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# THE VALUE OF MONEY

## SUMMARY

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## I

§ 1. THE writing of this article has been suggested by Professor Anderson's recent volume on the *Value of Money*. But the article is not directly concerned with the content of that volume. For Professor Anderson's discussion is mainly vigorous controversy, and my view is that controversy on this subject is no longer necessary. The "quantity theory" is often defended and opposed as tho it were a definite set of propositions that must be either true or false. But in fact the formulae employed in the exposition of that theory are merely devices for enabling us to bring together in an orderly way the principal causes by which the value of money is determined. As to what these principal causes are, competent writers of all schools are, I venture to think, really in substantial agreement. The logical machinery

of the "quantity theory" has set them by the ears because they have not always realized that it is merely machinery. It is as tho economists who expressed the general theory of value with the help of diagrams should quarrel with those who prefer language or those who prefer algebra. All ways are merely devices for facilitating an orderly arrangement of ideas; and, tho a debate about their comparative convenience and helpfulness is, of course, legitimate, to suppose that this debate implies any fundamental disagreement about the real causes at work would be a grave mistake. Into this mistake, as it seems to me, controversial writers about the "quantity theory" have too frequently fallen; and, therefore, at the outset I insist that, tho the machinery that I shall suggest in the following pages is quite different from that elaborated by Professor Irving Fisher in his admirable *Purchasing Power of Money*, and, as I think, more convenient, I am not in any sense an "opponent" of the "quantity theory" or a hostile critic of Professor Fisher's lucid analysis. He has painted his picture on one plan, and I paint mine on another. But the pictures that we both paint are of the same thing, and the witness of the two, as to what that thing in essentials is, substantially agrees.

## II

§ 2. By money I mean for the purposes of this discussion legal-tender money; and by the value of money I mean the exchange value of a unit of it. The question whether it is proper to use the term value in this sense — a question which Professor Anderson discusses with great elaboration — seems to me to be concerned with linguistic suitability and to have no scientific importance. Economists in general use value to mean "exchange value," and I see no need to invent a new term.

But the "exchange value of a unit of money" cannot, of course, be left without further definition. Exchange value in terms of what? The answer, of course is, in terms of commodities. But commodities or, as some prefer to say, "commodities in general," is a vague phrase. In the chapter on "The Measurement of the National Dividend" in my *Wealth and Welfare* the problem of its proper interpretation for various purposes was discussed. For the present purpose it is convenient to adopt a plan similar to that employed by Dr. Marshall in his unpublished paper on the "Pure Theory of Foreign Trade," which has been reproduced in Professor Pantaleoni's *Pure Economics*, and to assume that the value of all commodities other than money in terms of one another is determined independently of the value of money. On this assumption, the value of any combination of commodities in general can be cited in terms of any single commodity. The aggregate of all commodities is represented by so many bushels of wheat; and the value of money by the number of bushels of wheat which a unit of it will purchase. This value is governed, like the value of everything else, by the general conditions of demand and supply. An investigation of the causes upon which the value of money depends means, therefore, just as it would do if we were concerned with lead or tobacco, a detailed analysis of these two groups of forces. To this analysis, therefore, we may at once proceed.

### III

#### *The Demand for Legal Tender Money*

§ 3. In the ordinary course of life, people are continually needing to make payments in discharge of obligations contracted in terms of legal-tender money. Some

of these payments have to be made across the counter, as when commodities are bought for cash; others at some specified date after purchase, as when they are bought on three-months' bills; others at some unspecified date after purchase, as when they are bought vaguely on credit. Besides the flow of obligations that are thus continually maturing against them, most people have also a flow of claims that are similarly maturing in their favor. But the obligations and the claims that become due at any moment seldom exactly cancel one another, and the difference has to be met by the transfer of *titles to legal tender*. Under this name I include actual legal tender (for practical purposes token coins may be reckoned as part of this), bank notes, and bank balances against which checks can be drawn. If a person is unable to meet his obligations from these sources when they fall due, he will certainly be inconvenienced and will possibly be rendered bankrupt. Hence everybody is anxious to hold enough of his resources in the form of titles to legal tender both to enable him to effect the ordinary transactions of life without trouble, and to secure him against unexpected demands, due to a sudden need, or to a rise in the price of something that he cannot easily dispense with. For these two objects, the provision of convenience and the provision of security, people in general (I do not here include bankers, whose special position is discussed later) elect to hold in the form of titles to legal tender the aggregate value of a given quantity of wheat. In other words, they offer a demand price per unit for titles to legal tender equal to the aggregate quantity of wheat that they have determined upon, divided by the aggregate number of legal tender units for which titles are forthcoming. There is thus constituted at any given moment a definite demand schedule for titles to legal-tender

money. Let  $R$  be the total resources, expressed in terms of wheat, that are enjoyed by the community (other than its bankers) whose position is being investigated;  $k$  the proportion of these resources that it chooses to keep in the form of titles to legal tender;  $M$  the number of units of legal tender, and  $P$  the value, or price, per unit of these titles in terms of wheat. Then the demand schedule just described is represented by the equation  $P = \frac{kR}{M}$ . When  $k$  and  $R$  are taken as constant, this is, of course, the equation of a rectangular hyperbola.

§ 4. From the demand schedule for titles to legal tender is *derived* a demand schedule for legal tender itself. The derivation is as follows. The titles to legal tender that people hold are kept in two forms, partly in actual money in their pockets and tills, and partly in bank balances. If bankers with whom these balances are deposited retained the whole of them in legal tender in their vaults, the derived demand schedule for legal tender would be exactly the same as the direct demand schedule for titles to legal tender. In fact, however, bankers only keep a money reserve equivalent to a part of the balances that they hold for customers. Hence, whereas that part of their immediately available resources which people choose to keep in cash, constitutes a demand for actual legal tender equal to the corresponding demand for titles to it, that part which they keep in bank notes and bank balances gives rise to a demand different from itself, and smaller. The magnitude of the total derived demand depends, therefore, in part, upon the choice that the general body of the public exercises in this matter. The derived demand schedule for actual legal tender is capable, like the original demand schedule, of being represented by an

algebraic formula. Let  $c$  be the proportion of his titles to legal tender that the representative man chooses to keep in actual legal tender (including token coins), so that  $(1 - c)$  is the proportion that he keeps in bank notes and bank balances; and let  $h$  be the proportion of actual legal tender that bankers choose to keep against the notes and balances held by their customers. Then the derived equation of demand for actual legal tender will be:

$$P = \frac{kR}{M} \{c + h(1 - c)\}, \text{ or } M = \frac{kR}{P} \{c + h(1 - c)\}.$$

When  $c$  and  $h$ , as well as  $k$  and  $R$  are taken as constants, this equation, like the simpler one from which it is derived, is the equation of a rectangular hyperbola.

§ 5. It cannot be denied that this formula has a somewhat arid appearance. I propose, therefore, to clothe the dry bones by a brief separate study of each of the variables which it includes. First consider  $R$ , representing the community's total real resources of commodities, expressed, for convenience, in terms of so many bushels of wheat. My formula shows that, other things being equal, the larger this variable is, the higher will be the demand schedule for money. It is, therefore, important to observe that  $R$  is likely in general to be increased by developments that bring the forces of nature more effectively under man's control; such as an increase in the efficiency of the people individually, or an increase in their collective efficiency either through mechanical inventions or through inventions in business organization. This generalization does not, however, hold good of inventions that facilitate the production of commodities for which the elasticity of demand is less than unity; for an increase in the quantity of these commodities involves a decrease in the aggregate quantity of "wheat value" in existence, and

so tends to lessen the quantity of "wheat value" that people need to keep in the form of titles to legal tender. This becomes obvious if we take an extreme case and conceive of a commodity whose quantity is increased with the result of reducing its aggregate wheat value to zero.

§ 6. Secondly, consider the variable  $k$ . When the aggregate wheat value of the community's resources is given, the quantity of wheat value kept in the form of titles to legal tender is determined by the *proportion* of his resources that the average man chooses to keep in that form. This proportion depends upon the convenience obtained and the risk avoided through the possession of such titles, by the loss of real income involved through the diversion to this use of resources that might have been devoted to the production of future commodities, and by the satisfaction that might be obtained by consuming resources immediately and not investing them at all. These three uses, the production of convenience and security, the production of commodities, and direct consumption, are rival to one another. For our present purpose, the use of immediate consumption need not be particularly considered. Its presence mitigates, but never does more than mitigate, the effect of the principal causes with which we have to deal. Practically, the critical question for a business man — and the same class of question has to be asked by everybody — is, as Professor Carver well observes: "will it pay better to have one more dollar in his cash drawer and one less on his shelves, or will it pay better to have one less dollar in his cash drawer and one more on his shelves." <sup>1</sup>

It is easily seen that the satisfaction yielded by successive units of resources devoted to future production

<sup>1</sup> American Economic Association Papers, 1905, p. 131.



diminishes as the number of units so devoted is increased. For nobody denies that the satisfaction a man obtains from the one hundredth unit of any commodity is likely to be less than he obtains from the ninetieth, and nobody supposes that production in general obeys the law of increasing return in a measure adequate to counteract this tendency and to cause the *fruits* of the tenth unit of resources invested in production to yield more satisfaction than those of the ninth. An exactly analogous proposition holds good of the satisfaction yielded by successive units of resources held in the form of titles to legal tender. So far as money is desired as a means for facilitating exchange, this is well shown in the following passage: "Some exchanges could scarcely be made at all without the use of money. In these cases the utility of money is very high, and would equal the utility of the exchanges themselves; that is, the advantage of being able to exchange, over the disadvantage of not being able to make the exchange at all. Some exchanges could only be made with great difficulty without money, in which cases the utility of money would be considerable. Some other exchanges could be made with comparatively little difficulty, in which cases the utility of money would be inconsiderable. And some exchanges could be made as easily without money as with it, in which cases the utility of money will be *nil*." <sup>1</sup> Reasoning of the same general kind clearly holds good in so far as money is desired as a means of providing security. Thus the curves that represent the desire for resources to be used in production and in money respectively both slope downward; and resources will be devoted to the two uses up to the point at which the last unit of resources

<sup>1</sup> Carver, "The Concept of an Economic Quantity," *Quarterly Journal of Economics*, May, 1907, pp. 443-444.

devoted to each of them yields the same quantity of satisfaction. It follows that, other things being equal, the variable  $k$  will be larger the less attractive is the production use and the more attractive is the rival money use of resources.

The chief factor upon which the attractiveness of the production use depends is the expected fruitfulness of industrial activity. If a man understands that, in consequence of mechanical inventions or of an expected rise in the prices of the commodities in whose production he is engaged, a given quantity of resources invested in his business will yield an abnormally large return, he will be more anxious than he otherwise would be to devote resources to production. In the converse case he will be less willing than he otherwise would be to do this.

The factors which determine the attractiveness of the money use are more complex. The most obvious is the convenience to be got from a holding of titles to legal tender in the ordinary business of life. This partly depends upon the intervals of time at which people are accustomed to be paid for their services. If, for example, a man is paid £365 once a year, he is practically certain, on the average, to keep a larger proportion of his resources in titles to legal tender than he would do if he was paid the same amount in daily proportions of £1 each.<sup>1</sup> It also depends in part upon how far the organization of industry is adapted to allow the discharge of debts without resort, direct or indirect, to titles to legal tender. The importance of this consideration is well brought out in Sir Theodore Morison's account of the Industrial Organization of an Indian Province. "A very large number of exchanges," he writes, "were in old days effected by means of barter. Rents were

<sup>1</sup> Cf. Fisher, *The Purchasing Power of Money*, p. 84.

paid in kind, and debts between the cultivator and the money-lender, tho reckoned in terms of money, were usually settled in grain. The wages of field laborers and of the village artisans were paid almost entirely in grain, and it was therefore possible for the cultivator in former days to make a large number of transactions in the year without employing money at all. Now that the self-sufficiency of the village is being impaired, the occasions for the use of money are largely increased. The tenant usually pays his rent in money; he also employs money, along with bundles of corn, to pay his laborers; a few articles of foreign manufacture are coming into common use, which are purchased at fairs, and for them money is the only payment accepted.”<sup>1</sup> In the modern industrial world, the tendency is, perhaps, on the whole, in the opposite direction. There seems to exist a good deal of cross trade between firms worked by means of book-debts. When a firm buys from one party and sells to another, bills drawn on his debtor are passed forward to his creditor, so that titles to legal tender are required to discharge only one bill instead of two of a given amount. There are also in vogue many elaborate devices, such as the Stock Exchange Clearing House and the Railway Clearing House, for carrying still further this method of economizing the use of bank money, while on the established settling days debts are so far cancelled that only differences have to be directly met. Against these influences has to be set the tendency to specialization of processes to different firms, involving, as it does, an increase in the number of transactions that have to be undertaken prior to the completion of many finished goods. Under the same head falls the increasing volume of speculation and other business indirectly associated with industry

<sup>1</sup> *Industrial Organization of an Indian Province*, p. 306.

that is done on the stock exchanges, and for which, of course, a money basis is needed.

But the attractiveness of the money use does not depend only on the contribution which a holding of titles to legal tender makes to business convenience. It is also affected by another important circumstance. Any holding of titles to legal tender is always capable of being exchanged against some quantity of commodities. Clearly, if it is expected that the quantity of commodities for which, say, a note for one pound can be exchanged will be greater a year hence than it is now, the inducement to hold pound notes now is increased; and, conversely, if it is expected that a pound will buy fewer commodities a year hence, it is diminished. Thus any expectation that general prices are going to fall increases people's desire to hold titles to legal tender; and any expectation that they are going to rise has the contrary effect. For this reason the suspicion that a nation will fail to maintain or to restore the full convertibility of a paper currency, immediately lowers the demand for that currency in terms of things, and so raises prices, in terms of that currency.

§ 7. So far, of the causes that operate by way of the variable  $k$ . Consider next the variable  $c$ , *i. e.*, the proportion of their titles to legal tender that people choose to keep in actual legal tender in their own pockets and tills. The choice between actual cash and bank notes and bank balances is determined in the main by custom and convenience, and people's habits in this matter are not in all countries fixed. Thus, Professor Irving Fisher writes of recent conditions in America: "Some day in the future, when the use of checks has grown up to its work, it would not be strange if the ratio of checks to money should remain fairly constant. At present, however, we are passing through a long transition

period during which the device of using checks instead of money is being extended with prodigious rapidity. This is the dominant feature of the present situation and forms the chief basis of the forecast here attempted. All nations — even those which have used checks for generations — are making a continually larger use of checks relatively to money.”<sup>1</sup>

Leaving aside bank notes as being relatively unimportant, we may note the following points. First, the proportion of titles to legal tender held in the form of actual legal tender will be smaller the more people have banking accounts, and, therefore, are *able* to keep their titles to legal tender in the rival form of bank balances. The more people have banking accounts the more widespread and the better organized the banking system will become. The development of branch banks and the cultivation of small accounts in turn causes the numbers of the bank-using public to increase. The chief reason why the proportion of coin to bank money used in India is so much larger than in England is that in the former country the banking system is very imperfectly developed.

Secondly, the proportion of titles kept in actual legal tender will be smaller the more readily checks are accepted in ordinary transactions — and readiness to accept them becomes more widespread as small tradesmen come to have banking accounts and high-waged employés follow their example. Thirdly, this proportion will be smaller the longer shopkeepers allow their accounts to run before requiring payment; for it is much more convenient to pay large sums by check than coin. The average size of accounts is greater, the larger the proportion of rich people in the community, — the very rich pay scarcely anything in coin. It is

<sup>1</sup> American Economic Review, September, 1912, pp. 547-548.

also greater the more widespread is the custom of paying for purchases through accounts covering a series of purchases, or through deposits paid in advance rather than over the counter at the moment of purchase. Lastly, the proportion will be smaller, the more convenient and less costly is the machinery by which payments can be made direct from bank balances, without resort to actual legal tender by the paying public. The fact that checks are subject to a small tax is relevant in this connection. Of course, if there is any question of the solvency of banks, the risk of loss, when titles to legal tender are kept in the form of bank balances, strongly favors the alternative form — an incident that in some panics, like the 1907 panic in the United States, may become of very great significance.

§ 8. There remains the variable  $h$ , that is the proportion of actual legal tender that the banking system chooses to keep against its liabilities to customers. The influences that determine this proportion are similar to those that determine the variable  $k$ , *i. e.*, the proportion of their resources that people in general (other than bankers) choose to keep in the form of titles to legal tender. Here, as there, the governing factors are, on the one hand, the convenience obtained and the risk obviated by resources held in the form of a money reserve, and, on the other hand, the advantage that is sacrificed when resources are locked up in this form. It is obvious that the advantage sacrificed is determined by that general productivity of industrial investment that has already been referred to in connection with the variable  $k$ . The convenience and security that banking reserves provide are, therefore, all that need to be discussed here. The benefit under these heads that a given quantity of resources will yield depends on the following principal considerations.

The first factor is the internal organization of the banking system for economizing the need for large reserves. Means to this end are the elaborate arrangements of clearing houses, by which cross-debts are balanced against one another, and the further device of a banker's bank associated with the clearing house in such wise that the net balances that remain over after the process of cancellation is complete can be discharged by simple entries in the books of the said bank. Arrangements of this kind not only save the use of coin directly, but also indirectly. By bringing the banks together into some sort of unity, they enable their reserves to be used at need for mutual support. This means that the aggregate reserves, instead of having to guard against the sum of the maximum separate drains that are likely to be made upon the several banks individually, need only guard against the maximum drain that is likely to be made upon the sum of these banks collectively. A much smaller aggregate reserve is necessary for the latter than for the former of these purposes. Hence a one-reserve system can be worked much more economically than a many-reserve system. The English banks as a body, because of the centralization of a large part of their ultimate reserves in the Bank of England, can safely keep these reserves much smaller relatively to their liabilities than the American banks, at all events before the recent reforms, were able to do.

The second factor is the kind of claims of which banks' liabilities are predominantly made up. If a large part of them are claims by foreign depositors, who are likely to require legal tender for shipment abroad, or by native depositors engaged extensively in foreign trade, actual legal tender — when the legal tender is also an internationally recognized money substance

such as gold—is liable to be called for in ways that no elaboration of clearing house or other devices can prevent.

The third factor is the proportion in which bankers' liabilities are in bank notes in the hands of the public or in bank balances. This is important, because in modern states the law tends to insist rigorously upon the retention of large reserves against notes, while (except in the United States) leaving the question of reserves against deposit accounts to the banks' discretion.

Lastly, account must be taken of the temperament of the people in respect of liability to panic and so on, and of the general state of confidence in the banking system. It is obvious that a new bank among an impulsive people will need to keep a larger proportionate reserve than an old and well-tried bank among an unemotional people.

§ 9. This completes the discussion by which I have aimed at clothing the dry bones of my equation of demand. It remains to explain the relation in which that equation stands to the "equation of exchange" made familiar in the "quantity theory"—an equation, by the way, which would itself be more properly described as an equation of demand. At first sight, it might be thought that the two formulae are in violent conflict. But, in fact, it is easy to show that they are perfectly consistent with one another. In order to do this, it is not necessary to complicate the argument by comparing them in their fully elaborated forms. They are both much simplified when abstraction is made of the operations of banks. When this is done, my formula reduces to  $P = \frac{kR}{M}$ . It is enough to exhibit the relation between this and the corresponding simplified formula of the "quantity theory." In that formula  $T$



represents total transactions,  $M$  the number of units of titles to legal tender,  $V$  the velocity of circulation of these units, and  $\pi$  the price per unit of "commodities" in money. The "equation of exchange" then is

$$\pi = \frac{MV}{T}. \quad \text{Now since } P \text{ in my equation is the price}$$

of money in terms of things and  $\pi$  in the "quantity theory" equation is the price of things in terms of money, it follows that  $P = \frac{1}{\pi}$ .

$$\text{Hence } \frac{kR}{M} = \frac{T}{MV} \text{ or } kV = \frac{T}{R}.$$

Evidently in given conditions of production and trade  $\frac{T}{R}$  may be taken as a constant. It follows that  $kV$  also

is a constant. So soon as this is perceived, the relation in which the two equations stand to one another is at once apparent. When people decide to keep half as much of their resources as before in the form of titles to legal tender, this *means* that the velocity of circulation is doubled. This has been explained very clearly by Dr. Marshall: "If a person, whether in the course of trade or for his own use, buys for currency goods and services of the value of ten thousand pounds of wheat during a year, and if he retains on the average purchasing power in the form of currency to the value of one hundred pounds, then so far as he is concerned, currency will circulate one hundred times in the year. If he keeps twice as much purchasing power, that is, to the value of two hundred pounds of wheat, then currency will, so far as he is concerned, circulate fifty times in the year, that is, only half as rapidly. Thus generally, *ceteris paribus*, any increase in the ready purchasing

power that people choose to keep will diminish proportionately rapidity of circulation, and *vice versa*."

§ 10. It is thus evident that there is no conflict between my formula and that embodied in the quantity theory. But it does not follow that there is nothing to choose between them. Mine is not, of course, any "truer" than its rival. They are both equally true. The claim that I make on behalf of mine is merely that it is a somewhat more effective engine of analysis. It focusses attention on the proportion of their resources that people choose to keep in the form of titles to legal tender instead of focussing it on "velocity of circulation." This fact gives it, as I think, a real advantage, because it brings us at once into relation with volition — an ultimate cause of demand — instead of with something that seems at first sight accidental and arbitrary. But to argue in the air about the merits of a machine is always a waste of time. I offer this specification of it in order that those interested in monetary theory may test its powers in actual work upon concrete problems.

#### IV

##### *The Supply of Legal-Tender Money*

§ 11. The formula set out in the preceding section refers exclusively to demand. But in order to determine the value of anything an equation of supply also is needed. What this is depends upon the substance which a country decides to use as money and the rules under which it is manufactured. The principal alternatives are as follows.

§ 12. First, the quantity of legal-tender money available at any time may be fixed, as in a country making use exclusively of inconvertible paper notes, by the arbitrary decision of the government. Under an ar-

rangement of this kind, the supply curve of legal tender is obviously a vertical straight line fixed in whatever position the government may choose. Its equation is  $M = D$ , where  $D$  is a constant.

§ 13. Secondly, some part of the total quantity of legal tender money may be arbitrarily fixed. In practice this is the more usual arrangement. In Germany and France, alongside of the gold currency, many old silver coins circulate as full legal tender. In Germany these amount to some twenty million pounds.<sup>1</sup> In the United States, "gold and silver are legal tender equally with greenbacks, or government notes issued during the Civil War, and the treasury notes issued against the deposits of silver bullion under the Sherman Law of 1890."<sup>2</sup> In Austria inconvertible paper circulates alongside of gold. Under these arrangements the shape of the supply curve is the same as it would be if the arbitrarily regulated part of the supply did not exist; but the whole curve is pushed further to the right. Its equation is  $M = \{D + f(P)\}$ . It is thus less elastic than it would be in the absence of the arbitrarily fixed part of the circulation.

§ 14. Thirdly, the whole of the legal tender money in the country may consist of one substance coined freely at the mint, and there may be no difficulties in the way of the import and export of this substance. In that event the quantity of legal tender available in any country in response to a given wheat price per unit is equal to the quantity of the substance in the world *minus* the quantity absorbed in other uses, whether these uses be the currencies of other countries or the arts or anything else whatever. This quantity is determined by the supply curve of the world minus the demand curves for these other uses. The supply of the world may, when

<sup>1</sup> Pierson, *Principles of Economics*, vol. i, p. 425.

<sup>2</sup> Kinley, *Money*, p. 50.

the monetary substance is a precious metal, be treated, for periods of moderate length, as practically constant; for the aggregate stock in the world is very large relatively to the total annual output, and, therefore, *a fortiori* relatively to such changes — themselves, from the nature of the industry, probably slow-working — in the annual output as may be induced by changes in (wheat) price. The demand for the currencies of other nations is regulated in the way described in the preceding division of this article. The demand curve for the arts depends for its shape and position, like any ordinary demand curve, upon fashion, taste, the availability of substitutes, such as silver, to fulfil like artistic purposes, and so on. It relates, of course, to the total money substance employed in the arts, and not merely to the new supplies of it absorbed into them during the year. The supply curve of legal tender in the country in which we are interested is derived from the above factors.

§ 15. Fourthly, the money may consist of two substances freely coined and bound together by some legal tie, as under bimetallism and symmetallism. From the present point of view, the principal difference between moneys of this type and the simpler money discussed above is that, since there is a larger stock of money substance available, a given rise in wheat price is likely to call out a larger additional supply than would otherwise be forthcoming. That is to say, the supply is likely to be more elastic.

§ 16. Fifthly, the money may consist of one substance coined under a seigniorage. Its supply price is then a compound of the cost of the substance contained in the coin and the seigniorage charge. Therefore, a smaller weight of coined money will be forthcoming at a given wheat price per unit than would be forthcoming if

there were no seigniorage. Let the seigniorage be £*s* per £100, and the equation of supply of the substance of which coins are made,  $M = \phi(P)$ . Then the corresponding equation of supply of actual coins will be

$$M = \frac{100 - s}{100} \phi(P).^1$$

§ 17. Sixthly, the supply may be regulated by an act of state, but the state may be guided by the purpose of maintaining a constant ratio of exchange between its money and that of foreign countries with which it has important trade relations. This is the familiar gold exchange standard. Under it the supply of money in the country under review is a function of the commodity (wheat) price of foreign money, falling as this rises, and rising as it falls. The value of the native money fluctuates in just the same way as it would do, if it consisted of freely minted coins of the substance used in foreign money, but its average level is somewhat lower since less of this substance is required in the currencies of the world as a whole.

§ 18. Lastly, the supply may be regulated by the state on the plan recommended by Professor Irving Fisher: that is to say, in such a way as to keep its value constant in terms, not of a foreign currency, but of commodities in general at home.

§ 19. All these various systems of supply are possible and an interesting study might be undertaken into their comparative advantages. That, however, does not fall within my purpose. Nor shall I even attempt to exhibit

<sup>1</sup> This implies that the wheat value of coined money under seigniorage is higher than it would have been in the absence of seigniorage, but higher by somewhat less than the amount of the seigniorage. This result is not appreciably affected by the policy the state adopts in respect of the gold collected in seigniorage. Whether the state coins it or sells it uncoined, makes no difference at all. Even should the state destroy it, the difference would be imperceptible, since the amount of it is very small relatively to the total supply.

the diverse ways in which the choice that is made between them affects the special problem of the value of money. Since this article is designed merely to elucidate a method and does not profess to be exhaustive, my discussion will be concentrated upon a single dominant system of money — namely, the simple gold standard, that put third in the preceding classification.

## V

### *Demand and Supply*

§ 20. It is a familiar proposition in pure economic theory that, when the equations of demand and supply for any commodity are given, the value of that commodity is found by their solution: or, in geometrical language, that when the demand curve and the supply curve are given, its value is measured by the ordinate drawn from their point of intersection. This analysis provides a kind of scaffolding by the help of which the causes that bring about changes in value can be investigated. But that investigation is never a simple one, and, when its subject-matter is the value, not of an ordinary consumable commodity, but of money, the difficulties to be overcome are exceptionally great. The most important of these have now to be set out.

§ 21. First, in the real world we cannot always hope to meet only with causes that act either on demand alone or on supply alone. The same cause may easily act upon both. Certain sorts of inventions, for example, may at once facilitate production generally, thus raising the demand schedule for money, and also facilitate the extraction of gold from the mines, thus lowering the supply schedule. Naturally the result is different from what it would have been if demand alone or supply alone had been affected. From a short period point of

view, a 10 per cent increase in the *production* of gold accompanied by an equal increase in the production of commodities generally, means a percentage increase in the *supply* of gold, much less than the corresponding increase in the *supply* of commodities. Consequently, the effect exercised through demand will be predominant. But, from the standpoint of an indefinitely long period, the stock of gold existing at the beginning must be insignificant compared with the quantity produced during this period. The effects upon production and upon supply are, therefore, substantially equal, and the predominance of the demand side disappears.<sup>1</sup> The way in which these complex effects work themselves out is not, however, my present concern. What I am interested to point out is that in the real world we may have to do, not with a one-handed, but with a two-handed cause.

§ 22. Secondly, even when the cause that is being studied acts on the side of demand only, it is most improbable that it will operate through one only of the various *foci* of causation that are distinguished in my demand formula. It is of great importance that no misunderstanding should arise upon this point. The analysis which that formula embodies enables us to distinguish and to discuss separately the principal elements out of which the demand schedule for money is made up. It provides, in short, at any moment of time a true *anatomy* of demand. But it does *not* imply that in the actual world changes in the elements that are summarized under the different letters of the formulae occur independently. It is perfectly legitimate to draw a picture of the bones of a child's body, to measure how much each bone contributes to the total height, and, if we will, even to calculate what difference would be

<sup>1</sup> Cf. Edgeworth, *Economic Journal*, vol. v, p. 436.

made to that height if the length of any given bone were doubled and everything else remained the same. But it is not legitimate — on the contrary it is altogether ridiculous — to proceed on the assumption that, as a matter of fact any one bone will double in length while all the others remain unaltered. For we know that in growth there is a certain harmony and that many of the changes that occur in any one part are the result of general causes that affect other parts also. This is true of the economic body no less than of the human body. A general industrial expansion does not involve merely an expansion of resources — a growth in the variable  $R$ . It also involves the establishment or extension of banks and banking facilities, and this means that the proportion in which people use bank money relatively to actual legal tender is increased, or, in other words, that the variable  $c$  is diminished. Nor is this all. Industrial expansion, since it carries with it larger real income, may easily involve an increase in the proportion of their resources that people choose to keep in the form of titles to legal tender; for a very poor man cannot afford the luxury of money in hand. If this happens, the same cause that has brought about an increase in the variable  $R$ , will have affected the variable  $k$  in the same sense. Yet, again,  $k$  (the proportion of their resources that the public keep in titles to legal tender) and  $h$  (the proportion of actual legal tender that bankers keep against their liabilities) are obviously liable to be affected by common causes. A boom in business confidence lessens, whereas a general apprehension of panic increases, both of them. These connections are, of course, set out merely as illustrations, and do not profess to be exhaustive. They may suffice, however, to drive home the point that the different letters of my demand formula do not represent channels each of them reserved, as it



were, for the separate action of special private groups of causes. They are rather public channels along all of which a single cause may operate at the same time.

§ 23. Thirdly: when it has been ascertained that the demand schedule has been modified in a definite manner, the resultant effect upon the value of money is not a single thing. If the quantity demanded at a given price is doubled, the supply schedule relevant to immediate effects will not be the same as that relevant to later effects. The change in demand introduces a *series* of changes in the value of money, extending over a long period and different at each moment of that period. To the question how the value of money will be affected, no intelligent answer can be given without reference to the time that is supposed to have elapsed since the change occurred. This point is easily illustrated. The immediate effect of a fall in the demand for legal tender — we are supposing that the legal tender substance is gold freely coined — is, of course, to reduce its value in greater or less degree. But, so soon as its value has fallen, a reaction is set up by way of foreign trade. Gold having become less valuable relatively to goods in one country — say England — foreigners are stimulated to send goods to England as a means of purchasing gold, and to take out a greater proportion of their debts in the form of gold. In this way the supply of gold is diminished, and the reduction in its value that was brought about at the first shock is partially cancelled after a comparatively short time. But this is not the only reaction. After a somewhat longer time, the fall in the value of gold will lead to an increased use of that metal in the arts of the world as well as in the currencies of foreign countries. This again obviously checks the fall in the value of gold. If the elasticity of the arts demand is given, the extent to which the presence of

that demand checks the fall is clearly greater the greater is the normal consumption of the money substance in the arts relatively to its consumption in the currency of the country affected. If the consumption in the arts is given, it is greater the *more elastic* is the arts demand. Nor is even this all. After a still longer interval, the fall in the value of gold may be expected to lead to a restriction of the industry of gold mining, which the fall will have rendered less profitable. It must, indeed, be recognized that this circumstance acts in a way somewhat less direct than is sometimes supposed. Thus Professor Fisher writes: "It is often taken for granted that, as soon as the gold production begins to subside, the price level will begin to subside also. This is a gross error. The price level does not depend directly on the *rate* of gold production, but on the *stock* of gold and other money. The question is not one of an increasing or decreasing annual production of gold. The inflowing stream of gold is of significance only as it affects the contents of the reservoir into which it flows. A lake does not cease rising the instant the freshet filling it reaches its maximum flow. The lake will still continue to rise *so long as the inflow continues greater than the outflow*. This is often long after the inflow has passed its maximum."<sup>1</sup> Nevertheless, of course, in the end the check to gold output checks the fall in its value.

The above three influences all take a certain time to work themselves out. The first is perhaps more rapid than the second, and is certainly more rapid than the third. It would be convenient if we could rigidly separate off periods relevant to each of the three, and say, for instance, that in the first month, the first only would operate, after three months the second, and after four

<sup>1</sup> American Economic Review, September, 1912, p. 536.

months the third. This, of course, we cannot do. The influences are partly synchronous and partly successive. Their collective effect is that the supply schedule against which the changed demand impinges displays greater and greater elasticity the longer the period over which the effect of that changed demand is being calculated. It follows that that effect is likely to be most considerable at first, and thereafter to be gradually reduced.

§ 24. Lastly, account must be taken of the fact that the demand schedule and the supply schedule for money are not strictly independent of one another. Hitherto, I have tacitly ignored this fact. To do so is in accordance with the practice of economists in their preliminary exposition of the general laws of demand and supply. It is usual to write the equation of demand  $p = \phi(x)$  and the equation of supply  $p = \psi(x)$ . But of course all economists are aware that, when the element of time is taken into account, a change in the equation of supply may react to alter the equation of demand, and *vice versa*. After a period of liberal supply, people may have become so accustomed to some commodity that the demand schedule is raised to a higher level than it occupied before; and, conversely, after a period of keen demand, economies of production may have been developed that will set the supply schedule at a lower level than it formerly occupied. This is the familiar doctrine of infant demands and infant industries. It is not susceptible of translation into demand and supply curves, because three variables are involved, but there is no difficulty about expressing it in algebraic formulae. The reason that more prominence is not given to it in economic textbooks is that, for a large number of problems, abstraction can be made of it, and greater simplicity thereby attained, without any great

loss of accuracy. But all economists know that for some problems it is of great importance. There is reason to think that one aspect of it — reaction of supply changes upon the position of the demand schedule — has considerable significance for monetary theory. First, it is not improbable that a large increase in the supply of money might permanently lower the demand schedule by diminishing the proportion (c) of their titles to legal tender that people choose to keep in actual cash. That this is likely to happen is suggested by Professor Cannan in the following passage: “Nor do I think that, if the sovereign would only buy what is now half a sovereign’s worth of goods, the currency would be doubled; at present my average holding of gold is about £5, and with the rise of prices supposed, it might increase to £6 or £7, certainly not to £10, since I should prefer to go oftener to the bank for cash than I do now rather than to carry double the amount of gold about.”<sup>1</sup> If Professor Cannan is right the reaction which he anticipates would, of course, cause a given increase in the supply of money to reduce its value more than it would do if there was no reaction. Secondly in some circumstances a large increase in the supply of money, by making money relatively cheap in terms of things, may give bankers an opportunity to render the basis of credit more “solid” by building up larger proportionate reserves. There is reason to think that this effect followed in some degree upon the large gold production that took place during the fifteen years preceding the war. A development of this kind means, of course, an increase in the variable  $h$  and therefore a rise in the demand schedule for money. If it takes place, a given increase in the supply of money will cause the value of money to fall *less* than it would do if this reaction were lacking.

<sup>1</sup> *Economic Journal*, September, 1910, p. 396.

## VI

*Conclusion*

§ 25. This completes the summary analysis which I proposed to myself in writing this paper. Anyone who has followed it up to this point must, I think, agree, whether or not he is in accordance with the argument set out, that the elements upon which the value of money, and changes in that value, depend are so numerous and complex that *some* technical device for holding them together in order is absolutely essential. To tackle these problems without tools is like going into a modern battle unhelmeted and unarmed. The “quantity theory” furnishes a tool which in the skilled hands of Professor Irving Fisher has accomplished great things. But less experienced craftsmen need, I think, a better — a more completely fool-proof tool. It is this that, in the preceding pages, I have endeavored to provide.

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