. 17.

² pp. 16-17.

³ "légère erreur dans le calcul de l'imputation", p. 16.

does work with the same *relations* between these quantities. Now, in an earlier part of this work¹ we have seen that these relations are expressed by the *technical co-efficients*, and it appears that Prof. Aftalion has chosen his variations so that the technical co-efficients, which are attained, correspond in both cases of variation.

This, however, is not permissible. The theory of marginal productivity holds that when given amounts of the different agents are applied to one another, the marginal productivity of each agent is the basis of its remuneration and that it is equal to the rent that is left, when the other agent is remunerated, according to its marginal productivity. Both processes of variation therefore *refer to one and the same set of given quantities*.

Prof. Aftalion, however, compares marginal productivity with regard to certain quantities of the agents, with rent in the case of the application of different amounts of these agents, and only by this process can a correspondence of technical co-efficients be obtained.

With regard to certain constant amounts of the different agents this would be absolutely impossible. Let us imagine 100 labourers working on 100 units of land. Let us first apply the labourers to the land, introducing one man at a time. Then we shall see that the relation in which labour and land are combined, when expressed as a fraction, of which the number of men is the numerator and the number of units of land the denominator accrues from $1/100$ to $100/100$. If we now reverse the process and apply land in successive doses to the fixed amount of a hundred labourers, it will appear that this fraction will diminish in value. When the first unit of land is applied, it will be $100/1$, and the lowest value reached by the fraction will be $100/100$. It appears thus that the series of relations can never correspond in the two cases of variation, except at the moment when the total quantities of both agents are used and which is attained at the end of the two processes.

Instead of this correspondence the situation shows us a series of relations of co-ordination, continuously accruing

¹ p. 57.

from $1/100$ to $100/1$. If we had chosen the number of units of land as the numerator and the number of labourers as the denominator, instead of a continuous increase we should have seen a continuous diminution of the value of the fraction, but this, of course, would not have caused any essential difference in the result.

This correspondence of the relations of co-ordinations, of which we have proved the impossibility, is, however, the very basis of Prof. Aftalion's reasoning. It appears, thus, that it cannot be maintained.

We must, however, now ask, whether apart from this possibility, the theory of marginal productivity could be maintained in the case of labour co-operating with land only.

We shall first examine an interesting attempt to show that the sum of the value of the different agents of production is equal to the value of their joint product, by *Knut Wicksell*¹. He supposes a hundred labourers to be working on a field of a hundred units of area. When one labourer is added to the group, he argues, we may suppose the increase of produce, caused by the contribution of the one hundred and first man to the working force, to be almost equal to the marginal productivity of the labour, which was available before the addition took place, that is to say the product of the hundredth labourer.

Then the area of land is supposed to be increased by one unit, and the increase of produce, caused by this increment, when there are 101 labourers, would, according to Wicksell, not differ perceptibly from the product ascribable to the one hundredth unit of area when there were 100 labourers.

He concludes that the total produce has been increased by the sum of the marginal products of land and labour and that the sum of these must equal the product which the marginal units of land and labour have created together. For, while before the beginning of our process of variation, we had 100 labourers and 100 units of land, we have now 101 labourers and 101 units of land, so that the total produce must be increased by $1/100$.

We cannot accept this reasoning. For apart from the

¹ Knut Wicksell: *Vorlesungen über Nationalökonomie*, I., pp. 187-188.

question whether it is allowed to choose the unit thus, as Wicksell does, and whether it is in this case permitted, to suppose that the productivity of the one-hundredth labourer is equal to the productivity of the one-hundred and first, or at least that the difference between these products is so small that it may be neglected, the contributions of the labourer and the unit of land, which are added in the example, *may not in this case be considered as the marginal products of labour and land.*

It is undoubtedly true that, when to a certain productive group, a unit of each agent is added successively, and each of these units gets the increase in value that results from its application, the sum of the values, ascribed to them must equal the value of their joint product.

But what happens when these units are added or withdrawn successively is not equal to what happens when they are added or withdrawn alternatively. What happens, when a unit of an agent of production is taken away, is *determined largely by technical conditions.* It is an open question whether the method of production being given, a field that can furnish enough work for a hundred men could afford work for one man more, without causing the organization of production to be less expedient and thus to turn human energy into waste. Let us, however, suppose that this waste is very small. Then, we must still be aware that the addition of the man involves some loss, whereas the addition of a unit of land, which takes place when the addition of the man has already been made, causes an extra gain, because now the old co-ordination of the factors, the same technical co-efficients, may be re-established.

When, however, the additional units of the two agents are supplied *alternatively*, when 100 labourers are co-operating with 100 units of land, then they both cause the technical co-efficient to be changed and thus both cause an extra loss.

In the following chapter we shall investigate the possibility of proving the equality of the sum of the marginal values in the case of labour co-operating with land only, when the additions or withdrawals that we are concerned with are performed alternatively, but with reference to larger amounts of the collaborating agents.

CHAPTER VIII

THE THEORY OF MARGINAL PRODUCTIVITY SATISFACTORY IN THE CASE OF LABOUR CO-OPERATING WITH LAND ONLY

ALTHOUGH in the previous chapter we were forced to reject the attempts of Prof. Aftalion and Knut Wicksell to prove that the sum of the marginal values of the different agents of production is equal or approximately equal to the value, available for distribution, we shall show in this chapter that this probably *can* be proved, at least for the case at hand, that is when labour is in co-operation with land only.

We must first examine further the problem of the unit of variation with special reference to this case. The units of labour will, of course, under these conditions also be determined and must very likely be equal to one man's labour for a certain period. But, it would seem that there is in the case at hand a perfect freedom of choice, concerning the unit of land.

Let us suppose for a moment that this is really so. Then it is obvious that the value ascribed to land must under these conditions, be dependent on the choice of the unit of valuation with reference to land.

When we take a small unit away the labourers will have to work with the remainder which may be distributed equally among them. When, however, we take a unit away, which is larger than the first, let us say twice as large, then the labourers will have to work on the remainder, which is still smaller. This means that the technical co-efficients are in the second case more different from the original ones than in the first case. And, if the technical co-efficients which were first chosen were the most advantageous under the conditions assumed—and this we may suppose—then a change in these co-efficients must be disadvantageous, and

the second and more important change is likely to cause a greater loss than the first.

The value ascribed to land would then vary in both cases, because the loss caused by the withdrawal of the unit in the second case would be more than twice as large as the similar loss in the first case, whereas the unit in the second case was only twice as large as in the first.

It appears therefore that *valuation would be in this case rather an arbitrary process*, and that it is only possible with reference to *definite units*.

But, it might be objected : must not the units be chosen as infinitesimal quantities ? We have shown, however, that in any case this choice is not allowed. For an infinitesimal quantity of land is never valued in ordinary business life, and there is no price that could be formed on the basis of a theoretical valuation that would not correspond to real economic phenomena of the kind.

But may we not say that a piece of land that becomes the object of a valuation, can be regarded as infinitesimal because it is very small in relation to the total quantity available ?

For some purposes we may actually do this. We may, for instance, say that when a small piece of land is withdrawn, the remaining land is equally distributed among the labourers so that each of them will have to work on a quantity of land not perceptibly smaller than the quantity with which he used to co-operate, so that this diminution may be considered negligible. This reasoning may be allowed, and, as we shall see, it is of fundamental importance for the theory of marginal productivity in the case we are studying.

But for the moment we are only concerned with the problem of the choice of the unit of variation and this is not solved by that reasoning. For the fact that certain effects of the withdrawal of a piece of land may be considered as infinitesimal does not make the piece of land itself infinitesimal.

Therefore the indefiniteness of the problem, caused by the indefiniteness of the unit of valuation with reference to land continues to exist and we must conclude that the problem is *in this form* insoluble.

It is, however, under these conditions a very abstract problem, for in real economic life the unit of valuation is, as a rule, not questionable, but given and determined by the practical situation. In old countries, capital, applied to the land, has given to most places of land a certain individuality, which it does not seem expedient to destroy and even in new countries, in which land is not yet thus intermingled with capital, we may not presuppose a perfect freedom of choice for the unit. For methods of production more or less fix the technical co-efficients, that is the *relative amounts* of the agents of production, as well as the normal magnitude of the farm, that is the *absolute amounts* of the agents and thus cause the unit of land, that for ordinary business life becomes the object of valuation, to be approximately fixed. Besides, the existing distribution of property has some influence.

And these very valuations, which the situation in real economic life makes necessary, must have an influence on prices. That in practical business life the price of a piece of land or its use is often expressed per square metre, must not mislead us, for these prices per square metre are derived and only the valuations of whole plots are at the basis of price formation. And even, if the unit were a square metre, it would be all the same for us, for we are here only concerned with a research for the definiteness of the unit of valuation and not for its absolute magnitude.

We therefore purposely avoid the many difficulties, caused by the fact that the units, valued in practical business life, are of a very varying size, whereas there must all the same be some uniformity in the formation of the prices. We also pass over difficulties caused by differences in quality of the land and suppose a definite unit to be settled, while every unit is a separate plot. Further, we assume perfect equality in the quality of the land and perfectly free movement of labour from one plot to any other, *while the available quantities of labour and land are very great.*

Under these conditions the objection that the sum of the values of the agents of production, when determined according to their marginal productivity, exceeds the value available for distribution, will prove to be powerless.

We may now suppose that when a unit of an agent of production is withdrawn, the remainder of it can co-operate with the other agents and *that the marginal product of the latter is not perceptibly damaged.*

In order to prove this, we must recall the fact that the product of the withdrawn unit is detected by comparing the joint product of the total quantities of both agents with the joint product of the quantities, which are available after the withdrawal. Let us suppose that there are x labourers co-operating with y units of land, and that a unit of land is withdrawn. Then, we may regard as the value of this unit the difference between the joint product of x labourers and y units of land and the joint product of x labourers and $(y - 1)$ units of land.

Let us further suppose that there were z men working on the withdrawn land. These z men must leave the field and will be added to the working force on the remaining land. We must assume now that they can be added to this without causing considerable losses and that the remaining land can be distributed equally among the labourers available without causing disadvantageous co-ordinations of land and labour. Under these conditions we might assume *that the marginal product of labour has not perceptibly changed, so that, what gets lost, when a last unit of land is withdrawn, is equal to the joint product of that unit and the labourers that were working on it minus the marginal productivity of labour, multiplied by the number of men that were working on the plot. In this case, therefore, the sum of the imputed values would equal the value of the joint product of the agents considered.*

We must, however, not accept this reasoning without verifying it. The value ascribed to the withdrawn unit of land, is, as we have seen equal to the difference between the product of x units of labour and y units of land, and the product of x units of labour and $(y - 1)$ units of land. Marginal productivity of labour would likewise be measured by the difference of the product of x units of labour and y units of land, and the product of $(x - 1)$ units of labour and y units of land.

What must be tested now, if possible, is whether marginal

productivity of labour remains approximately the same, when a unit of land is withdrawn, and whether the deviations are so small that they may be neglected.

The marginal productivity of labour *after the withdrawal of a unit of land* is measured by the difference between the product of x units of labour and $(y - 1)$ units of land and the product of $(x - 1)$ units of labour and $(y - 1)$ units of land.

To show the situation in a somewhat more intelligible form we shall again express the relations in which the different agents of production are combined as fractions, of which the number of labourers is the numerator and the number of units of land the denominator. By putting a P. before this fraction we want to indicate that we mean the product created by these co-ordinations of agents of production.

The three quantities we are concerned with would then be measured by the following formulas :

$$\text{Marginal productivity of land} = P. \frac{x}{y} - P. \frac{x}{y-1}$$

$$\begin{aligned} \text{Marginal productivity of labour before} \\ \text{the withdrawal of a unit of land} \end{aligned} = P. \frac{x}{y} - P. \frac{x-1}{y}$$

$$\begin{aligned} \text{Marginal productivity of labour after} \\ \text{the withdrawal of a unit of land} \end{aligned} = P. \frac{x}{y-1} - P. \frac{x-1}{y-1}$$

Now it is very difficult to calculate how much the difference between $P. \frac{x}{y}$ and $P. \frac{x-1}{y}$ varies from the difference between $P. \frac{x}{y-1}$ and $P. \frac{x-1}{y-1}$.

At the bottom of the whole problem lies the question of the effect of a change in the technical co-efficient on the product of industry.

We have seen that the use of capital goods causes such a change to be of very great importance and we have argued that even in Wicksell's example the variation caused too many extra losses (or extra gains) to lead to the desired result.

But here we are not concerned with capital goods, and the case presented here is somewhat different from the case

presented by Knut Wicksell. There we had 100 labourers and 100 units of land, but here we have supposed the absolute numbers of units of land and labour to be very great. And it may be that the extra loss (or extra gain) caused by the change of the technical co-efficients which results from the withdrawal of some marginal units, is so small that it must practically be neglected.

It is therefore very probable that the difference between $P \cdot \frac{x}{y}$ and $P \cdot \frac{x - 1}{y}$ does not vary widely from the difference between $P \cdot \frac{x}{y - 1}$ and $P \cdot \frac{x - 1}{y - 1}$, although it is difficult to prove.

It might be proved, however, by analysing all the factors, determining these differences. This, however, cannot be done within the scope of this work and it is questionable, whether it would be worth while to do so, as the conditions assumed are never realized in actual economic life and the circumstances therein are fundamentally different.

We must conclude, however, *that the theory of marginal productivity is likely to be true in the case at hand, and that under the conditions which we have assumed here, the objection that the sum of the imputed values will exceed the value available for distribution, will probably be powerless in this case.*

However, when a basis of the theory of wages is sought for, we must reject the theory. For it stands and falls with the assumptions made. And these assumptions are never realized in practical economic life. As soon as we reckon with the existence of more or less durable capital goods and of only a few expedient methods of co-ordination of the different agents of production, the objection regains its power and the loss, caused by the withdrawal of a marginal unit will be much greater than in the case considered¹. Factories, houses, engines, capital sunk in the soil for permanent improvements, etc., cause every industrial group to be an

¹ Prof. H. L. Moore's brilliant quantitative researches (*Laws of Wages*, p. 44 *et seq.*) do not destroy this argument, for he only verifies some conclusions, which may be drawn from the theory of marginal productivity, but which also result from another theory that we shall examine in Chapter XII.

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organic unit. Take the smallest part of its equipment away, take one labourer away, or one piece of land, even when it is possible to take it away, and you will cause a considerable loss.

This does not mean that the theory of marginal productivity must be given up as a theory of VALUATION, for as such it is a logical consequence of the theory of marginal utility. But the valuations, resulting from this mode of proceeding do not lead to possible prices for the units valued.

However, it is clear that their value cannot be wholly without influence on their prices. There is a huge problem behind this and we shall have to face it. We shall do this at a later part of our analysis, when a theory, wholly different from the one we have hitherto considered, has furnished us with a basis on which we can begin to unravel this difficult, but not insoluble problem.

But we must first search for other methods of determining the law of wages and we shall now have to devote our attention to a theory which is, as a rule, connected with the theory of marginal productivity, but which, if right, would not be liable to the objection that an accumulation of the shares in distribution would exceed the value available: the *Residual Theory of Wages*.

CHAPTER IX

THE RESIDUAL THEORY OF WAGES

THE residual theory of wages is often considered as an old theory that has had its day, but that cannot be taken seriously, since the appearance of the theory of marginal productivity. As, however, our criticism of this theory has pointed out that it is liable to the serious objection that the sum of the values of the different agents of production exceeds the value of their produce, it might be asked whether the theory could not be saved when one of the agents were a "residual claimant". This would probably be the case. When, for instance, there are three agents co-operating and two of them were remunerated according to their marginal productivity, the sum of their values would very likely be smaller than the total produce. If, then, the difference between the total produce and the sum of the values of the available quantities of the two agents, were declared to constitute the share of the third agent, the objection that the sum of the values of the agents exceeds the value of the produce could not be made. We shall have to examine, however, whether such a mode of proceeding is allowed.

The residual theory is not only formulated with reference to wages, but also other incomes have been considered as a residual. Here, however, we are only concerned with static incomes, and as such we consider land-rent, interest and wages, and in modern times of these only wages are denominated as a residual income by able economists. Therefore our analysis can be restricted to the residual theory of wages.

According to Prof. C. W. McFarlane¹ the residual theory of wages was first given by Cairnes. The modern residual theory of wages, however, originates from W. Stanley Jevons, who states that "the wages of a working man are ultimately

¹ Compare Prof. C. W. McFarlane : *Value and Distribution*, pp. 257-258.

coincident with what he produces, after the deduction of rent, taxes and the interest of capital"¹. This statement is referred to by F. A. Walker², who worked out the theory. It is doubtful whether the residual theory may be called *the* theory of wages of Jevons, as there are also germs of another theory in his work³. F. A. Walker, however, emphatically declares that the labourer is "the residual claimant to the product of industry" and that the (three) other shares being cut off from the product of industry, "the whole remaining body of wealth, daily or annually created, is the property of the labouring class; their wages, or the remuneration of their services"⁴.

We must also include a group of authors among the adherents of the residual theory of wages, who are not commonly considered as such. They do not emphatically declare the labourers to be in the position of residual claimants and are in most cases more nearly related to the theory of marginal productivity than to the residual theory pure and simple, but, as we shall show, their interpretation of the situation must logically lead to a residual theory all the same.

We shall approach these theories by starting from the theory of wages of Henry George. This author says that wages must be equal to "the average produce of labour at the margin of cultivation"⁵. Land-rent is, in his opinion, independently determined by the excess of the produce of a piece of land "over that which the same application can secure from the least productive land in use"⁶.

When the old theory of rent is adequate, this may not be called a residual theory. For land gets only a differential gain and labour is in a certain sense remunerated according to its marginal productivity. If however, the old theory of

¹ W. Stanley Jevons: *Theory of Political Economy*, p. 270.

² F. A. Walker: *Political Economy*, p. 250.

³ See pp. 216-217 of his *Theory*, where he gives a rudimentary theory of marginal productivity.

⁴ F. A. Walker: *Political Economy*, pp. 250-251.

⁵ Henry George: *Progress and Poverty*, Book III., Chapter VI., p. 146.

⁶ Henry George: *Progress and Poverty*, Book III., Chapter II., p. 118.

rent is not adequate, that is to say, when land-rent contains, apart from its differential gain, an element that is determined by marginal productivity, this theory fails. And, even if we disregard this question and presuppose that the Ricardian theory of rent is essentially right, we must combat this theory of wages. For what determines wages in this case is the produce of labour on the extensive margin of production, so that this is really a theory of "squatter sovereignty over the labour market".

But, we repeat, this is not yet a residual theory. We only reproduce it here because, as we shall see, this sequence of thought can easily lead to a residual theory of wages, and has led to it in several cases. This occurs, when the problem of interest is introduced into the reasoning. It must, however, not necessarily occur.

Prof. H. R. Seager¹, for instance, maintains the differential theory of rent. What remains, when the owners of land have received their share must, in his view, be distributed among the possessors of the other agents according to their marginal productivity. It is clear that this is no residual theory. But it is at the same time clear that it is liable to the same objection that forced us to reject the theory of marginal productivity as a direct basis of price formation. For what remains for labour and capital is likely to be smaller than the sum of the remunerations of these agents according to marginal productivity.

But, as we have already said, this trend of thought has led several authors to pronounce theories that must be seen as residual theories. When it is said : land gets a differential gain and the remainder goes to the labourers and the capitalists, it seems only a small step further to say : first land-rent is deducted from the total produce value and then the labourers get the remainder, *after the deduction of interest*. Then, however, a residual theory is obtained.

Prof. A. T. Hadley contested the residual theory. "In laying stress on the competition of capitalists to one another", he says, "it seems to lose sight of the corresponding competition among labourers", and he declares that "no one group

¹ Prof. H. R. Seager : *Introduction to Economics*, p. 260.

of producers can be marked as a residual claimant under the modern process of industrial competition"¹.

The theory he gives himself is the well-known theory of the "discounted product of industry"². Discounted product, however, means that interest must be subtracted from the produce before labour can have its reward and this theory must therefore be classified among the residual theories.

In *Macht oder ökonomisches Gesetz*³, Von Böhm argues that wages can never rise so high that they would take a part of the other incomes away. Although probably not intended so, this proves to be a residual theory. *This would not be the case if the sum of the values of the different agents of production would equal the value of the produce.* If this were so there would be no difference between saying that the marginal value of labour determines its price and saying that the share of labour is equal to the total produce minus the values of the other agents, when determined by marginal productivity. *It is this cardinal objection to the theory of marginal productivity that the values, if added, exceed the produce ready for distribution, which makes most of the theories here considered, into residual theories.*

Analogous to Von Böhm's reasoning is the following explanation by C. J. Bullock: "General wages find an upper limit beyond which they cannot claim permanently so large a portion of the product that employers will be discouraged from undertaking or carrying on business enterprises. If they should ever rise so high, the number of industries would diminish, the general demand for labour would decrease, and wages would necessarily fall sooner or later.

"Neither can wages absorb permanently so much of the product that interest cannot be paid to capitalists. If this should happen, the supply of capital would diminish and the demand for labour would gradually fall off. Moreover, wages cannot absorb the share of the product that goes to

¹ Prof. A. T. Hadley: *Economics*, pp. 317-318.

² Prof. A. T. Hadley: *Economics*, p. 301.

³ E. Von Böhm-Bawerk: *Macht oder ökonomisches Gesetz, Zeitschrift für Volkswirtschaft*, 1914.

landowners in the form of rent. This share is received on account of differences in the advantages offered by various tracts of land, and cannot be absorbed by wages¹.

A kindred theory is exposed in one of the most frequently used text-books of our days : Prof. Taussig's *Principles*.

When speaking of the distribution of the produce among workmen of different kinds and grades, he expounds the theory of marginal productivity. "The principle of marginal utility", he says, "is here applicable under the guise of marginal efficiency or marginal indispensability. Consider, for example, the case of common unskilled labour. It is cheap because there is plenty of it. If there were very little of it, it would be in the highest degree indispensable, and would be paid for at a corresponding rate. Being plentiful it is applied not only to operations that are indispensable but to others that are less and less needed, until finally its marginal application is reached at the point where it is least needed. While in some directions it adds enormously to the output, or to the joint efficiency of all the labour with which is combined, in others it adds less. It is its marginal efficiency that determines the pay which the whole must accept. So it is with skilled labour. In some directions it is in the highest degree important ; the loss, were it taken away, would be very great. It is the loss, or diminution in output, which would ensue if the last instalment of it were taken away, that determines the remuneration of any kind of labour"².

When once applied with reference to the remuneration of the different kinds of labour, the theory must be applied too, when the general laws of distribution are sought. When these are spoken of in another part of Prof. Taussig's work, he shows us, however, quite a different theory.

"The simplest and clearest mode of stating the theory of general wages", he then says, "is, in my judgment, to say that wages are determined by the discounted marginal product of labour". What is meant by this expression is explained by Prof. Taussig with the following words : "What

¹ C. J. Bullock : *Introduction to the Study of Economics*, pp. 414-415.

² Prof. F. W. Taussig : *Principles of Economics*, Vol. II., Chapter 48, §2.

is meant by *marginal* product will be obvious enough. It appears most clearly as to agricultural produce and with regard to the theory of rent applied to such produce. Wages and interest are determined on the margin of cultivation. Any excess secured on land better than the marginal land goes to the landowner, and does not affect the returns of other persons. The same principle is applicable to monopoly gains, and to all differential gains. The labourer who deals with the owner of good land, or with a monopolist, must accept what can be paid him by the marginal landowner or the competitive producer. Any extra or differential returns go to the fortunate owners of those instruments which have been sheltered by nature or by social institutions from unfettered competition.

"*Discount* implies an advance. Let it be recalled that production takes time, that the materials and machinery needed in the time-using process are made by labourers. Wealth is unequally distributed, and the immense majority of the labourers have not the wherewithal to support themselves during the prolonged period. Their remuneration is advanced to them out of a surplus possessed by someone else. The operations of capitalists consist in a succession of advances to the labourers. The capitalist class secures its gains through the process of handing over to the labourers less than the labourers eventually produce. The product of labour is discounted by the capitalist employers"¹.

It is obvious that this is a residual theory pure and simple. From the total produce first land-rent is subtracted, then interest, and the remainder consists of wages. Rent is determined by the common differential principle, interest by the marginal productivity of capital², wages by the residual principle. Thus, three different theories for the three branches of social income.

All the same, the theory is tempting, for it is not liable to the objection which in our opinion was rightly directed against the theory of marginal productivity. And it is perfectly modern, as the differential theory of rent is a form

¹ Prof. F. W. Taussig: *Principles of Economics*, Vol. II., Chapter 51, §5.

² *Ibid.*, Chapter I., §4.

of the principle of imputation and perhaps not in contradiction to the theory of marginal productivity, and with regard to interest the theory of marginal productivity is accepted².

But several questions immediately arise, as soon as we take a critical attitude towards this theory. Why is not the theory of marginal productivity also applied to labour? Why is labour in the position of a residual claimant? How is it possible that, if value determines price, also with regard to the agents of production, the principle of marginal utility is applied in one case and not in another? And when it is really necessary that one of the agents is in the position of a residual claimant, why must it be labour? Why not capital? Why not land?

It is clear that the fact that, when the theory of marginal productivity is applied, the sum of the values of the agents of production exceeds the value of the produce, is in itself no valid reason for pronouncing one of the agents a residual claimant. If, therefore, one of them is to be considered as a residual claimant, there must be some special necessity for this.

Now, it is not by chance that labour is so often considered as such, because much has been said about the weak position of the labourers on their market. And it seems logical to say that the possessors of the other agents will withdraw their supply, as soon as they do not get the marginal product of the agents, supplied by them, whilst the labourers cannot do this. They must live, and in order to live they must sell their labour and accept the price that enterprisers are willing to give to them. And this would not be more than the residual that remained after rent and interest had been subtracted from the total produce.

This reasoning is tempting, but all the same, we think it entirely fallacious. For labourers are no longer in this

² However, in the same section Prof. Taussig considers disutility as the determinant of interest. Apart from the fact that we are not concerned with the supply side of the problem, we do not think that this can be allowed, not even in Prof. Taussig's theory where marginal productivity is accepted as a determinant of interest, and thus may not be overlooked in this discussion.

position and there is no reason why competition should secure for labourers a share equal to their marginal productivity as well as it does for capital.

There is an element of the Bargain Theory of Wages in that reasoning. We have not paid attention to that theory, because we do not think it worthy of much attention and because we do not think that there is a better way of proving its fallacy than to prove that there are economic laws that sharply determine functional distribution and that power has no independent influence on it, but can only work through economic law.

Therefore, the residual theory is no way out of the difficulties in which the theory of marginal productivity has entangled us. To assume that one of the static incomes is determined residually is rather an arbitrary mode of proceeding of which we cannot approve. "No static income is what it is", says Prof. Clark, "merely because the deducting of another income from the social product leaves a certain remainder"².

We must conclude, therefore, that this completion of the theory of marginal productivity cannot be accepted. The obstacle that we found in our way in the form of the most important argument against the theory of marginal productivity thus remains and we must leave it now and seek other principles of functional distribution.

And, as we shall see, the obstacle itself will prove to be a guide-post on our way, because the claim that the sum of the values of the agents of production must equal the value of the produce sets itself a condition, to which functional distribution has to conform. If we try to complete it by other conditions, which must be fulfilled, it is possible that we might find as many of them as are required to determine functional distribution and thus wages.

When we denominate the values of land, labour and capital as x , y , and z , and the value of the produce as P , and imagine a case in which a units of land, b units of labour and c units of capital are required, we can express the

² *Distribution*, p. 202.

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When we denominate the values of land, labour and capital as x , y , and z , and the value of the produce as P , and imagine a case in which a units of land, b units of labour and c units of capital are required, we can express the

¹ *Distribution*, p. 202.

condition, of which we have spoken, by the following equation¹:

$$ax + by + cz = P.$$

This leads us to an analysis of the theory of imputation of Fr. Von Wieser which is based on equations of this kind, and which we shall examine in the following chapter.

¹ For the sake of simplicity we do not pay attention to intermediary goods and do not even ask, whether it is allowed to put the value of "capital" as an unknown factor into the equation. For it must not be forgotten that we are here concerned with wages and must avoid all the problems, which we can put aside without damaging our study.

CHAPTER X

VON WIESER'S THEORY OF IMPUTATION

WHEN treating the theories of Menger and Von Böhm, we have said that we thought it better to postpone the treatment of Von Wieser's theory to a later stage of our study. It is clear now, why we have done this. We wanted first to examine the character and the adequateness of the theories, based on the loss-principle and the principle of variation. This examination has left us unsatisfied and searching for other principles and it has appeared that the cardinal objection to the theory furnishes at the same time a condition for the solution of the problem, and this condition seems to lead us, at least provisionally, to the theory of imputation of Von Wieser. Although an Austrian and one of the leading personalities of the Austrian School, in the treatment of this problem he differs essentially from his Austrian colleagues, and, as we shall see, he stands in this respect nearer to another school of economists than to the Austrian School. Therefore, we have separated Von Wieser's theory from the theories of Menger, Von Böhm and the adherents of the theory of marginal productivity and postponed the treatment of this theory of imputation until the critical examination of those other theories had reached its end.

The expression "theory of imputation" seems to be used for the first time by Von Wieser. Menger and Böhm have used another name, as we have seen, and have spoken of the "theory of the value of complementary goods."

Notwithstanding the essential differences between the two theories they have much in common. Von Böhm-Bawerk often uses quotations from Von Wieser's works in order to throw more light on his own expositions. They agree about the distinction between physical causation and economic imputation. Von Wieser has made the celebrated

comparison between imputation in matters of criminal law and economic imputation. In both cases there are many elements collaborating to produce the effect, but only some of them may be regarded as imputable². From the point of view of criminal law only the man that committed the crime must be considered as responsible and not the many other persons that have unconsciously made the crime possible, such as the man who sold the revolver, or the men who made it.

Likewise, in economic imputation we must exclude some groups of causes that cannot from our point of view be regarded as imputable. These are, according to Von Wieser, those which have occurred in earlier periods of production that now belong to the past, those which belong to other realms of life, for instance to politics, further those elements of nature that cannot be controlled by mankind, as sunlight for example, and the elements that can be controlled, but of which there are plenty, so that they are free goods³.

From this point of view the business man can value the different productive elements that he combines. The problem may seem very difficult, but, according to Von Wieser, it is accurately solved by the daily practice of business-life. This appears from the following celebrated and often quoted passage: "Ein guter Geschäftsmann musz wissen und weisz, was ihm ein Tagelöhner, was ein guter Arbeiter einbringe, wie sich eine Maschine rentiere, wie viel er sich auf den Rohstoff zu rechnen habe, welchen Ertrag das, und welchen jenes Grundstück liefere. Wüszte er das nicht, vermöchte er nur in Ganzen, in Bausch und Bogen, Einsatz und Erfolg der Produktion zu vergleichen, so hätte er ganz und gar keine Auskunft, falls der Erfolg hinter dem Einsatz zurückbliebe"³.

It is sometimes denied that practice solves the problem. So says Dr. H. Hefendehl: "Es gibt keinen Unternehmer, der seine Kalkulationen von der Frage abhängig macht oder auch nur zu berechnen imstande wäre, wieviel ihm jeder

² Von Wieser: *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 209.

² Von Wieser: *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 210.

³ Von Wieser: *Der natürliche Wert*, §20.

Arbeiter einbringt, wie sich jede seiner Maschinen rentiert, welcher Teil des Reinertrages dem Grundstück und welcher den auf ihm errichteten Gebäuden zu verdanken ist"¹.

This objection is akin to an objection of J. A. Hobson's that we met when treating the objections to the theory of marginal productivity². Hobson acknowledged that we might measure the difference of produce between a certain co-ordination of agents of production and a co-ordination of agents that becomes expedient, when a unit of one of the agents gets lost, but he urged that it is impossible to determine the "bare productivity" of one unit of an agent. But, as we have seen, this objection is rather weak, because the difference between the two co-ordinations just measures the value that must influence the enterpriser when he is buying a unit of the agent of production considered.

Therefore, if in Von Wieser's theory values were determined by the loss-principle, contests of this kind would not weaken his reasoning.

But is the theory really based on the Loss-principle? There are parts of Von Wieser's work that point in this direction. When a producer can obtain on one plot of land with the same cost a larger produce than on another plot of land, he says, this producer will ascribe the whole excess to the better land³.

It is clear that this is an application of the Loss-principle. However, as we have seen⁴, Von Wieser contests this principle and says that what gets lost, when an article is withdrawn is not equal to what it is worth when the business is steadily going on⁵. We have said, however, that there is no other principle of determining the value of a thing and that Von Wieser's antithesis of loss-value and "productive contribution" was not justified.

¹ Dr. H. Hefendehl: *Das Problem der ökonomischen Zurechnung*, p. 76

² See p. 49 of the present work.

³ *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 210.

⁴ p. 47 of the present work.

⁵ Compare *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., p. 191 and also p. 211, where he deals with Menger's principle.

However, we shall see that Von Wieser's solution is different from the theories of imputation which we have treated and we shall have to find out, whether it is all the same an application of the loss-principle.

According to the form it is not. A solution is, says Von Wieser, only satisfactory when the following two conditions are fulfilled: the whole produce must be distributed among the co-operating elements and the shares must be so calculated that each of them is remunerated according to the extent to which it has contributed as a "practically important" cause to the attainment of the result.

The productive elements are divided by him into two classes: "Kostenproduktivmittel" and "spezifische Produktionsmittel". The means of production of the first kind have "the character of cost"; they can be used for the production of many different articles and there is a considerable stock of them, so that they really are used for the production of these different articles and thus connect the different branches of production. The "specific" means of production, however, are either very scarce or they can only be used for the production of one thing, so that in both cases they are not, like the other group of productive elements, used for the production of many different products¹.

This distinction is of great importance for Von Wieser's theory of imputation, for he distinguishes between an "ordinary imputation" with regard to the means of production of the first group, and a "specific imputation" with regard to those of the second group.

The ordinary imputation is the most difficult. Let us assume, says Von Wieser, that the product "table" is a marginal product of the two means of production wood and labour. Let the marginal utility of the table be n , the number of hours of labour required $20 a$, and the quantity of wood required $10 h$. As long as we have no other data, we cannot yet impute the produce, for we have two unknown factors, a and h , and only one equation. He assumes,

¹ *Theorie der gesellschaftlichen Wirtschaft, Grundriss der Sozialökonomik*, I., pp. 185-186.

however, that the product "cupboard" is also a marginal product of the same two means of production, and supposes that the relation between the quantities required in this case (that is, in the phraseology that we have assumed in a previous chapter, the technical co-efficients) is different from the same relation with reference to the production of the table. When this is so, Von Wieser continues, the problem of imputation is solved. We shall be able to calculate for a and h definite values and determine the percentage which $20 a$ and $10 h$ can get from the joint produce.

We must now ask whether in this mode of proceeding the loss-principle is used or not. It is not easy to answer this question, for the answer depends more or less on the interpretation of the work done. *It is, in any case, to a certain extent possible to see in all this an application of the loss-principle.*

Let us suppose that the joint produce of $20 a$ and $10 h$ is 100, whilst in another branch of production $20 a$ is combined with $5 h$ and a product of 75 is created. We then have two equations and two unknown factors, which we can calculate by means of subtracting the second equation from the first :

$$20 a + 10 h = 100$$

$$20 a + 5 h = 75$$

$$\begin{array}{r} + 5 h = 25 \\ \text{thus} = 5 \end{array}$$

$20 a$ may now be calculated as a difference between the value of the produce and the value of the amounts of h that have been collaborating with it.

What has happened in this example is analogous to the things that happen when the theory of marginal productivity is applied. The quantity of one of the agents is diminished and the loss of value resulting from this withdrawal is imputed to the quantity withdrawn.

There is, however, an important difference. We have seen that in the theory of marginal productivity only quantities that are very small in comparison with the total quantities available, are withdrawn. But the quantities, withdrawn

here, are not small. $5 h$ is, in the example given, a comparatively large quantity and it is questionable whether the value of $5 h$ would be equal to five times the value of $1 h$, in the case that only $1 h$ were withdrawn.

It is probable that we would have obtained another value for h if we had withdrawn only one unit of h . Therefore, $5 h$ may not be considered as equal to five times $1 h$. But it is possible that Von Wieser would think this variation by one unit impossible. We might suppose that he assumes a case in which there are only two relations in which the agents of production may be co-ordinated. But then, this would mean that one of the agents gets a certain value, determined by the loss of a fairly large quantity of it, while the other agent *would be a residual claimant.*

If, however, the case had been chosen differently so that the quantity of the second agent could also be varied, then we should get an independent valuation of the second factor. Let us assume the following two cases :

$$20 a + 10 h = 120$$

$$10 a + 4 h = 40$$

We can now find the value of h through doubling both sides of the second equation and subtract it from the first equation. *This is, however, not quite right.* For if $10 a + 4 h = 40$, this does not mean that $20 a + 8 h = 80$, because *doubling the produce does not mean doubling the value of the produce*, as the law of diminishing utility will have its influence. This already shows how dangerous it is to express the relation of values in the process of production in equations. We can, however, make this error infinitesimal by assuming that *very many products of each kind are made*, so that, if we take $20 a$ and $8 h$ from the total stock available, we may assume that twice as much value gets lost as in the case when $10 a$ and $4 h$ are withdrawn.

Then we should get the following solutions for h :

$$20 a + 10 h = 120$$

$$20 a + 5 h = 80$$

$$5 h = 40, \text{ so that } h = 8.$$

Likewise, we could calculate a , as follows :

$$40 a + 10 h = 160$$

$$20 a + 10 h = 120$$

$$20 a = 40, \text{ so that } a = 2.$$

In actual life, however, it is not very likely that the variations would be so chosen. If we varied unit by unit, we would get different equations, and *each pair of equations would give a different solution*. But, let us assume that for each article only one set of technical co-efficients could be chosen. Even then we should get different values, because we should have more equations than we have unknown quantities, as soon as more than two products are made. And the values would be different for each different pair of equations that would be chosen.

In order that this method of imputation may be logically possible, it is therefore requisite that there is a correspondence between the equations, so that the values of the agents in the different equations correspond.

Probably Von Wieser has assumed this condition. If not, it is easy to complete the theory in this direction. It is obvious that if the value that a certain quantity of an agent has in some other equations, is higher than the value that results from other equations, this must mean that the available stock of the agent is not appropriately distributed over the different branches of production. This distribution will therefore change and more of the available stock of the agent must be used in that branch, where its value is highest. The result will be that more products will be made in that branch of production, so that the value of those products will diminish. Therefore, the value of the productive agent considered will also diminish.

It is possible that in this way a solution might arise in which the values would correspond in the different equations. This would, however, be equal to *adding a condition* to the problem. For, next to the condition that the sum of the values of certain amounts of different agents of production had to be equal to the value of the products created by

them, which is expressed in the equations themselves, we should have a new condition : that the values of each agent, when deduced from different sets of equations, had to correspond.

Would then the values obtained be equal to the values determined by the loss-principle? *To a certain extent, yes.* For, as we have seen, the solution of the equations is based on the comparison of different co-ordinations of agents of production ; in order to be able to make the comparison we multiply one of the equations by a certain factor, which is so chosen that the number of units of one of the agents is the same in both equations, while the number of units of the other agent is different in both cases. According to the loss-principle, the difference in produce in the two cases must be ascribed to the number of units of one of the agents that one of the co-ordinations contains more than the other.

But, all the same, there are great differences between this kind of imputation and the imputation, based on the normal application of the loss-principle. First, the unit would in that case be chosen in another way, but, also, it is in most cases, certainly not possible to make another article out of a given group of means of production, when some of them are taken away. This obstacle, caused by the immobility of capital goods would be even more harmful in this case than it was when the case of the normal application of the loss-principle was analysed.

But, when we may not assume that one kind of production is suddenly changed into the other, we may not speak of an application of the loss-principle. Still we might speak of a method of differences. But can we say that the values which are calculated for the unknown quantities in this way, are the *values* of the agents ?

Not, if we define the value of a thing as the amount of wealth which is dependent on the disposal of it. For only the difference between two co-ordinations of agents of production gets as its remuneration the loss-value. And, besides, this is only true in those cases in which the production of an article can be replaced by the production of another article, when certain units of an agent of production are withdrawn.

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But then the difference between the values of the two-co-ordinations is divided by the number of units of an agent of production that one of the co-ordinations contains more than the other and what is thus obtained is not the loss-value of one unit of this agent of production.

Therefore, it is best to say that the values obtained by Von Wieser, *although they are akin to the loss-value, may not be considered as such.*

CHAPTER XI

THE MEANING OF VON WIESER'S EQUATIONS

IN the previous chapter we have tried to interpret Von Wieser's theory of imputation as an application of the method of differences and the loss-principle. We were forced, however, to conclude that, although the theory might be thus interpreted, there would remain a serious difference, because the values obtained would be equal to the loss-value of a certain number of units of an agent of production, divided by that number of units, which is not the same thing as the loss-value of a marginal unit of an agent.

This interpretation therefore does not lead to the result desired and does not furnish us with the values, which act on price formation in actual life.

Besides, if this interpretation were right, it would be questionable, whether it would be allowed to express the co-ordinations of the different agents—"schemes of production" as Prof. S. J. Chapman¹ has called them—and their products in the form of equations. For to say that 20 *a* and 10 *b* furnish, when properly co-ordinated, a produce, equal to 120, is one thing, and to say that 20 *a* + 10 *b* = 120 is another thing. Of course we could use this mode of expression, if we were only well aware what it meant. But then, the use of equations would not procure us important advantages and it would cause a very serious disadvantage in the form of a danger of working with these equations, while forgetting what they originally meant. How dangerous that is, we shall show with regard to the solution of a set of equations, which Von Wieser himself gives as an example :

$$\begin{aligned}x + y &= 100 \\2x + 3z &= 290 \\4y + 5z &= 590^2.\end{aligned}$$

¹ Prof. S. J. Chapman: *Work and Wages*, in continuation of Lord Brassey's *Work and Wages*, Part II.

² *Der natürliche Wert*, p. 87.

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It is easy to calculate that $x = 40$, $y = 60$ and $z = 70$. But as soon as we control how this calculation has taken place, we observe that, at least when the equations are interpreted in the way we have done, we must pass, when solving them, through the greatest absurdity.

For, in order to eliminate x we must multiply the first equation by two. Then we can subtract this new equation from the second one :

$$\begin{array}{r} 2x + 3z = 290 \\ 2x + 2y = 200 \\ \hline 3z - 2y = 90 \end{array}$$

It is clear, however, that this is absurd. $3z + 2y$ would mean the joint produce of two quantities of agents, but what would $3z - 2y$ mean in this case? It would obviously be an absurdity.

Probably, something else must be meant by Von Wieser, when he presented his equations. The nearest explanation and one which is accepted by most authors is that Von Wieser, by saying that $x + y = 100$ only means to say *that the sum of the values of the quantities of productive elements used for the production of an article must be equal to the value of that article.*

This, however, we must reject after our examinations concerning the value of agents of production in some earlier chapters. The value of a certain quantity of an agent is determined by the loss-principle and, as we have shown, the sum of these values is not likely to be equal to the value of the produce. Therefore, Von Wieser may not assume that this is the case.

We have seen, however, that Von Wieser has another interpretation of the notion of value, and that he distinguishes between the "productive contribution" of an agent and its loss-value. We have proved, however, that this distinction is not tenable.

Here lies the origin of Von Böhm's contention of Von Wieser's theory of imputation. It is not true, says Von Böhm, that $x + y = 100$. With reference to an example

that Von Wieser gives, he remarks, that when a huntsman values a gun and a cartridge, he must know that the value of the shot is dependent on the gun, as well as on the cartridge, and that therefore to say that both must share the value is equal to excluding the only right solution, which is that any of the two constituents could obtain the whole value of the shot¹.

This objection to Von Wieser's equations is shared by several authors. So says Dr. O. Kraus: "Es wäre ein Irrtum, zu glauben, eine *produktive* Verbindung könne durch ein *Additionszeichen* dargestellt werden"². Dr. H. Hefendehl remarks that the process of adding the values in order to obtain the value of the produce is in contradiction to the process of deducing these values from the value of that produce, that is the "recurrent filiation of value"³.

A peculiar objection is made by Dr. W. Mohrmann. "Im Produktionsprozess", he says, "wirken . . . die Produktionsfaktoren nicht analog der Addition, sondern analog der Multiplikation". "Der Produktion entspricht . . . die Multiplikation, deren Resultat ein Produkt ist, also etwa

$$4 \times 8 = 32.$$

. . . Man kann nicht . . . sagen, dass 8 mehr zu dem Produkt 32 beigetragen hat. Es lässt sich auch kein noch so unbestimmtes Übergewicht des einen Faktors über den andern konstatieren"⁴.

Von Böhm's criticism of Von Wieser's theory is, in our view, justified. But, as we have seen, Von Wieser's criticism of Von Böhm's theory is equally justified. For the sum of the marginal values of the agents exceeds the value of the produce in those cases, where the loss-principle is applied, and we have seen that this objection is also tenable against the theory of marginal productivity, when applied to actual conditions.

Therefore there is an element of truth in the witty remark

¹ Von Böhm-Bawerk: *Positive Theorie*, II., p. 152.

² Dr. O. Kraus: *Zur Theorie des Wertes*, p. 119.

³ Dr. H. Hefendehl: *Das Problem der ökonomischen Zurechnung*, p. 30.

⁴ Dr. W. Mohrmann: *Dogmengeschichte der Zurechnungslehre*, pp. 95-96.

of Dr. W. Mohrmann, that the Austrians have perfectly succeeded in mutually proving the mistakes of their theories¹.

All the same, we have a reason for saying that there is only an "element of truth" in this expression. For, *with regard to the theory of value*, Von Böhm's theory may not, as a whole, be considered a mistake; the loss-principle is wholly adequate for the solution of that problem and, if we had to reject Von Böhm's theory, it was not because the principle was not right, but because it was only insufficiently worked out and because a firm application of this principle must lead to the theory of marginal productivity. But, *with regard to the theory of price*, there must be some use in Von Wieser's equations. For the sum of the prices, paid for the agents of production cannot exceed the price of the goods, produced by them.

Therefore, the theory of value of Von Böhm and also that of Prof. Clark, gives no adequate basis for this part of the theory of price. But the equations of Von Wieser cannot solve the problem of valuation, because they presuppose the equality of the sum of the values of the agents of production and the value of their produce, which is, as the results of the theory of value of Von Böhm and Prof. Clark show, not permissible.

We must, therefore, have recourse to a *third interpretation of Von Wieser's equations*. The unknown quantities must not be values, but *prices* of the agents of production and the equations must represent a *direct relation between the prices of productive agents and the price of their product*. And, when this interpretation is made, the equations must be correct, for there is no doubt that, at least *under the assumptions of free competition and static conditions*, the price of a commodity must equal its cost, that is to say, the sum of the prices paid for the agents of production.

The equations *as such*, however, are of little value, as is rightly remarked by Knut Wicksell. "Es ist klar", says Wicksell², "dass man durch ein solches Verfahren, überhaupt

¹ Dr. W. Mohrmann: *Dogmengeschichte der Zurechnungslehre*, pp. 37-38.

² Knut Wicksell: *Über Wert, Kapital und Rente nach den neueren nationalökonomischen Theorien*, p. xii.

nichts mehr erfahren wird als man schon im voraus wüsste, nämlich dasz bei freier Konkurrenz das Entgelt oder der Ertragsanteil eines und desselben "Produktionsmittels" in allen Geschäften annäherungsweise derselbe sein musz. Das und nichts anderes besagen, wie man leicht sieht, die obigen Gleichungen. Wenn also Wieser mit seinem 'produktiven Beitrage' nur das tatsächlich ausfallende Entgelt der verschiedenen produktiven Faktoren: den Lohn der gemeinen Arbeit, die Rente der Böden gleicher Qualität, den durchschnittlichen Kapitalzins u.s.w. bezeichnen wollte, so hat er einen wahren, aber selbstverständlichen Satz ausgesprochen; hat er etwas anderes gemeint, so musz seine Lösung a priori als falsch erklärt werden".

The same point of view is taken by Prof. G. Cassel. He, too, acknowledges the correctness of Von Wieser's equations, but thinks them, as such, of very little value. Prof. Cassel rebukes Von Wieser in that he has taken his equations from the wider system of equations, of Léon Walras. "Der Hauptfehler Wieser's", he observes, "liegt darin, dass er aus dem ganzen Gleichungssystem, das den Ausdruck für die Preisbildung darstellt, nur eine Gruppe herausnimmt, nämlich die Kostengleichungen. Sie geben an und für sich natürlich einen selbstverständlichen Satz, bei dem nicht viel herauskommt".

This is perfectly true. The equations express the condition that the sum of the prices of the means of production must in every branch of production be equal to the price of the product.

But this condition is not sufficient to determine the system of prices. There are more equations than there are unknown quantities. The number of combinations that can be made with the ordinary means of production, when expediently used, is larger than the number of kinds of ordinary means of production. It is fair, however, to interpret Von Wieser, as Wickseil does, so that he is supposed to express a *second condition*: that the price of each of the means of production is the same in all branches of production.

² Dr. G. Cassel: *Grundriss einer elementaren Preislehre, Zeitschrift für die gesamte Staatswissenschaft*, 1899, p. 455.

Yet, there is a problem behind this. Can the equations be formed thus, that the unknown quantities correspond in the different cases? Not, of course, if they are chosen at random. But, in practical business life they are not chosen at random.

Let us suppose that the volume of production in different branches were chosen at random. Let us assume that there are only three means of production, but many possibilities of combining them. If we should then choose three branches of production, we should be able to calculate certain prices for the means of production. But we should have got quite different prices, had we chosen three other equations.

It is clear that a situation in which there would be very different prices for each of the means of production in the different branches of production, could not last, and that the forces of economic life would work towards an equalization of the payment of each productive element in the different branches of production. Labour, for instance, would move from the places where it is relatively badly remunerated to the places where it is relatively well remunerated. The same thing would happen with the other means of production.

The result of this movement would be that more would be made of some products, while the volume of production would diminish in other branches of production, viz., those branches from which means of production would be withdrawn in consequence of this process.

Then, however, a new influence is set at work: the prices of the products of which the output has increased will fall, while the prices of those of which the output has diminished must rise.

This new influence can be expressed by *a second series of equations*, expressing the relations between quantities produced and prices.

But even now the prices of the means of production are not determined. It is, of course, now possible to make the different equations of the first (Von Wieser's) series correspond. For we may suppose the conditions of demand to be such that they can be represented by a continuous curve. It might, however, seem that there is insufficient elasticity on the

supply side, because the volume of production cannot at the moment be changed arbitrarily. It can, however, be changed in the long run, and, if static conditions are assumed, and this must be done and is already done by using Von Wieser's equations, which express a condition that can only occur when static conditions exist, we may suppose that the volume of production has adjusted itself to the relative demand for the different products in such a way that in every branch cost equals the price of the product, while the remuneration of each of the means of production is equal in all trades.

However, there are still many solutions possible and any set of prices for the means of production would be able to cause such a state of equilibrium, *were it not that the available supply of the different means of production limited this possibility.*

And here we reach a *third series of conditions, which can be expressed in the form of a series of equations*: the available supply of the different means of production must be equal to the quantities required for the composition of the volume of production that is attained.

As we shall see in the next chapter, these three sets of conditions are sufficient to determine the system of prices in a static state. In any case the equations of Von Wieser are as such, of comparatively little value, and *the acceptance of these equations must lead sooner or later to the acceptance of other series of equations, viz., to the theory of the Mathematical School, which bases the determination of the whole system of prices on series of equations of this kind.*

CHAPTER XII

THE PRINCIPLES OF DISTRIBUTION, ACCORDING TO THE SCHOOL OF WALRAS AND CASSEL

IN sharp contrast to the Austrian and American Schools, which, although not without a struggle, have won the world, the Mathematical School, or School of Lausanne has up to our days been very unpopular. This unpopularity is, however, wholly undeserved and although many able economists still do not pay much attention to the theory, it must sooner or later obtain the influence that it deserves. In our opinion the time has come for this influence and we consider it as one of the chief aims of our work to show that the conjunction of the fundamental truths in the realm of our study is favourable to the entrance of the principal thoughts of the School of Lausanne.

The germs that were principally created by the genius of Menger, Von Böhm-Bawerk and Prof. Clark, have developed and the principles of valuation, which are the combined result of their life-work, will very soon belong to the undisputed truths of economic science.

On the other hand we have shown in our analysis that these principles of valuation do not offer an adequate basis for the theory of price. Our criticism of the theory of price, which is based *directly* on these principles of valuation, has forced us to observe a direct relation between the prices of products and those of the means of production, required to produce them. This has brought us provisionally to Von Wieser, but must lead us, as we have shown, to the principles of the theory of prices of the Mathematical School.

The principal reason of the unpopularity of this important theory is the intricate form which was given to it by the great founder of the School, Léon Walras. For the average student it is absolutely impossible to understand his masterpieces and even those who could get through them, often do not take the trouble and are deterred from doing so as soon as they

see the many pages, full of those mathematical symbols, grouped in the form of intricate equations, which are a horror to the non-mathematical mind.

An article, written by Prof. Schumpeter on the occasion of Walras' death² shows us how little this great economist has been appreciated, even by his own countrymen, and how this misappreciation embittered his life. It was not in France, but in Switzerland³ that a chair was offered him and his influence was until recently practically limited to Italian economists³.

This has changed, however, since the date of appearance of Prof. Gustav Cassel's "Theoretische Sozialökonomie"⁴. In this work that, although published only a few years ago, has already obtained a great and deserved authority a simplification of the system of Léon Walras has been accomplished, to such an extent that every serious student, willing to take some trouble, can penetrate into the fundamental thoughts of the Mathematical School⁵. Prof. Cassel's work is not merely a simplification of the theory of Léon Walras. There are other elements in his work and even where the two systems coincide in their main thoughts, there are some subtle differences. With regard to the present study, however, it is mainly this coinciding part of both theories that we are concerned with, while the differences are so subtle that for both reasons we need not give more than the principal thoughts of Prof. Cassel's theory of price formation. We

² Prof. J. Schumpeter: *Marie Esprit Léon Walras, Zeitschrift für Volkswirtschaft*, XIX., p. 397. A remarkable sample of the impopularity of the theory is given by Prof. Ch. Gide in his article, "Economic Literature in France," *Economic Journal*, 1907, p. 207.

³ Lausanne.

³ Pareto was his most noted Italian pupil. In modern times he seems to have adherents in France too. Among these is Mr. Antonelli, whose *Principes d'économie pure* is based on Walras' principles. Compare Prof. Ch. Gide: *Die sozialökonomische Literatur in Frankreich seit 1900, Die Wirtschaftswissenschaft nach dem Kriege*, p. 45.

⁴ In 1918. In 1925 Prof. Cassel published his *Fundamental Thoughts in Economics*, which contains a simple exposition of his principles but not the series of equations that we are here concerned with. The principles of that part of Prof. Cassel's theory that we shall here consider, were published as early as 1899 in an article, entitled "Grundriss einer elementaren Preislehre" (*Zeitschrift für die gesamte Staatswissenschaft*) and four years later in his work *The Nature and Necessity of Interest*.

⁵ As we were informed, a work has been written by Léon Walras, in which he tried to compress his theory into a simpler form. This work has, however, not yet been edited.

shall quote in notes the principal places in Walras' works, where the corresponding thoughts are to be found and we shall do the same with reference to some kindred subjects of Prof. Cassel's treatise. For a deeper analysis of Prof. Cassel's system we must refer the reader to Prof. Cassel's book and to our own doctor's thesis, which is essentially a critical commentary on it¹.

As we have explained in the previous chapters, there are three series of equations, which we must examine, as to whether they determine the system of prices or not.

The first of these series expresses the relation between the prices of the products and the quantities that can be sold of them at these prices. Prof. Cassel supposes that there are n kinds of goods, of which the prices are denoted as p_1, p_2, \dots, p_n , while the quantities that can be sold at these prices are represented by the symbols A_1, A_2, \dots, A_n .

The quantity that can be sold of each of these goods is *dependent on the prices of all goods*, for the demand of a person for one of the goods is not only dependent on the price of that article, but also on the prices that he has to pay for the other goods that he wants to buy². This quantity can, therefore be considered as a *function* of all prices, which procures Prof. Cassel the following series of equations :

$$\begin{aligned} A_1 &= F_1(p_1, p_2, \dots, p_n) \\ A_2 &= F_2(p_1, p_2, \dots, p_n) \\ &\dots\dots\dots \\ A_n &= F_n(p_1, p_2, \dots, p_n)^3. \end{aligned}$$

¹ *Het theoretisch-economisch stelsel van Gustav Cassel*, The Hague, 1926. Among other criticisms of Prof. Cassel's theory we mention Prof. A. Amonn : Cassel's System der theoretischen Nationalökonomie, *Archiv für Sozialwissenschaft und Sozialpolitik*, Bd. 51. Prof. Fr. H. Knight : Cassel's Theoretische Sozialökonomie, *Quarterly Journal of Economics*, XXXVI.

² This is a peculiarity of the theory of the Mathematical School, which is, in our opinion, perfectly justified. As it does not lie within the scope of our study, we cannot further expound the reasons of this mode of proceeding, which, however, the reader can find in Prof. Cassel's treatise and in our own work on this subject.

³ *Theoretische Sozialökonomie*, p. 117 (third edition). In a different way this condition is formulated in equations by Walras. Compare : *Théorie mathématique de la richesse sociale*, p. 38 et seq., or *Éléments d'économie politique pure*, p. 113 et seq. (édition définitive). In his *Grundzüge der Volkswohlstandslehre*, Professor A. Amonn accepts and uses Professor Cassel's equations.

commodities and thus, according to the first series of equations, the prices of these commodities.

By varying these supplies continuously we could practically speaking get all prices that we want and, if a given set of prices were accepted for the means of production, we could invest in each branch of production so many productive elements that the price of each commodity would be equal to, or at least approximately equal to its cost, when calculated on the basis of the given prices for the means of production, account being taken of the technical co-efficients, which are also given.

This proof of the indefiniteness of the problem, however, shows at the same time, which is the missing condition and what absurd consequences we attain by disregarding it. The third set of conditions, which limits the problem further and therefore makes it definite, is the *scarcity of the supply of the means of production*. We shall assume that this scarcity is an absolute one. This is not so in real life, of course, but we have emphatically limited our study to the price formation of a given supply of means of production and therefore avoid all problems, concerning supply¹.

Prof. Cassel denotes the quantities available of the r means of production as R_1, R_2, \dots, R_r . The third condition, limiting and determining the system of prices may now be formulated as follows. *The prices of the means of production must be chosen so that the demand for any of them is equal to the available supply of it.*

Before showing how Prof. Cassel forms his third set of equations out of these materials, we shall show that this mode of proceeding is reasonable.

We have seen that any set of prices for the means of production can lead to a state of equilibrium, wherein the price of each commodity equals its cost, if the amounts of the different means of production may be chosen at random. But it is clear that when different sets of prices for the means of production are chosen, the equilibrium can only be reached

¹ See p. 6, Prof. Cassel assumes provisionally a fixed supply of the means of production, but afterwards conceives the supply of each of the means of production as a function of its price, which, of course, may lead to another series of equations.

with different volumes and compositions of the system of industry. But only one out of all these possible sets can lead to a state of equilibrium, in which just the available quantities of the means of production are required. It is possible that no set of prices leads to the use of all quantities available, but there is of course a set of prices that approximately accomplishes this. And that is all we want, because the difference could not be greater than a few small units of some means of production. These would be left unemployed but this would not prevent us from calling the situation a state of equilibrium.

Prof. Cassel expresses the third condition as follows. The quantity of each of the means of production, which is required for the total production of a commodity is equal to the product of the number of units of this commodity, which is produced and the corresponding technical co-efficient, that is, as we have seen, the number of units of the agent considered, required for the production of a unit of the commodity considered. We can calculate now, for each of the means of production, how much of it is required for the production of the equilibrium amounts of all commodities and so obtain for every one of them a series of products of technical co-efficients and equilibrium amounts, which, when added together must furnish a sum equal to the available supply of the corresponding means of production.

This leads to the following series of equations :

$$\begin{aligned} R_1 &= a_{11} A_1 + a_{21} A_2 \dots + a_{n1} A_n. \\ R_2 &= a_{12} A_1 + a_{22} A_2 \dots + a_{n2} A_n. \\ &\dots\dots\dots \\ R_r &= a_{1r} A_1 + a_{2r} A_2 \dots + a_{nr} A_n. \end{aligned}$$

The solution of the equations is now comparatively easy. In itself the third group is insoluble, because it contains r equations and n unknown factors. According to the first group of equations, however, the A 's are functions of the p 's and these are, according to the second group of equations, functions of the q 's. It is, therefore, possible to express the

¹ *Theoretische Sozialökonomie*, p. 121, corresponding to the series (3) of Walras. Compare *Théorie mathématique*, p. 64 or, *Éléments*, p. 212 (édition définitive).

A's in q's so that then the third group of equations contains r unknown factors and r equations and thus is soluble.

By this process it is proved that the system of prices can be determined under certain conditions¹, independently of the process of valuation.

When we had criticized the theory of valuation, we asked, whether perhaps a direct relation between the prices of the products and those of the means of production could be found to exist. Such a relation really does exist. It may not be said, however, that the prices of the commodities determine the prices of the means of production, for, as Prof. Cassel has rightly remarked, the whole system of prices is determined at the same time and by the same conditions, and we cannot say that one set of prices governs the other. Which are, then, the elements that determine the system of prices?

These are the given co-efficients of the equations, which Prof. Cassel divides into two groups: the *objective* and the *subjective determinants of price*.

Of the objective there are two: the technical co-efficients² (a), and the available quantities of the means of production (R). There is only one subjective determinant: the given relation between the quantities, demanded of the different products and their prices³.

Prof. Cassel, therefore, protests against the "objective" theory of prices, as well as against the "subjective" theory of prices. It is, according to Prof. Cassel, erroneous to say that cost determines price, but it is, in his view, just as erroneous to say that cost is determined by price and that price is determined by subjective valuation². We must however, not forget that the "subjective" theory of prices also acknowledges one of the "objective" determinants of price: the scarcity of the means of production. Even the term "marginal utility" contains an objective and a subjective element: it is a subjective valuation with regard to a certain quantity of goods.

The cardinal difference between Prof. Cassel's theory and the

¹ Compare Chapter XIII: of the present work.

² *Theoretische Sozialökonomie*, p. 122.

³ *Theoretische Sozialökonomie*, pp. 76-77 and pp. 123-124.

theories of Menger, Von Böhm and Prof. Clark relates to the third determinant, to which recourse is taken for the solution of the problem of prices. And this third condition is in the theories of Menger, Von Böhm and Prof. Clark the assumption that the valuation of the means of production furnishes an adequate basis for price formation, while in the system of Prof. Cassel it is the assumption that the technical co-efficients are to a certain extent given and have an independent influence on the system of prices.

Although we cannot pay much attention to this question as it is not directly connected with our problem, we must remark that this really is in a certain way a synthesis of the objective and subjective theories of price. The influence of conditions of demand with reference to products, is acknowledged and so is the influence of the scarcity of supply of the means of production. But Prof. Cassel also acknowledges the influence of a cause, working in the realm of cost and this is not cost of production itself, but the technical co-efficient, which is one of the elements, determining cost. The relative quantities of the different means of production used thus obtain influence. *But it is clear that acknowledging this is equal to approaching Ricardo.*

This is Prof. Cassel's own interpretation of the dead formulas of his school, in our view, one of the most valuable contributions to economic science in modern times¹.

We must now end this short and incomplete exposition of the principles of Prof. Cassel's theory of prices, as it is sufficient for our purposes. We have reduced Prof. Cassel's system of formulas from seven series to three. This, however, involves us in no mistake, but is to a certain extent a simplification, although for didactic reasons Prof. Cassel was right to pass through seven phases in his text-book.

We have avoided the problems caused by the element of time, which, of course, is not done by Prof. Cassel. Neither

¹ For the problem of the relation between Cassel and Ricardo the following literature should be consulted: Prof. A. Amonn: *Ricardo*, p. 118 et seq; Dr. Ed. Lukas: *Ricardo und Cassel, Jahrbücher für Nationalökonomie und Statistik*, Bd. 119, 1922.; Prof. G. Cassel: *Die Produktionskostentheorie Ricardos und die ersten Aufgaben der theoretischen Volkswirtschaftslehre, Zeitschrift für die gesamte Staatswissenschaft*, 1902.

have we used his peculiar phraseology, which, although perhaps expedient in some cases, did not suit to our purposes. For we have reached his theory by passing through a series of other thoughts and the sudden acceptance of a new phraseology would have seemed to be the introduction of a new element of thought and therefore would have unnecessarily complicated our exposition. For the same reason we have avoided all the elements of Prof. Cassel's theory that do not directly affect our trend of thought.

We must, however, still pay some attention to a completion of the series of equations, which is necessary in Prof. Cassel's system. All prices are expressed in "money", in his reasoning. The prices of the agents of production, however, are incomes for those who get them and thus influence their demand for the different commodities. The first set of equations, which expresses the conditions of demand, is therefore not independent of the q 's. This is why Prof. Cassel completes his system with an additional series of equations. We purposely avoid the difficulties connected with the problems underlying this reasoning, which in our view belongs to the most disputable parts of Prof. Cassel's work and must refer the reader to our analysis of his system¹.

His "supplementary principles" do not concern us here. With one exception, however, as we shall see in the next chapter, that is to say, the principle of substitution.

The system is essentially static and studies the state of equilibrium. A change in the given co-efficients of the equations, of course, means a change in the system of prices and a movement towards another equilibrium. This is no complete exposition of economic dynamics, of course, but it is sufficient for our purposes.

The theory we have considered in this chapter seems to us in the main a sufficient basis for an analysis of price formation and thus for the theory of wages. Wages are to be searched for in the sets of equations among the q 's. It may not be said that they are one of the q 's, as a matter of course,

¹ *Het theoretisch-economisch stelsel van Gustav Cassel*, §9.

² They are related to the problems of differential cost, increasing returns, joint supply and substitution.

as there are many kinds and grades of labour, which it is perhaps most expedient to consider as quite different objects of price formation.

We have some objections to the form in which the theory is expounded. But we shall not enter into an elaborate criticism, because that would go beyond the scope of our work and also because we have done this in another work, already mentioned.

The principles of wages, which this theory gives us, are in our view wholly adequate. They are simple and clear and what is of particular advantage in our time, they furnish a fine basis for *quantitative study*.

For there is no doubt that the trend of economics is towards quantitative analysis. Qualitative analysis, said Alfred Marshall some twenty years ago, has achieved the greater part of its work, but there is a large field open for quantitative research¹. And in recent times it seems that this prophecy of that great British economist is coming true².

This mathematical theory, which reduces the greater part of economic problems to relations between given and unknown quantities is a fine foundation for quantitative research. Though, sometimes, objections are expressed to "merely quantitative" researches³, we do not think that quantitative analysis on the basis of mathematical theory is open to these objections.

Sometimes a distinction is made between "description of functional relations" (Schumpeter) and the detection of economic causality. It is held then, that discovering the functional relation between prices and quantities of goods is not equal to expressing the action of the law of cause and effect in economic life.

In a certain way this is true. It is not possible to expound the essential truths that economic life contains, without entering into the psychology of human behaviour.

¹ A. Marshall: "The Social Possibilities of Economic Chivalry," *Economic Journal*, 1907, pp. 7-8. We have not exactly reproduced Marshall's words.

² Compare Prof. Wesley Mitchell: "Quantitative Economics", *American Economic Review*, 1925.

³ Compare Prof. H. Oswald: *Vorträge über wirtschaftliche Grundbegriffe*, p. 179.

The prime causes of all social phenomena are of a psychological kind, and the economic phenomena are no exception to this rule¹.

The point of contact between the problem of price and the psychology of man has, however, till now been the theory of valuation. Prof. Cassel has opposed the theory of valuation as a whole and this is, in our view, not right. However, *with regard to the formation of the prices of consumer's goods* we do not consider the problem of the position of the theory of valuation in economic science very important. It is a matter of determination of the scope of study and no more. Those, who are satisfied by deducing prices from the subjective valuations of the buyers in the market and disregard the problem that is behind these valuations, may do so, except when their purpose is to detect economic causality. And for many purposes this mode of proceeding is sufficient. Prof. Cassel does not even start from given valuations, but only supposes the functional relation between the quantities sold of all the articles and their prices to be given. This is also allowed for many purposes.

Only, when the full detection of economic causality is aimed at, which is the case in every textbook that pretends to this and most of them do so, it is necessary to give an explanation of the forces that cause the people to act as they do or would do under certain conditions.

With regard to the formation of the prices of producer's goods, however, things are different. For, as we have seen, the prices of the means of production cannot be conceived as the result of valuation and the functional relation that determines all prices and thus also those of the means of production, leads in this respect to other results, which are, as it seems, independent of valuation. With regard to the prices of consumer's goods it might be said that the theory of value is a completion of the functional relation between quantities and prices, a completion, which is necessary for the full comprehension of the phenomena considered.

But with regard to the prices of producer's goods *the complementary character* which these goods usually have seems

¹ Compare R. Eisler: *Sociologie*, §12.

to destroy the relation between valuation and price formation, because, as we have seen, the sum of the values of the complementary producer's goods exceeds the value (or price) of the product, while the sum of the prices, paid for these producer's goods is equal to the price of the product and, as it seems, these prices are determined wholly independent of the valuation of producer's goods.

Does this mean that the valuation of producer's goods has no influence at all on their prices? It is clear that this result would be absurd. Although it must be admitted that the prices of the means of production are not directly determined by valuation, it is very likely that valuation must have some influence. This we shall examine in the following chapter.

CHAPTER XIII

THE SYNTHESIS OF THE THEORY OF MARGINAL PRODUCTIVITY AND THE PRINCIPLES OF DISTRIBUTION OF THE MATHEMATICAL SCHOOL

WITH regard to the problem of distribution two lines may be traced throughout the history of economic science of the last fifty years. One starts from Gossen and Menger, from Stanley Jevons and Marshall, and culminates in the theory of marginal productivity, as it is given by Prof. J. B. Clark.

The other line starts from Walras, leads to Pareto, and his other immediate followers, but remains invisible to the greater part of the world, except for that portion that comes to the surface in Von Wieser's system. In recent times, however, it suddenly reappears in the theory of Prof. Cassel and gains public attention.

The economists of the first group have given a theory of the *valuation* of producer's goods, which does not directly lead to an acceptable theory of price. Those of the second group have given a theory of the *prices* of producer's goods, which seems to be wholly independent of the valuations of these goods.

We have accepted the principles of price of the second group, as well as the principles of value of the first. This forces us to determine the relation in which they stand to each other.

In the previous chapter we have assumed that the *technical co-efficients* which were one of the groups of factors that determined the system of prices, were given. This assumption may, however, only be made provisionally. In fact, there is a problem behind this. Which are, in real business life, the motives for choosing the technical co-efficients?

In trying to solve this problem we shall assume that a certain set of technical co-efficients is first given and that a

certain corresponding set of prices has established itself. If we further assume that the choice of these given technical co-efficients was rather arbitrary, then it is obvious that the situation will not endure. For a change in the technical co-efficients will cause a gain for the enterpriser and if we assume that he pursues his own interests in a shrewd manner, and this, of course, we must assume, it is clear that he will try to obtain the greatest possible advantage with the smallest possible cost. Thus he will change, within the limits of possibility, his technical co-efficients to such an extent that the greatest possible net advantage is obtained by him.

The reader will have recognized Marshall's *Principle of Substitution*. It is acknowledged by Prof. Cassel, who formulates it in the following way: When a method of production can be substituted by another without causing a change in the result of production that method must be chosen which in the given situation of prices for the means of production is the cheapest¹.

This does not always mean an entire change in the method of production, he continues, but often only means the substitution of a certain quantity of one of the means of production by a certain quantity of another of the means of production. "When a quantity of one of the means of production, or of a group of means of production can in this way be used instead of another, we say that these quantities are mutually *interchangeable* in the process of production with which we are concerned"².

When only a limited number of variations is possible, we can calculate, as soon as the prices of the means of production are given, the cost of each of the different methods and then determine which of them is the cheapest. But it is also possible, Prof. Cassel acknowledges, that a method of production can continually be changed, because "certain means of production supplant others in very small doses, without causing a change in the result of production".

In this case, too, the cheapest co-ordination must be found by substitution. As long as one of the interchangeable

¹ *Theoretische Sozialökonomie*, p. 91.

² *Theoretische Sozialökonomie*, p. 91.

quantities is still more expensive than the other the maximum result is not yet reached; the criterion of the cheapest co-ordination is that the last mutually interchangeable quantities, which are used in production have the same price². How much is to be used of the different means of production is thus dependent on the relative height of their prices.

Before proceeding we must examine, whether this reasoning is right. We have seen that the technical co-efficients belong to the factors determining the system of prices, among which are the prices of the means of production. But from the exposition that we have just considered it would follow that just the opposite was true and that the prices of the means of production determined the technical co-efficients. It appears thus that Prof. Cassel is reasoning in a circle³.

As soon as the technical co-efficients are changed, the prices must change too, and it is therefore not permissible to conceive the prices of the means of production as given quantities and to say that the process of substitution is then continued till with reference to these given prices a maximum of advantage is obtained. Account must be taken of the reaction of changes in the technical co-efficients on the system of prices.

At the base of this error is the fact that two *simultaneous* conditions are given a *successive* character. The principle of substitution is conceived by Prof. Cassel as a supplementary principle, and is only treated when the other principles of price, which we met in the previous chapter have been explained. In fact, it belongs to the fundamental principles of price and, although it is, of course, allowed to treat the problem of prices at first in a simple form, under the assumption that the technical co-efficients are given, this is in our view no reason for thrusting the principle of substitution onto the second place.

² *Theoretische Sozialökonomie*, p. 92. Compare Stuart Wood: *The Theory of Wages*, Publications of the American Economic Association, 1889.

³ This same objection may also be directed against a kindred reasoning of Walras.

We therefore have proposed elsewhere² to complete the system of equations of Cassel and Walras by the introduction of a new functional relation, viz., between the technical co-efficients and the systems of prices with reference to given conditions of demand and given quantities available of the means of production. For, these other things being equal, there would be for any set of technical co-efficients a different system of prices, and only one of these situations would afford the maximum of advantage and thus guarantee a true state of equilibrium.

There are many difficulties hidden under these simple sentences. We must, however, avoid them here, for we know enough to continue our expositions.

One thing must still be remarked, however. It is a peculiarity of Prof. Cassel's treatment of the problem that he analyses the possibilities of mutual substitution of the means of production *with reference to a fixed result of production.* He always speaks of quantities that can supplant one another, while the result of production is unchanged. We have no objection to this mode of proceeding. The influence of variation of the productive elements can be demonstrated just as well by comparing the amounts that are required for the production of a unit of produce with reference to different technical co-efficients, as by adding to or subtracting from a given amount of co-operating productive elements one or more units. There is only one advantage in this mode of proceeding that is of particular value for our purposes. For by this way of putting the problem it becomes clear that we are approaching the material that we were concerned with in another part of this analysis and which was the object of the theories of valuation.

Here, indeed, lies the point of contact between the mathematical theories and the theories based on the principle of marginal productivity. The bridge, connecting the two realms of economic thought, is the principle of substitution.

Prof. Cassel rejects the theory of valuation, and, in our view, he is wrong in doing so. He also rejects the theory of marginal productivity and in our view he is not quite right

² *Het theoretisch-economisch stelsel van Gustav Cassel*, §14.

in doing so. For, although we share most of his objections to this theory as a direct basis for the theory of price, we consider it as the only adequate basis of valuation. And that valuation plays a part must be admitted, and is, partly, also admitted by Prof. Cassel himself.

His objections are mainly based on the limited possibility of variation and on the thought which may be seen as a consequence of the acceptance of this fact, that the withdrawal of a unit of an element of production often means the destruction of the whole marginal product.

Now, there are, no doubt, *cases in which the technical co-efficients may, under certain conditions be regarded as fixed*². In these cases there is no such thing as the problem of the technical co-efficient and, if the case were general, the whole system of prices would be determined by the three series of equations that we have become acquainted with and there would be no room, either for the principle of substitution or for any influence of the valuation of the means of production on the system of prices.

In those *cases, in which only a few methods of production can be chosen*, while the choice of one of these methods at the same time fixes the technical co-efficients, there is room for the principle of substitution, but there is little room for any influence of the valuation of the means of production. For a more or less fundamental change in the method of production means a great change in the amount of several means of production, used for producing a certain quantity of a certain commodity. The change in the result of production that follows from this substitution is measured by the difference between the value of the produce before and after the substitution had taken place.

This might be conceived as a valuation and at the same time an imputation. Let us assume that the substitution took place in the form of the addition of some quantities of different means of production, then we might ascribe the increase of produce to these quantities' added, and this increase being one of the elements, determining the choice

² See p. 58 of the present work.

of the technical co-efficients², it could be said that valuation influenced the choice of the method of production.

But it must not be forgotten that this method of valuation is wholly different from the method that we have acknowledged as right. In the case assumed a certain value is ascribed to certain quantities of *several* means of production. This is, however, quite a different thing from the *separate* valuation of one of the means of production. Besides, we have assumed that an *addition* of quantities of different means of production took place. If we had assumed that of some of the means quantities had been added, while of some others quantities had been withdrawn, we would be entangled in the same difficulties that we met, when discussing Von Wieser's theory, where we got by subtracting two equations from one another, an equation, expressing that a certain amount of *x* minus a certain amount of *y* was equal to a certain definite amount³.

In the case that the quantity of only one of the means of production changes, we could, however, by comparing the results before and after the change, get something like a separate valuation of this element. *Not, however, a valuation according to marginal productivity.* For we should have before us the case we have discussed, when examining Von Wieser's theory³, with regard to the following couple of equations :

$$\begin{array}{r}
 20 a + 10 h = 100 \\
 20 a + 5 h = 75 \\
 \hline
 \text{thus} \quad 5 h = 25 \\
 \quad \quad h = 5
 \end{array}$$

We have remarked, when discussing this case, that the loss caused by the withdrawal of 5 *h* would be wholly different from five times the loss caused by the withdrawal of 1 *h*, that is five times marginal productivity, so that the value that we have got for 5 *h* may not be divided by 5 in order to get the real value of 1 *h*.

² The second element is, as we have seen, the relative heights of the prices of the means of production, or rather these prices before and after the substitution.

³ See p. 101.

³ See p. 95 *et seq.*

We must conclude, therefore, that also in this second case, that is when there are only a few methods of production, that can be chosen, the real separate valuation of the different means of production has no influence.

There is, however, a *third case*. This is the case *in which small quantities of the different means of production can continually and mutually supplant one another*. This case is, as we have seen, acknowledged by Prof. Cassel and we shall see that in this case the theory of valuation is of very great importance.

For what makes this situation wholly different from the one prevailing in the first and second cases is *that here the unit of variation is equal to the quantity that must be chosen as a unit of valuation*. Let us compare two co-ordinations of means of production, between which the only difference is that one of them contains one unit more of one of the means of production than the other. Then it is obvious that the difference between the value of the produce in both cases measures the value of that one unit that one of the co-ordinations contains more than the other. It is equal to what we have called the loss-value of that unit and as a consequence it is equal to the marginal productivity of the group of means of production to which it belongs, with reference to the unit of production that we have considered.

When we neglect, for the time being, the influence that the withdrawal of one such unit exercises on the price of the means of production considered, the extent to which substitution takes place is dependent on two things: on marginal productivity and on the prices of the means of production. But this is equal to saying that the whole system of prices and thus also *functional distribution is determined by two groups of principles: those which are implied in the Theory of Marginal Productivity and those which are expressed in the system of equations of the Mathematical School, that is: the principles of value and those of price*.

It is thus clear that a synthesis between the two theories is not only possible but that it is strictly necessary. Two questions, however, need still to be examined, before we can conclude our analysis.

The first question relates to the assumption that additions to certain co-ordinations of means of productions could remain without influence on their prices. This assumption can, of course, only be made provisionally and we have seen that in this respect an *interaction of causes* exists, that can only be expressed by a functional relation. Every change in the technical co-efficients results in a change of the system of prices and, when studying the extent, to which substitution is applied, account must be taken of the resulting changes in the system of prices, so that *the two quantities that must be compared during the process of substitution: the valuation and the price of the means of production are perpetually shifting.*

But this, of course, is no insurmountable obstacle and we have already seen how this difficulty can be solved.

The second and most important question relates to the extent itself, to which substitution can be applied. Prof. Cassel says that, when one of the means of production can be varied in small quantities, it will be applied up to that moment, *at which its marginal productivity will equal its price*¹. He gives an example in which there are two means of production that can continually supplant one another. It is thus clear that this principle of Prof. Cassel's can also, if it is true, be applied to the other means of production and the result would be *that the prices of both means of production would equal their marginal productivity.*

If this were true, however, and the case at hand were general, we should be able to explain the mechanism of price formation with the help of the theory of marginal productivity alone and we should not want the system of equations of Prof. Cassel. For the conditions expressed by them: conditions of demand, equality of cost and price and a demand for the means of production equal to their supply, would then be implied in the theory of prices based directly on the theory of valuation of Prof. Clark.

It is not true, however, and it is in contradiction to Prof. Cassel's own criticism of the theory of marginal productivity². We have seen that, if the prices of the means of production were based directly on their valuations their sum would exceed the value of the product created by them. It was just

¹ *Theoretische Sozialökonomie*, p. 93.

² Compare p. 50.

this obstacle that forced us to leave the theory temporarily and which brought us in contact with the mathematical theories.

We are at a point now where we are forced anew to face the theory and as a consequence we are in the same difficulty. This difficulty is not removed and therefore we cannot accept the above-mentioned consequences of Prof. Cassel's reasoning.

All the same the situation is somewhat different from that presented when the theory of marginal productivity is conceived as a direct basis of the theory of prices of the means of production.

The cardinal objection to the theory of marginal productivity is, as we have seen, only tenable *when there is a limited possibility of variation and when the assumption of the perfect mobility of capital cannot be made*¹. But here we are only concerned with the case in which there is a perfect freedom of variation, *while we are allowed to reckon with a certain mobility of capital.*

When marginal productivity had a direct bearing on price, only the loss resulting from the withdrawal of a marginal unit under actual circumstances, could be considered. The marginal value *at one moment* would then influence the prices at that same moment and this whole process would be of a *static kind*.

The process of substitution, however, is essentially dynamic, and therefore it is, to a certain extent, permissible to reckon with the capacity of capital and labour to adapt themselves to changes in the relation in which they are combined.

Strictly speaking there are two kinds of substitution. One of them relates to *short periods*, in which it is not possible to adapt a certain amount of capital to a changed number of labourers. This might be conceived as an object of static study. This is, however, a matter of terminology. Some writers take a wide view of "economic dynamics", others prefer a narrower notion and for our present purposes it is not strictly necessary to examine this question.

In this short-period substitution the value added to a certain process of production by an additional labourer must

¹ See Chapter VI.

be equal to his loss-value, that is marginal productivity under existing circumstances. In this case it is, as we have seen, out of the question that the labourer would ever receive as payment what is dependent on his collaboration. It would be either too little or too much, and if there were also other means of production of which the prices were to equal their marginal value, our cardinal objection would immediately destroy the illusion of this possibility.

The other kind of substitution, however, relates to *long periods* and is in any case purely dynamic. Let us assume that an enterpriser, working with much capital and comparatively little labour, resolves to accept a new scheme of production, which forces him to take more labourers while the amount of capital required remains constant—a case which does not often occur in real business life!—and that he can carry out this change gradually, so that every time that an old machine is worn out and is exchanged for a new one, he can appoint a new labourer. Then it is clear that the value of a labourer to the enterpriser is not equal to the static loss-value of this labourer. As soon as the new labourer is added the new machine is there and capital has adjusted itself to the increase of the amount of labour by one unit.

This is, however, still a different matter from an *unlimited* capacity of capital to change its forms and although in this second case of substitution the cardinal objection to the theory of marginal productivity is considerably weakened, we do not think it is destroyed and must conclude therefore, that even in this case the argument keeps some force. Substitution cannot go so far that the prices of the means of production equal their marginal productivity, because then the sum of these prices would exceed the value, available for distribution.

To say that substitution could at least for one or more of the means of production be carried so far, is, of course, no way out. This would be an arbitrary mode of proceeding, somewhat akin to the residual theory, but without support from the special circumstances that lead to that theory¹.

In our view the only tenable solution of the problem is

¹ See Chapter IX.

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the following. *When there is an unlimited possibility of variation the discrepancy between the prices and the valuations of the means of production gives rise to a process of variation that is carried on so far that the highest possible result under the given circumstances is obtained.* Those substitutions, in which the value exceeds the prices paid for the means of production by the greatest amount, will be applied and this will go on till the gain is compensated by the loss that is, of course, caused by the withdrawal of the means that are used for substitution, from the places where they were used before.

We may therefore conclude that, although in the realm of distribution value does not directly determine price, it is still of fundamental importance for the determination of the system of prices, because it is the compass, indispensable in the course of industry, that affords guidance with reference to the direction of substitution in those cases, where there is perfect freedom of variation.

It appears thus that a full comprehension of the problem of distribution is only possible through a synthesis of the theory of marginal productivity and the principles of distribution of the Mathematical School.

CHAPTER XIV

SUMMARY AND CONCLUSION

IN our analysis we have been concerned with some fundamental problems of functional distribution and only rarely have we referred to the special case of wages.

This was, however, absolutely necessary and was only a natural consequence of the choice of our subject. As we have said in our introductory chapter, we wanted to search for the *principles* of wages. And even these we wished to consider from the side of demand alone. We therefore excluded the problems of supply from the scope of our work and thus restricted our attention to the formation of price with reference to a given supply of labour and to given circumstances of other kinds.

When the problem of wages is viewed from this side, however, *there is no such thing as a separate theory of wages.* There is only a certain relation between prices of consumer's goods and prices of producer's goods in general, and thus we were forced to study the principles of functional distribution. Only when details are considered, there may be some, though never an essential difference between the formation of the prices of different producer's goods. Of course, when the study of supply is introduced, this is changed and in this respect we might perhaps even speak of essential differences. We have not considered the problem of differences between qualities in the means of production and have avoided the difficulties connected especially with the income, obtained by the possession of capital goods and its relation to interest. Therefore, we did not give a theory of functional distribution as a whole, but only examined that part of the problem that was absolutely necessary to attain the principles of wages in their most simple form. Also for that reason we confined our analysis to static conditions.

Under these circumstances wages may be conceived as one of the prices of the means of production that we were concerned with. It is one of the *q*'s in Prof. Cassel's system of equations while labour is one of the objects of valuation in the theory of marginal productivity. And in consequence of our conclusions at the end of the previous chapter we may now say that wages are determined by the same conditions that determine the whole system of prices, that is to say the three conditions implied in the system of equations and the Principle of Substitution or in other words: the conditions of demand for consumer's goods, the technical circumstances of production, the available supply of the means of production, the valuation of producer's goods, and, as we are searching for a static standard, the condition that a state of equilibrium is attained under these circumstances.

As soon as the *differences in quality* between the means of production are introduced, complications arise. They may be classified under three heads. First, instead of as one homogeneous quantity of a means of production we must consider labour as consisting of many different kinds and grades, which must *provisionally* be considered as different objects of price formation. This means that instead of one *q* we get many *q*'s for labour alone. In the second place it should be examined, in how far mutual substitution is possible between these different kinds and grades. The third complication is much akin to the second and consists in the necessity of determining the exact relation between the prices of means of production of the same kind, but of a different quality, which, to a certain extent, compete with one another.

But all this lies beyond the scope of our work and we cannot dwell upon it.

We are nearing the end of our examination of the principle of wages. In our introductory chapter we said that we should examine all theories, which from our point of view, were interesting. We were to consider those that failed, as well as those that had been successful, and we said that both groups had contributed to the progress of science and that the study of the failures was not less instructive than

that of the others. In our view the result of our researches justifies this expression.

There is in the history of science something like a law of the preservation of energy. The energy by which the stars are burning is never wasted and the same is true with reference to the brilliant thoughts of a science. Some seem to be burning eternally; others die out gradually, but, long afterwards, when they are almost forgotten, they reappear and flame anew with unparalleled splendour. Still others entirely disappear, but the energy which blazed in them, may be found again in some of those gaseous nebulae which are worlds in the making.

Still another comparison may be in place here, one from the realm of biology. Organisms are steadily developing and in many directions. But only those that seem to conform most to the circumstances, in which they must live, survive in the struggle for existence. It has often been remarked after Alfred Marshall, that what happens in business life is much akin to this. This is, to a certain extent, true. All lines of development are tried and those who have seized the right line survive and social distinction is their reward. But those who have shed out their energy in a wrong direction are economically destroyed and it is often forgotten that they have rendered a very useful service to society.

For, under present conditions, it is never possible to predict infallibly the outcome of any enterprise. Estimations, of course, can be made, and those made by able business men often come true, but there is still in our ever-changing society an element of chance that introduces too much of a gamble into business-life which may, however, be diminished by quantitative economic research and other activities. As long as this uncertainty prevails, failures continue to be just as instructive as successful attempts.

Likewise, in scientific research, it is sometimes possible to detect at once the right way of solving a problem. But with regard to most problems of economic theory this is entirely out of the question. The interdependence of economic quantities is so intricate that those who were the pioneers in this realm were predestined to fail. But together they have

furnished the materials with the help of which later generations could form for themselves an adequate idea of the interaction of causes that exists in our field of research.

This is especially true with regard to the problem of the relation between the prices of consumer's goods and those of the means of production that constitute them.

It is comparatively easy to say now that Say was not right and that Ricardo was wrong. But their thoughts are links that could not be missed in the chain of thoughts that we have followed in order to attain our conclusions.

Likewise, in the narrower field of imputation ; it is not difficult to see now that Von Böhm's theory is, as a whole, not tenable and that the residual theory was a failure. But all these lines of thought had to be followed, before the right path could be found.

Modern experiments have proved that a creeper finds its way, even when a sheet of glass with only a few holes in it is put above it. When its top reaches the glass plate, it searches and tries many possibilities before finding its opening. The same thing happens in science. Although some very lucky attempts are at once successful, as a rule the right path can only be found by searching and groping. And the failures, even those that *afterwards* seem the most absurd, have the immense value of warning the succeeding generations to concentrate their attention on the remaining, narrower field.

" Es ist packend, zu sehen ", says Prof. Othmar Spann, " wie selbst der absurde Gedanke, immer wieder in der Geschichte rücksichtslos zu Ende gedacht wird. Das ist ein Groszes in den Menschen, dasz sie bis zum äussersten Gipfel des Möglichen gehen ".*

We have excluded a great part of the attempts to solve the problem of functional distribution by considering only those theories of the last fifty years that we thought of fundamental importance from our point of view. Starting from Gossen and Menger, we have examined Von Böhm's casuistic theory, based on the loss-principle and we have seen how Prof. Schumpeter, after having gone for a time on the lines of this theory, joined the theory of marginal productivity.

* Prof. Othmar Spann : *Der wahre Staat*, p. 21.

This theory, also related to Marshall, Jevons and some other economists, we have expounded and criticized, as far as was necessary for our purposes, in the most perfect form in which it exists, and in which it was expounded by Prof. J. B. Clark. Then we have examined the different objections that have been expressed against this theory, of which only one proved to be tenable: the objection that, when the prices of the means of production are equal to marginal productivity, the sum of these prices would exceed the sum available for distribution. As a consequence of this objection we had to reject this theory as a direct basis of the theory of the prices of the means of production, not however, as a theory of their valuation.

This objection led us to the research of other possibilities of determining functional distribution. The residual theory proved to be no way out. But the objection itself contained a condition that played an important part in Von Wieser's theory of imputation. An examination of Von Wieser's theory, however, forced us to penetrate deeper into the realm of mathematical economics and so we had to expound and investigate the theory of Walras and Prof. Cassel. This led to a satisfactory result and we therefore joined this theory of prices.

We then had a theory of *prices* for the means of production, based on several series of equations and a theory of *value* for these means of production, based on marginal productivity. These two theories seemed at first to stand in sharp contradiction to one another, but we have made an attempt to reconcile them and thus hope to have attained a solid foundation for the theory of wages, which in our view is an adequate basis for further research, particularly for quantitative research.

A second conclusion that we can come to is that *functional distribution is wholly determined by economic law* and we thus had no need to examine the Bargain Theory of Wages. This result is often supposed to be attained by the theory of marginal productivity. As, however, we had to reject the theory of marginal productivity as a direct basis of the theory of distribution, we had to prove it anew. This we believe to

have done by expounding Prof. Cassel's theory. When combining its leading principles with those of Prof. Clark's theory, we have seen that this result remains and is by no means destroyed.

Our third and last conclusion is of a *practical* kind. When functional distribution is determined by economic law, it is clear that no artificial change in it could be successful. *The only method of increasing wages is to change the circumstances, so that a more desirable distribution is guaranteed by the action of economic laws*¹.

What we can do is, according to Prof. Cassel, *to influence the given quantities in the process of price formation, so that a more favourable distribution results*².

One of these given factors is the distribution of property. The most important one is the *relative scarcity of the supply of the different agents*. The highest wages can be obtained when there is much capital and relatively little labour. A third measure of fundamental importance is the improvement of the quality and efficiency of labour through a good system of education.

The first thing necessary is, however, that the total produce is great, so that the absolute amount available for distribution is large. "The social problem", says Prof. Cassel in an earlier work³, "is . . . essentially a problem of greater production".

We cannot penetrate deeper into this most interesting problem. But we know enough to conclude that, although functional distribution is determined by economic law, much can be done to improve it and that perhaps more can be done to improve personal distribution, although not *too* much must be expected from changes of the last mentioned kind.

All human action is limited by Nature. The times of mere utopianism are gone and all contrivances for social betterment have now to reckon with Nature's limitations.

¹ Of course, when economic law is not perfectly realized, an improvement of the labourers' conditions may be obtained by removing the obstacles that paralyse its action.

² Compare p. 163 *et seq.* of his *Theoretische Sozialökonomie*.

³ *The Nature and Necessity of Interest*, p. 186.

The weaker brethren among the idealists are disheartened by these obstacles, but the stronger ones know that a natural limitation of their possibilities is at the same time a justification of the endeavours to attain the greatest possible perfection within these limits.

The best artists have been those who knew only too well the limits of their material. The social reformer should take the same attitude and far from contriving schemes beyond the realms of possibility and just as far from being discouraged by the limitation of his actions, he should strive for *the realization of the highest desires within the limits of possibility.*

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