Business Acceleration and the Law of Demand: A Technical Factor in Economic Cycles

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# BUSINESS ACCELERATION AND THE LAW OF DEMAND: A TECHNICAL FACTOR IN ECONOMIC CYCLES

## I. INTRODUCTION

The publication of W. C. Mitchell's book, *Business Cycles*, has rendered obsolete all attempts to explain crises in terms of any one fact or any one narrow chain of causes and effects. The central problem, however, is as clearly defined throughout his remarkably comprehensive study of the details of the actual process as in more abstract treatments of single phases of it. It is the question why business adjustments do not stop at a point of equilibrium, but go on to a point from which a more or less violent reaction is inevitable, and so on without apparent end. And it seems probable that of all the many circumstances which at every stage of the cycle lead to the next stage, the greater part can hardly be held primarily responsible for this primary fact; certainly not all are responsible in equal measure.

Disturbances originating outside the business world, so to speak, such as wars and crop fluctuations, can scarcely be held primarily responsible. Some such disturbances there are bound to be, and our system seems capable of manufacturing its crises out of any raw material that comes to hand, when the crisis is due, and of rising superior to serious provocation at other times. Some forces act to spread the effect of prosperity or adversity from one industry to another, thus insuring that a boom or sharp crisis will effect industry

in general, but they cannot be held responsible for the condition which they merely transmit. Nor can the familiar "forces of equilibrium" be held responsible, though they are acting at all stages of the process.

There is one circumstance whose natural effect is different from all of these in that (1) it acts as an intensifier of the disturbances it transmits and (2) without any diminution of demand to start with it can produce a diminution. It can convert a slackening of the rate of growth in one industry into an absolute decline in another. This circumstance is not psychological, nor does it depend upon the nature of our credit system, nor upon the distribution of income, but rather upon the elementary technical necessities of the case. It is concerned with the way in which the demand for finished products is handed on in the form of a demand for machines, tools, construction materials, and unfinished goods in general. This circumstance is not to be erected into a "theory of crises," but it is put forward as indicating that the purely technical side of this phenomenon is of prime importance, though it has been somewhat overshadowed by the more spectacular features of credit inflation, speculation, capitalization, and mob psychology, while its details have been blurred in the more general theories of "overproduction" or "maladjusted production."

## II. CHIEF DATA TO BE INTERPRETED

There are certain outstanding facts in the behavior of crises which point in one direction and can be linked together by one explanation. It appears, first, that raw materials and producers' goods in general vary more sharply both in price and in the physical volume of business done than do consumers' goods, while wholesale prices fluctuate more than retail.[1]

The work of constructing industrial equipment appears to fluctuate more intensely than other types of production.[2] Its revival coincides, naturally, with a sudden and very great increase of investments. The failures which precipitate a panic are likely to be among producers of industrial equipment, although as to

[1] Mitchell, *Business Cycles*, pp. 502–503, and charts and tables, pp. 97, 100–103.

[2] *Ibid.*, pp. 471–72, 483–84, 557.

this "there is no general rule."[1] Another fact closely connected with those already mentioned is the shrinkage of merchants' stocks of goods in hard times[2] and their expansion in times of prosperity. Raw materials for manufacture are also carried in larger quantities at times when production is more active.[3] In point of time, also, it appears that raw materials take the lead, beginning to fall in price before the finished products, while "technical journals usually report that the factories and wholesale houses are restricting their orders some weeks, if not months, before they report that retail sales are flagging."[4] Mr. Babson notes in one of his reports[5] that "the production of pig iron forecasts the condition of the whole building industry and construction of all kinds," and that "the turning point of the statistics on new building has been from two years to six months earlier than the general crisis."[6] In 1907 a comparison of prices indicates that certain goods bought by producers reached their highest point and began their decline earlier than the goods sold by the same producers.[7] These latter were in some cases goods for consumption and in some cases tools, etc., to be used in further production. Manufactured producers' goods are not shown to be especially quick in feeling the upward trend of prices, though they rise farther than other types of goods.[8] The demand for consumers' goods fluctuates quite decidedly, but the greater part of its fluctuations appears to be the result of the changes in the amount of unemployment which result from the business cycle itself. Some changes in consumption are independent of this cause, and these may well be among the independent causes of business cycles, but it would seem that only a comparatively minor part of the total fluctuations in consumption can be of this character.

[1] *Ibid.*, p. 512. [2] *Ibid.*, p. 452. [3] *Ibid.*, p. 482.

[4] *Ibid.*, pp. 502–503 and charts and tables, pp. 97, 100–103. (Quotation is from p. 502.)

[5] Babson, *Reports*, 1914, Charts Nos. 612 and 598, cited by Warren M. Persons, *Amer. Econ. Rev.*, IV, 741.

[6] *Ibid.*

[7] Mitchell, *Business Cycles*, p. 501 and table, p. 98. Professor Mitchell's classification into "producers' and consumers' goods" does not quite accurately describe the commodities included in the table.

[8] *Ibid.*, p. 461.

## III. INDUSTRIAL EXPANSION AND DERIVED DEMANDS

These data suggest a unified explanation, and group themselves about one industrial fact: the production of capital goods. Its importance has long been recognized, and several theories of crises have turned upon it. The aim of the present study is to present the underlying technical facts in a definite quantitative formulation.

Every producer of things to be sold to producers has two demands to meet. He must maintain the industrial equipment already in use and the stocks of materials and goods on their way to the final consumer, and he must also furnish any new equipment that is wanted for new construction, enlargements, or betterments, and any increase in the stocks of materials and unsold goods. Both these demands come ultimately from the consumer, but they follow different laws. The demand for maintenance and replacement of existing capital varies with the amount of the demand for finished products, while the demand for new construction or enlargement of stocks depends upon whether or not the sales of the finished product are growing.[1] Normally, over a long period of years, there is a certain demand for new construction on which producers can rely, and hence the demand for new construction is a normal part of any demand schedule for this kind of goods. But it does not come regularly.

The nature of the mechanical law at work can be emphasized by imagining the industry reduced to a mere machine. Price, for the time being, is to be disregarded. Finished goods are turned out as fast as wanted, and materials and means of production are instantly supplied as fast as the process of finishing requires them. On this simplified basis we can predict accurately how the speed of the different parts of the machine must needs vary, and the results will furnish an index of the varying strains that are put on the much less mechanical system that does these things in real life.

The demand for a certain product, let us say, begins to increase steadily, each year seeing an increment equal to 10 per cent of the original demand. At the end of five years the increase stops and

[1] If demand be treated as a rate of speed at which goods are taken off the market, maintenance varies roughly with the speed, but new construction depends upon the acceleration.

the demand remains stationary. If the productive equipment has kept pace with the need, it is now enlarged by 50 per cent and calls for 50 per cent more expenditure for maintenance and replacements. Meanwhile there has been an added demand for new constructions equal in five years to half the entire original equipment. If renewals are at the rate of 5 per cent a year, the first effect of an increase in demand at the rate of 10 per cent in a year is to treble the demand for the means of production, since a demand for new

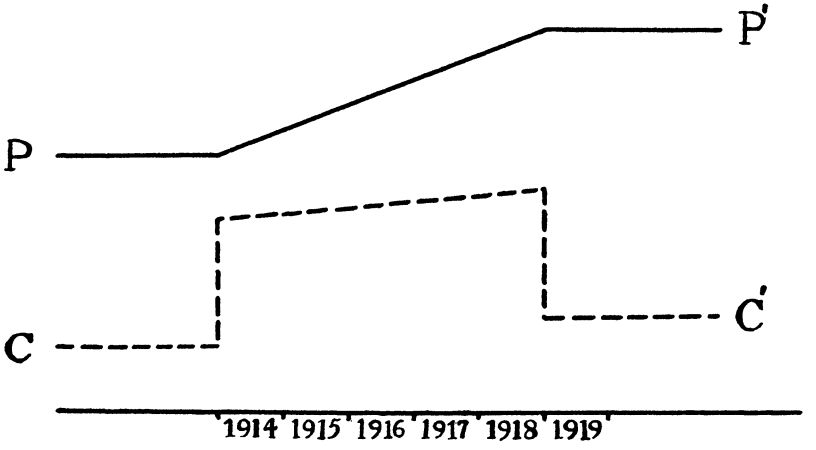


FIG. 1

The figure represents the course of demand (measured vertically) over a period of years (measured horizontally). *PP'* represents the demand for the finished product and *CC'* the derived demand in an industry engaged in construction and maintenance.

construction has arisen twice as large as the previous demand for maintenance. At the end of a year the demand for maintenance has been increased because of the fact that there is now 10 per cent more capital to be maintained (see Fig. 1). Under practical conditions the increase in maintenance would probably be considerably less than 10 per cent, as it takes some time for the new machinery to be installed, and after that it is some time before it reaches its average condition of wear and tear. Until then the repair bills are comparatively light. However, this consideration does not affect the main feature of our problem, which is the suddenness of the increased demand for the means of production and the fact

that it is far greater as a percentage change than the disturbance of demand that causes it.

What happens at the end of the five years when the demand stops growing? By this time the requirements for maintenance are 50 per cent greater than they were, while new construction has been going on at a rate equal to twice the original maintenance account. The total output has grown to three and one-half times its former volume. But the demand for new construction now ceases abruptly. This means that if the producers engaged in construction work had enough capacity to meet the demand of the fifth year, the sixth year would see them running with four-sevenths of their capacity idle.

This is a serious condition for any industry in the real world. It might well be serious enough to produce a panic if any considerable number of industries were in the same condition at the same time. And yet something like it is a normal effect, an inevitable effect, of changes in consumers' demands in a highly capitalistic industrial system.

Thus the law of demand for intermediate products states that the demand depends, not only on the demand for the final product, but on the manner in which that demand is fluctuating. A change from one year to the next in the rate of consumption has a temporary effect on the demand for the intermediate product which is greater than its permanent effect, in just about the proportion by which the total amount of investment in the intermediate product exceeds the amount annually spent for maintenance.[1] In order

[1] The assumption has been made that the new construction actually keeps pace with the demand for it, simply in order to have some figures that would not be too complicated. In fact, the supply is almost certain to fall behind the demand, thus lessening the amount of the overrun and of the ultimate revulsion without altering the principle at work. The law may be expressed algebraically, if the reader will remember that it represents only a purely mechanical view of the situation, and will supply for himself an allowance for the elements that are not included in the formula.

Let $t$ = years elapsed between two dates, $t_1$ and $t_2$.

Let $C$ = rate of consumption at time $t_1$.

Let $C+\Delta C$ = rate of consumption at time of $t_2$, the increase being distributed evenly through time $t$.

Let $I$ = investment necessary to produce output at rate $C$.

Let $L$ = average life of instruments included in $I$, in years. Then maintenance is

to bring about an absolute shrinkage in the demand for the intermediate product, all that may be needed is that the final demand should slacken its rate of growth. Making all due allowances for mitigating factors in translating the illustration back into real life, it is still difficult to see how the building and machine-making industries can possibly avoid the disagreeable experience of outgrowing themselves in time of prosperity. For demand can never be expected to grow at an absolutely steady rate, and the slightest fluctuation seems destined to put the producer of capital goods in a situation comparable to that of a passenger forcibly carried by his station.

This principle may be illustrated by a town which grows rapidly up to the size at which its industrial advantages are fully utilized and beyond which its normal production can expand but slowly. When the point of transition is reached from rapid to slow expansion, the town may find that it has outgrown itself by the number of people engaged in the extra construction work involved in the process of growing. Houses to take them in, stores to feed and clothe them, trucks to haul the materials they work with, offices, etc., all will be demanded, and thus a boom may be created which is none the less temporary for being based on

required at the rate $\frac{I}{L}$. The demand for new construction during time $t = I\frac{\Delta C}{C}$, an annual amount equal to $I\frac{\Delta C}{Ct}$. Demand for new construction is to previous demand for maintenance as $I\frac{\Delta C}{Ct} : \frac{I}{L}$, or as $\frac{\Delta C}{Ct} : \frac{1}{L}$, or as $L\Delta C : Ct$.

If $L$ be large, as in the case of long-lived instruments, the disturbing effect is great. If it be small, as in the case of merchants' stocks of goods of sorts that are turned over rapidly, the disturbing effect is far less, though still appreciable.

The total demand for replacements and for new construction may be taken to have increased from $\frac{I}{L}$ annually, at time $t_1$ to an annual amount equal to $\frac{I}{L}\left(1+\frac{L\Delta C}{Ct}\right)+\frac{I\frac{\Delta C}{C}}{L}$ or $\frac{I}{L}\left(1+\frac{L\Delta C}{Ct}+\frac{\Delta C}{C}\right)$ at time $t_2$ after which it would drop to $\frac{I}{L}\left(1+\frac{\Delta C}{C}\right)$.

The last term of this expression is exaggerated, as has been mentioned, by ignoring the fact that it takes some time for new equipment to reach its average condition of depreciation and renewal. Any attempt to avoid this would only complicate matters without any substantial increase in accuracy. If we are thinking of dealers' stocks of goods which change hands quite rapidly, the third term of the formula would hold substantially true.

tangible economic needs. The experience of the boom town has been common enough in the growth of our western country, and the blame need not be laid entirely upon the vagaries of mob psychology. In a similar way the great work of rebuilding which must follow the present war will give rise to a huge temporary addition to the demand made upon the industries engaged in reconstruction, and as this special work is accomplished and a state of slower and more natural growth takes its place, these industries will have to count on a corresponding shrinkage, not merely relative, but absolute. This will almost inevitably lead to a depression, and, if unforeseen, it may lead to a crisis.

### IV. DERIVED DEMAND FLUCTUATES FIRST

This principle has another very interesting consequence. So far as the demand for new construction follows this law it not merely fluctuates more than the demand for the finished product; it also fluctuates in a way which gives it all the appearance of leading instead of following in point of time. This can be clearly seen if the course of business activity is represented by a curve as in Fig. 2 instead of by the straight lines used in the previous diagram.

In this figure the curve which represents the rate at which the wholesalers take the finished product from the manufacturer is drawn on the assumption that the normal stock of goods in the hands of all the dealers is equivalent to four months' consumption. The curve which represents the course of demand for a durable instrument of production is drawn on the assumption that the life of the instrument is approximately eight years. Had a longer life been assumed, the disturbance shown would have been much more marked. No necessary relation is assumed between the absolute heights of the upper and lower pairs of curves, the significant thing in each pair being the percentage fluctuation.

The need for new construction, indicated by the shaded area, reaches its maximum when the demand for the final product is at its point of fastest growth. As soon as this rate of growth slackens and long before it has reached its highest point the need

for new construction has started downward. The curve *CC'* represents the same impossibly fluid condition of industry that was previously assumed, in which the need for new construction is satisfied as soon as it arises. The curve *cc'* is closer to the facts, for it represents the work of supplying the derived demand as lagging somewhat. It shows that, even allowing for this natural

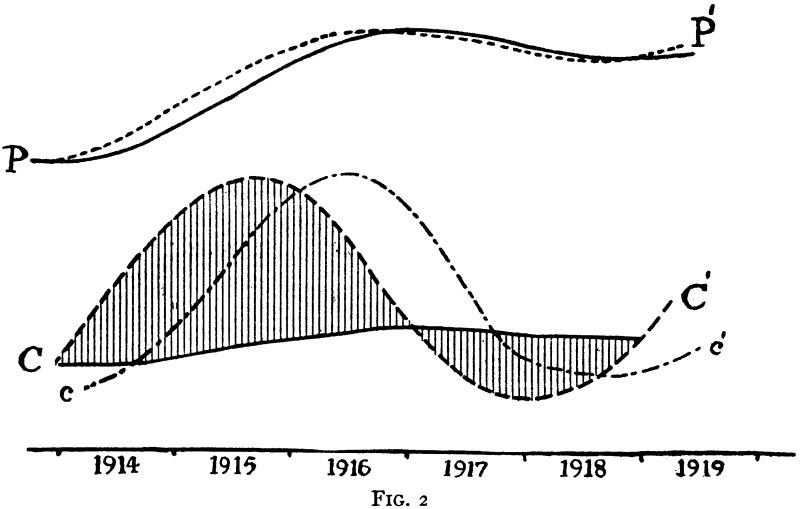


FIG. 2

——————— Demand for finished product.
- - - - - - - - - - Wholesalers' demand for finished product.
— — — — — Hypothetical demand for durable means of production. Shaded area shows excess or deficiency as compared to needs of maintenance.
— · — · — · — Hypothetical demand for durable means of production with allowance for lagging.

lagging, one might well expect to find some, at least, of the businesses that furnish capital goods starting their revival before the demand for the finished products has reached its bottom point, and starting their reaction before the demand for the finished products has reached the crest of its wave. This lagging would naturally be more marked in the case of machinery and construction generally than in the case of raw materials, partly because the disturbance in the case of long-lived goods is more intense, and because it takes more time to increase production by a large amount than by a small amount. Another reason is that the

long-lived goods are of a sort that takes more time to turn out, and a third reason is that the first increase in demand for finished products can be taken care of by utilizing the excess producing capacity which an industry using much machinery habitually carries over a period of depression. Thus they do not need to buy more equipment the instant the demand begins to increase.

The investment in long-lived instruments cannot be reduced as readily as it can be increased. It is reduced, if at all, by the slow process of starving the maintenance account in dull seasons, and this policy is conditioned by such complex technical relationships that it is impossible to reduce it accurately to any set formula. The deciding factor is economic rather than technical, it is the force with which the financial pinch is felt rather than the fact that the reduction in output has made some of the equipment technically superfluous. On the opposite side stand the optimism of the employer or his industrial pride, or other elements of the "personal equation." Thus the formula would be correct in representing replacements as diminished or postponed, but when it comes to estimating how much this postponement amounts to it is impossible to make any assumption that would not be quite arbitrary.

## V. THE HYPOTHESIS COMPARED WITH STATISTICAL EVIDENCE

This hypothetical case agrees remarkably closely with the observed behavior of the demand for raw materials, manufactured producers' goods, and manufactured consumers' goods. It accounts for both the greater intensity and the greater promptness of the price movements of goods at the earlier stages of the productive process as compared to the final sale to the consumer, as well as for the fact that raw materials rise probably more promptly, if anything, though not more sharply, than finished instruments of production. The bigger the stock of goods as compared to the annual wastage and replacement, the greater this element of intensification becomes. Anything tending to reduce the size of stocks and to speed up the turnover would seem to be advantageous as tending to lessen this intensification, so long as the stocks do not become so slight as to create the danger of an absolute shortage

in case of strikes, or poor harvests, or other unpredictable interference with the normal course of supply.

In attempting a more detailed test of this hypothesis, the railroads furnish the most favorable case, both because of the full statistics available and because the railroad is under obligation to carry whatever traffic offers at the time it offers, and so must needs adjust its facilities as best it can to the fluctuations of demand. It cannot "make to stock" in slack periods like the manufacturer. Thus the technical needs of the business are unusually free from disturbing financial influences. In the accompanying chart (Fig. 3) a comparison is made of railway traffic and purchases of cars over a period of fifteen years.[1] The results of this comparison may be briefly summarized.

1. The percentage fluctuations in car manufacturing are vastly greater than in railroad traffic, though the line *BB'* indicates that they are still not nearly great enough to cause the equipment to keep pace with the needs of the traffic in its ups and downs, even if averaged over yearly periods.

2. The orders for cars have the appearance of fluctuating ahead of the movements of traffic. On the basis of this fact, Mr. E. B. Leigh, of Chicago, has urged in several addresses and pamphlets that railroad purchases are the cause of business prosperity. It seems undeniable that car orders reach their maxima and minima ahead of the index of general business activity, and even reach their maxima ahead of the maxima of railway traffic itself. As here analyzed, however, orders for cars do not move in

[1] The data were taken from the Interstate Commerce Commission's *Statistics of Railroads in the United States*, with the exception of the line representing "cars ordered," which was taken from a chart made by the Brookmire service for Mr. E. B. Leigh, of Chicago, and published by him in various pamphlets urging the importance of railroad purchases as a cause of general prosperity. The 1915–16 figures for traffic and the 1916 figures for total car equipment and net change in car equipment were taken from the preliminary report of the Bureau of Railway Economics, based upon the same figures published by the Interstate Commerce Commission. Since these reports cover fewer roads than the Commission's final figures, the totals would be misleading, and hence the net change between the 1915 and 1916 reports of the Bureau itself is used in placing the final points in lines *AA'*, *BB'*, and *DD'*. The resulting inaccuracy is so small as to be virtually imperceptible save in a chart drawn to a much larger scale than the one used here.

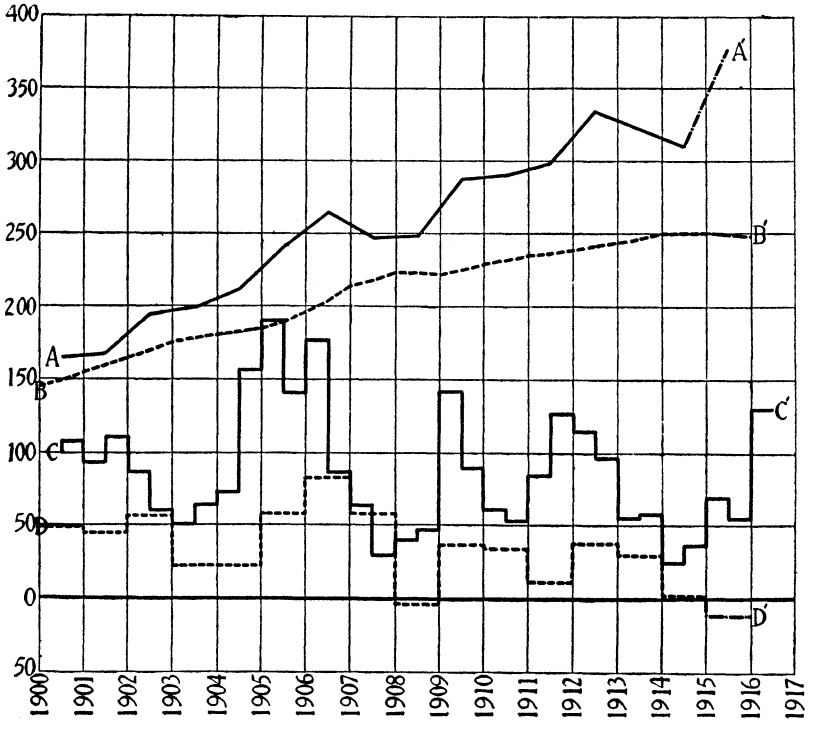


FIG. 3

Line $AA'$ represents traffic (ton-miles plus passenger-miles, 000,000,000 omitted) the total from July 1 to June 30 being plotted as one point at January 1.

Line $BB'$ represents total cars in service June 30 (0,000 omitted).

Line $CC'$ represents half-yearly orders for cars (000 omitted); taken from chart published by Mr. E. B. Leigh substituting horizontal lines covering an entire half-year for points located in the middle of each half-year.

Line $DD'$ represents the yearly net increase in cars (000 omitted) divided by two in order to correspond with half-yearly figures for car orders.[1]

The vertical ordinates are drawn at June 30 of each year.

[1] By making the lower lines rectangular, a comparison is afforded of volume of demand for cars with rate of increase of traffic, and one that is fairer for judging how the significant data compare in point of time than if two lines of the same sort, rectangular or otherwise, had been plotted against each other.

If both lines were made rectangular, the growth of traffic would appear as taking place at one instant. Car orders would have the appearance of growing a half-year ahead of traffic, merely because the first half of the period of growing traffic would not appear in the graph. If both lines were plotted as the upper one is, on the single-point system, a fairer result would be obtained with regard to the high and low points of car orders. In this case, however, another significant set of facts is wrongly dated;

any different manner from that which would naturally result if they were wholly guided by the need of moving the traffic—a result and not a cause.[1]

3. The direction in which the slope of the traffic curve deviates from the average slope agrees with the direction in which the yearly volume of car orders deviates from the average volume in twelve out of fifteen years. The disagreement is comparatively slight in one case (1904), and the failure of car orders to rise above the average in that year may be explained by the fact that car equipment had been catching up on traffic in the year preceding.

4. A change in the rate of growth of traffic is accompanied by a similar change in yearly volume of car orders ten times, by an opposite change once (1908), and in three cases one change or the other is so slight that the result may be regarded as neutral (1902, 1911, 1914). These four years of negative or neutral results are in each case years in which car orders are lower with reference to the previous year than the state of traffic growth calls for, and in each case the preceding year was one in which car supply caught up with traffic noticeably. These cases, then, involve a retarded adjustment for which the contemporary slope of the traffic curve makes no allowance.

namely, the beginning of an upward or downward bend in the slope of the traffic curve as compared to the beginning of the rise or fall in the absolute volume of car orders, with which it is to be compared. The beginning of a bend in the traffic curve is postponed, while the beginning of an absolute rise or fall in car orders is dated ahead, if both are plotted in this way.

The method adopted makes the bends of the traffic curve and the rises and falls of car orders both appear as happening all at once, and shows them at their (probable) mid-point, ignoring the beginning of each movement. Thus a comparison between the two is not vitiated. With regard to the other sets of data, the attainment of a given rate of growth of traffic, and the attainment of a given volume of orders for cars, both phenomena appear too soon, in all probability, since the average for a period is shown as a uniform rate from beginning to end of the period. Thus the method adopted is one by which the data we are seeking to compare suffer similar distortions. By following other methods of presentation the writer has been able to give either set of data the appearance of lagging behind the other; a fact which serves to emphasize the conclusion that no proof of lag is contained in the figures.

[1] No one would deny that activity in the production of railroad equipment has an effect upon other branches of business. The effects of any disturbance are widespread. The present contention is that the fluctuations are themselves natural results of the technical situation. Their effect is, of course, self-re-enforcing.

5. The noticeable peaks of car orders fall within the years of maximum growth of traffic. The year 1916 is an exception, the growth of car orders being much delayed. Of the twelve half-years of fastest growth of traffic, eight correspond to the eight half-years of highest car orders, while two (1915–16) are periods of wholly abnormal conditions. Of the eighteen half-years of slowest growth of traffic (including those of absolute decline) thirteen correspond to the thirteen half-years of lowest car orders. Of the four half-years of lowest car orders, one comes at the end of a two-year decline in traffic, another follows this one, and the other two follow immediately on the heels of the only other period when traffic absolutely declined.

6. In these minimum points the orders for cars appear to lag behind the shrinkage of traffic to which they correspond, thus supporting the contention that they behave as they would if they were governed by the needs of the traffic. The beginning of the recovery shows a similar lag. Apart from this there is no clear evidence of a tendency for either curve to lag behind the other when the level of car orders is compared with the *rate of growth* of the traffic, and the points of rise or fall in car orders are compared with the points of *increase or decrease in the rate of growth* of the traffic.

7. The general trend of car orders is slightly downward, in spite of a great increase in traffic.[1] The net yearly additions to the equipment of cars trend quite strongly downward.

In short, the figures, so far as they go, bear out the statement that the demand for cars varies with the rate at which traffic is increasing or diminishing rather than with the absolute volume of the traffic.

## VI. WHAT GOVERNS THE SIZE OF STOCKS

So far the assumption has been made that the need for productive instruments and materials varies with the output. It may be that this assumption will be challenged in some cases, however well it tallies with common experience in most situations. Where the rate of turnover can be easily increased, it may seem natural

[1] This may be accounted for by an increase in the capacity of cars.

that producers should take their gains partly in this way rather than bear the burden of an increased investment. However, this could only happen if the producers had previously been either careless enough to let the turnover become unduly slow, or else had been unable to speed up the turnover in slack times by carrying a decreased stock. In production of a technical sort such as that of factories, machine-shops, railroads, etc., the length of the process cannot be reduced at will. It is the business of the staff, from president to foremen, to keep the work moving at all times as fast as is reasonably possible, for waste time is waste time always. It is only in mercantile production that the rate of turnover can be increased more or less at will, and even here it is natural to increase the investment when the output increases.

The size of merchants' stocks is governed by many considerations, some psychological, some commercial, and some speculative. If a dealer knew beforehand just what goods would be demanded and just when, what kind and brand and quality and quantity, he would really have no need of keeping any stocks at all, save to serve as samples. If the static state means absolute steadiness in the demand for everything—if there were absolutely no change and hence no uncertainty in the matter of consumers' wants—dealers would be able to predict demand exactly. Even stock for sample purposes would hardly be needed, and the necessity for the investment of capital in large reserve stores of goods would virtually disappear. This need is the child of uncertainty, and uncertainty is a dynamic fact. Goods held against future demand are the playthings of chance and change.

The chief reasons for keeping a stock are, first, to give the customer a wide selection of goods which he can actually inspect and, secondly, to give assurance of being able to fill large orders without delay. What is the effect of expanding demand on the amount of stock needed to fulfil these functions? Obviously, the larger the orders, the greater the danger of being sold out, unless the stock is increased in a corresponding proportion, or something not too far short of it. The increase in demand would not seem to make it necessary to keep any wider range of goods in stock. But if we are thinking, not of what is necessary, but of what is profitable, we have

a different situation. The range of goods a merchant carries is limited largely by a process of natural economic selection, by weeding out the "stickers," whose turnover is too slow to pay for keeping them in stock. With a quickened demand there are fewer "stickers." Some goods which were just below the line of toleration will become profitable to handle on the basis of the increased rate at which they can be sold, and the natural result is the carrying of a greater variety of goods as well as of more goods of each kind. If the dealer is in doubt whether or not to keep a certain line in stock at all, a brisk state of demand will be likely to decide him to keep it.

When we begin considering what is profitable, rather than merely what is physically necessary, we open up a wide range of considerations. The size of the stock is one element in the quality of service rendered by any dealer, which means that it is something in which he is likely to economize when business is poor, and to be liberal when he can afford it. When demand is expanding, merchants are in general prosperous enough to be able to afford to spend money for the purpose of improving the quality of their service. If the increase in demand is part of a general growth of business activity, the customers themselves will be in just such a prosperous state of mind as would put petty economics at a discount. They would be less influenced by a slight saving in price, which can only be made sure of after close study of the qualities of the goods, than by an obvious superiority in quality of service and range of selection. When the buyer's mind swings in this direction the merchant is invited to respond in kind if he wishes to attract his share of the increase in business, rather than to attempt to do it merely by keeping prices down and seeing that the quality of the goods themselves is maintained. A time of general activity in business is a time when large stocks are good tactics commercially.

One other fact which may make merchants more willing to invest in considerable stocks is that a time of growing demand for some one commodity, or a time of general increase in activity, are both times of rising prices for the intermediate products called for in the business affected. This makes these commodities a profitable

investment[1] so long as credit can be had on easy terms with which to enlarge one's holdings. Merchants tend to assure their future supplies by buying either outright or for future delivery. Buying for future delivery is usually a cheaper way in which to combine certainty of future supplies with a chance of a speculative gain if prices go up, but it is chiefly used by contractors, and by shops and factories, rather than by merchants dealing with finished products.

Each of these two ways of meeting the situation has its own effect on the demand as felt by the manufacturer. Buying outright intensifies it, while buying for future delivery has an effect which may at times prove even more disturbing. While not increasing the immediate effect of an upward swing, it puts the market in a condition in which, if the demand from consumers slackens or stops its growth, the demand for the same goods on the part of dealers cannot immediately shrink in full response. The boom is artificially prolonged for the manufacturer at the expense of the middleman, only to fall all the more suddenly when the future contracts have been filled. At such a time the same factory often sells the same goods at prices wide apart, the price on new contracts being cut to the barest minimum while good prices are still being received from middlemen unfortunate enough to have bought too far ahead.[2] Taking all these things into consideration, one is justified in concluding that an increase in demand naturally tends toward an increased investment in dealers' stocks, which is, if anything, more than in proportion to the increase in sales, unless limited by: (1) difficulty in getting added credit to carry the extra "working capital," (2) an extremely sharp rise in supply prices, (3) the fear that the prosperity is temporary, or (4) the inability of manufacturers to make deliveries.

### VII. CONCLUSIONS. SOME DYNAMIC LAWS OF DEMAND

So far we have considered only one big division of the process. If we imagine the effect of all this on those industries which produce the tools and machinery used in the construction industry itself, we

[1] Mitchell, *Business Cycles*, p. 459.

[2] *Ibid.*, p. 488.

have a further possibility of multiplying the effects of a change in demand. In fact, the possibilities multiply with every step backward, for every industry which produces the means of production for some other industry has its own demand for its own tools and machinery to be filled. These possibilities of intensification are soon mitigated, however, by the fact that as we get farther and farther back we reach industries which produce machinery and tools for a large number of other industries at once, so that they register the effect of the average of a great many changes in a great many particular lines of production. Thus we finally reach the steel industry, which produces the chief of all the raw materials used in making capital goods. This industry is so large that a change in the demand for any comparatively unimportant product, however much it may be intensified in the way we have just studied, has no appreciable effect on the great mass of steel production of the country. Only the largest industries buy enough steel to have a decided effect on the demand for this basic material. Railroading, which itself is to a very large extent engaged in the production of intermediate products, furnishes the steel industry with an outlet for its products which is so large as to be quite decisive and at the same time so fluctuating as to be a constant barometer of prosperity or of depression. And the steel industry itself is an equally important barometer, reporting in intensified form all general movements which originate with businesses closer to the final sale of the product.

In summary, the chief attempt of this study has been to give an exact formulation to the relationship, in quantity and in time, between demand for products and demand for the means of production; a relationship which plays a large part in several different theories of business cycles, and the results of which are so obvious that almost all descriptions of business cycles display them. The main principles contended for are as follows:

1. The demand for enlarging the means of production (including stocks of finished goods on the way to the consumer) varies, not with the volume of the demand for the finished product, but rather with the acceleration of that demand, allowance being made for the fact that the equipment cannot be adjusted as rapidly as demand

changes, and so may be unusually scarce or redundant to start with in any given period. The demand for equipment may decrease as a result of this law even though the demand for the finished product is still growing.

2. The total demand for producers' goods tends to vary more sharply than the demand for finished products, the intensification being in proportion to the average life of the goods in question.[1]

3. The maximum and minimum points in the demand for producers' goods tend to precede the maximum and minimum points in the demand for the finished products, the effect being that the change may appear to precede its own cause.

These are but a few of the dynamic laws of demand. Two others may be mentioned which have been brought incidentally into the current of the argument and which have been discussed by other writers. We have seen that the demand for durable goods depends, not merely on the price, but on the direction in which the price is expected to move in the near future, as judged chiefly by the direction in which it has been moving in the immediate past.[2] As this has been worked out by other writers, it need not be elaborated here, but may be listed as one of the dynamic laws of demand. Another fact clearly brought out by Mitchell's study is that the demand for materials is sometimes hindered from reacting promptly to a change in the demand for the finished product by the existence of standing contracts, which divide the market into open and closed sections. The result may be under certain conditions to accentuate the suddenness of changes.

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[1] The "life" of a finished product in this statement means the length of time it remains unsold.

[2] This fact is mentioned by Senior, *Political Economy*, 6th ed., pp. 17–20, esp. p. 18, as well as by Mitchell, *op. cit.*, p. 459. Cf. also G. B. Dibblee, *The Laws of Supply and Demand*, pp. 139–40.