The Marshallian System in 1881: Distribution and Growth

J. K. Whitaker

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THE MARSHALLIAN SYSTEM IN 1881:
DISTRIBUTION AND GROWTH[1]

THE following pages take stock of the views on some central questions of economic theory held by Alfred Marshall in 1881, when he began to work in earnest on the manuscript of his *Principles*.   Consideration is restricted to his theories of distribution and growth, partly to conserve space, and partly because his early views on value, welfare and trade have been more widely disseminated and discussed.   In fact, little reference to his partial-equilibrium value theory proves necessary, since the distribution and growth theories are essentially macro-economic, with only loose micro-economic foundations.

Marshall is revealed in a novel light as a pioneer in what is now known as the neo-classical theory of economic growth.   And by considering a point of time when the early influences shaping his thought were still manifest, the main features of his vision of capitalist development are brought out more starkly and related more clearly to their antecedents.   As is frequently true, our author's mature thought—in this case submerged in the subtle complexities of the *Principles*—is most easily grasped by first considering its earlier expression.[2]

The following sections deal in turn with I, the sources; II, the distribution theory; III, the growth theory; IV, some general remarks.

I

The evidence used to reconstruct Marshall's views is of two kinds: his publications up to 1881, and his unpublished manuscript notes, now held in the Marshall Collection of the Marshall Library, Cambridge.   The most

[2] For a recent study of the distribution theory of the *Principles* see H. M. Robertson, "Alfred Marshall's aims and methods illustrated from his treatment of distribution," *History of Political Economy*, Vol. 2, Spring 1970, pp. 1–64.   A less sympathetic assessment is to be found in G. J. Stigler, *Production and Distribution Theories* (Macmillan, New York, 1941), Chs. IV, XII.

important printed source is the small, and rather neglected, book entitled *The Economics of Industry* which Marshall and his wife published in 1879.[1] Although sometimes laconic and imperfectly articulated, it contains the first statement of his theory of income distribution, as well as penetrating discussions of many side issues.

Among the unpublished items, most reliance is placed on some untitled notes on economic growth dated " about 1880." These are the main foundation for Section III, while the *Economics of Industry* is the major source for the discussion of distribution in Section II.

The following abbreviations will be used in making reference to these writings, and to other works by Marshall:

E: *Economics of Industry* (Second edition)

M: *Memorials of Alfred Marshall* (A. C. Pigou ed., Macmillan, London, 1925)

P: *Principles of Economics* (9th, Variorum, edition, edited by C. W. Guillebaud, Macmillan, London, 1961), Vol. I

V: *Principles of Economics* (9th, Variorum, edition, edited by C. W. Guillebaud, Macmillan, London, 1961), Vol. II

G: manuscript notes on economic growth c. 1880

U: other unpublished notes or manuscripts from the Marshall Collection.[2]

II

The world of the *Economics of Industry* is one dominated by owner-managed businesses, joint-stock companies getting little attention. Thus, managerial labour, or " business power " as Marshall often terms it, is typically remunerated by the surplus left when the expenses of the business are paid.[3] Marshall sees nothing crucial in this, requiring only that the average returns to different levels of managerial skill in different industries be not substantially less discernible or predictable than earnings in other skilled occupations (E pp. 142–4). He admits that ownership of capital is a prerequisite for entry into management (but so it is for many other professions), arguing however that: " A man who has business power and a

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[1] A. and M. P. Marshall, *The Economics of Industry* (Macmillan, London, 1879). All references will be to the 1889 printing of the second edition of 1881. The differences from the first edition are minor, but there is an important extra preface.

[2] The texts of all manuscripts cited as G or U are included in a planned volume, to which the present paper stands as appendix.

[3] Interest on capital is to be included in these expenses. The rate paid on *borrowed* capital includes a premium to allow for the objective risks of the trade and also one to allow for those risks (" personal risks ") attached to the lender's incomplete knowledge about the borrower's skill and probity. However, *owned* capital bears no personal risk and is costed in expenses at a lower interest rate, allowing only for trade risks (E pp. 134–7). This does not dispose satisfactorily of all the difficulties that a lower supply price of owner-employed capital raises for a simple marginal-productivity treatment.

little capital can get more capital " (E p. 118). With these provisos, " the supply of business power is determined in all essential respects in the same way as the supply of skilled labour " (E p. 135).

The central portion (Book II) of the *Economics of Industry* is devoted to the theory of Normal Value, and includes Marshall's explanation of long-term distribution. This theory premises free competition and full time for complete adjustment, but, in fact, various kinds of imperfection of knowledge and limitations on adaptation remain embedded even in the normal theory.[1] Deviations from normal are to be handled by a theory of Market Value, and are of two broad types: the first due to combination among buyers or sellers, and the second due to disturbances and frictions. Book III, Market Value, deals with short-term distribution, but gives no articulated theory, although it is full of penetrating hints and examples.

The aim of the normal theory is:

> to show that there is a unity underlying all the different parts of the theory of prices, wages and profits. . . . This law of Normal Value has many varieties of detail and takes many different forms. But in every form it exhibits value as determined by certain relations of demand and supply; and Cost of Production as taking the chief place among the causes that determine supply. (E p.*v*)

But, in fact, the treatment of commodity and factor prices is far from symmetrical. The normal price of any commodity is determined *micro*-economically by a partial-equilibrium intersection of its normal supply and demand curves.[2] In contrast to this, normal factor prices are determined by a *macro*-economic argument which is, in principle, a general-equilibrium one, although the roles of individual commodity prices and individual producers are obscured in aggregation.

The basic concept is the " net annual income," corresponding exactly to the modern concept of real national income (E pp. 98–100). This income is both the collective product and the combined reward of land, labour and capital. Marshall abandons the classical asymmetry in the treatment of labour and capital, but he still follows the classical practice of eliminating rent by a separate argument. As he later explained:

> . . . the chapter on distribution in our little book proceeds on [von Thünen's] plan of marching off to the margin of cultivation . . . to get

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[1] Thus:

Normal results are those which would be brought about by competition if it acted freely, and always had time to cause those effects which it has a tendency to cause. (E p. 148)

Marshall appears to have recognised quite early that he had not kept strictly to these premises. His copy of the first edition of the *Economics of Industry* (preserved in the Marshall Library) is annotated at the beginning of Book II

. . . in this [Book] we make no more allowance for sloth, apathy, ignorance, custom than we can help (bear in mind, though perhaps don't say so here, that in discussing the causes which determine the supply of skilled labour we are not able to act on this principle as much as in other parts of the book N.B. be on the lookout for other exceptions).

[2] The normal supply curve assumes that normal factor prices are paid (E p. 76).

> rid of rent before starting on the general problem of distribution: so that
> the whole annual produce might be taken as divided between labourer
> and capitalist.   Von Thünen . . . gave a good lead by suggesting
> symmetrical relations between labour and capital; the earnings of each
> being defined by the last profitable application of each at the margin.
> (V pp. 232–3)[1]

The net annual income depends on:

> . . . firstly, fertility of the soil, richness of mines, abundance of water-
> courses, and an invigorating climate: secondly, the number and
> average efficiency of the working population; this efficiency depending
> on moral as well as mental and physical qualities: thirdly, the abun-
> dance of the means which the industry of the past has accumulated and
> saved to help the industry of the present. . . . (E p. 37)[2, 3]

Subtracting from net annual income the amount of rent leaves what Marshall
calls the " earnings-and-interest fund."[4]

   This is regarded, like the net annual income, as a function of the aggre-
gate amounts of capital and labour (E p. 119).   The problem of distribution
is then treated in the following way.

> Our next step is to inquire how this [earnings-and-interest] Fund is
> divided into the share which capital takes as interest, and that which
> industry [i.e., labour] takes as earnings.   Afterwards we shall have to
> inquire how the share which goes to industry is divided among the
> various ranks of unskilled and skilled labour, and business power.
> (E p. 120)

   Marshall's procedure implies that aggregate rent, too, is a function of the
aggregate amounts of capital and labour, and this seems to be the meaning of
his assertion that it is " fixed by definite economic laws " (E p. 95).   But
such a summary dismissal is hardly justified by his detailed treatment of rent.
On classical lines, this considers the application of " doses " of combined
labour and capital to a given piece of land, giving only the briefest recog-
nition to the opportunity-cost idea that rent drives land to the highest-valued
use (E pp. 22, 83, 89–90).[5]   As elsewhere, Marshall seems to have jumped
intuitively to his macro-economic formulation without attempting to link it
directly to detailed micro-economic foundations.   The treatment below will
be sharpened by adopting explicitly an aggregative analogue of the " dose "
approach to rent.

   Despite frequent references to " remuneratory capital " (the wages fund),

   [1] Written in 1898.   Von Thünen's name is not mentioned in the *Economics of Industry*.

   [2] Marshall is speaking here of " total produce " from which labour-subsistence is deducted to
get Mill's concept of " net produce " (see Section III, below).   When he comes to distribution,
Marshall appears to re-title total produce as net annual produce or income.

   [3] A semantic warning is in order here.   Marshall frequently uses the word " industry " in its
archaic sense as a synonym for " labour," as well as in its modern sense.

   [4] This is also termed the wages-and-profits fund, profits being interest plus managerial earnings.

   [5] A farmer's rent, measured in product, is " what remains after deducting from his total produce
the return to his last dose multiplied by the number of doses he applies " (E p. 83).

Marshall appears to treat capital as comprising fixed assets predominantly, treating wages as paid at the same time as output is generated.[1]   He also regards the ratios in which capital and labour are jointly applied as responding flexibly to factor prices.   With these points in mind, the ultimate logic of his approach is easily indicated.   Let $L_1, L_2 \ldots L_n$ denote the quantities employed of the various types of labour, including managerial labour, and let K denote the amount of fixed capital employed.   Then the rate of net annual income, Y, is determined, given the state of the productive arts and the efficiencies of the various types of labour, by

$$Y = F(K, L_1, L_2, \ldots L_n) \qquad . \qquad . \qquad . \quad (1)$$

Now let an input dose comprise one unit of capital and L_i/K units of i-type labour.   Then the return to the marginal dose is

$$\rho = \frac{\partial F}{\partial K} + \sum_{i=1}^{n} \frac{L_i}{K} \frac{\partial F}{\partial L_i}$$

The earnings-and-interest fund, Z, is the number of doses applied, multiplied by the return to the last dose.   That is,

$$Z = \rho K = K \frac{\partial F}{\partial K} + \sum_{i=1}^{n} L_i \frac{\partial F}{\partial L_i} \quad . \qquad . \qquad . \quad (2)$$

whilst aggregate rent, $R = Y - Z$, is the surplus of output over the return to the doses, when each dose is remunerated at the marginal rate.   Like Y, both Z and R are functions of $K, L_1, L_2, \ldots L_n$.

The size and distribution of the earnings-and-interest fund are now simultaneously determined by bringing together factor demand curves, premised on marginal-productivity considerations, and factor supply curves. The demand curves have the form

$$K^d = D(L_1, \ldots L_n, r)$$
$$L_i^d = D_i(L_1, \ldots L_{i-1}, L_{i+1}, \ldots L_n, K, w_i); \quad i = 1, 2, \ldots n \quad . \quad (3)$$

where $K^d, L_1^d, \ldots L_n^d$ are the amounts of capital and labour demanded and $r, w_1, \ldots w_n$ are their respective rental prices, expressed in units of output. The demanded quantity of a factor decreases as its own price increases or the available quantity of another factor decreases (E pp. 120, 130).   The supply curves might temporarily be assumed to express the supply of each factor as a function of its price, so that

$$K^s = S(r)$$
$$L_i^s = S_i(w_i); \quad i = 1, 2, \ldots n \quad . \qquad . \qquad . \quad (4)$$

where $K^s, L_1^s, L_2^s, \ldots L_n^s$ are the quantities supplied.   Bringing together demand and supply curves by means of the equilibrium conditions

$$K^d = K^s = K$$
$$L_i^d = L_i^s = L_i; \quad i = 1, 2, \ldots n \qquad . \qquad . \quad (5)$$

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[1] See Section IV for amplification of this bald statement.

gives just enough conditions to determine factor prices and quantities, and thus Y, Z and R.   Alternatively, the market for some particular factor could be studied in isolation, treating the available quantities of the other factors as parameters (E pp. 129, 147).

The demand functions (3) might be viewed as re-expressing the marginal-productivity conditions

$$r = \frac{\partial F}{\partial K} (L_1, L_2, \ldots L_n, K)$$

$$w_i = \frac{\partial F}{\partial L_i} (L_1, L_2, \ldots L_n, K); \quad i = 1, 2, \ldots n. \qquad . \quad (6)$$

This interpretation would avoid the adding-up problem represented by the fact that not all the demand curves can be specified independently if factor payments are to exhaust Z exactly in (2).   But Marshall appears to derive his aggregate demand curves by direct intuition, although with clear allusions to the micro-economic operation of the marginal-productivity principle.[1]   Broadly, he views capital and the various types of labour as demanding each other's aid and providing each other with a " field of employment." The demands are channelled through the " masters " or managers, who act as the agents for the others (E p. 129), with the demands for the masters themselves being expressed through available profit opportunities (E p. 142).

This is somewhat allegorical, but it is hard to disagree with Stigler's view that Marshall here " advanced the marginal productivity theory in England for probably the first time since Longfield and Butt wrote."[2]   The reluctance to be more explicit about marginal productivity might have resulted from Marshall's desire for simple exposition, or his mistrust of pushing the logic too far.   But it is more likely that his conception remained unclear. Thus, in the notes (G), written about 1880, the interest rate is expressed as a function of the amounts of capital and labour employed and of the " scope for employment of capital."   The latter is expressed as another function of the labour and capital employed, but neither function is related to the accompanying aggregate production function.   By the later-1880s Marshall was certainly equating factor prices to the partial derivatives of production functions (U.c. 1887), so that his full development of the demand side of his distribution theory can probably be dated at the mid-1880s.

Turning to the supply side, the case of labour supply can be dealt with first.   In effect, for a given type of labour, Marshall's practice is to convert all quality differences into quantity differences, by working in homogeneous efficiency units.   Thus, if one man is more efficient than another, he is regarded as supplying more standard labour units of the type in question, and similarly if he becomes more efficient over time.   The standard unit of

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[1] For example: " the current rate of interest measures the Final Utility to each borrower; that is, the advantage to him of that capital which he is only just induced to employ " (E p. 124, also pp. 120, 130, 142).   [2] *Op. cit.*, p. 344.

each type of labour is physically unchanging and receives a *task* wage.[1]   The real return to a worker, termed his *time* wage, is the product of the relevant task wage and the number of efficiency units he supplies (E p. 101).

The fundamental cleavage between the different types of labour runs in terms of a social hierarchy of *grades* of labour, ranging from the unskilled at the bottom to the professional classes at the top (E p. 108).   Each grade is split into different *trades*, or occupational groups, some of which might be industry-specific.   Marshall follows Mill and Cairnes in emphasising the restrictions imposed by ignorance and social convention on movement between grades.   In fact, he assumes that typically an individual may move no more than one grade from his father's.[2]   Nevertheless, this limited mobility is envisaged as indirectly linking all occupations into effective competition for labour, so that a systematic structure of occupational differentials is established (E pp. 107–8, 130–1).[3]

Entry into an occupation

> . . . will be chiefly due to the action of parents in selecting an occupation for their children, but will be to some extent caused by a change of occupation on the part of adults.   (E pp. 108, 116)

But, in fact, it is parental decisions which are treated as the determining factor for skill differentials.   Thus, differentials rest on parents' unselfish concern for their children's well-being and must be such as just to induce marginal parents to undertake the sacrifice of providing the requisite education and training for their offspring.[4]

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[1] Thus, L_i in earlier equations should be interpreted as $N_i e_i$, where N_i is the number, and e_i the average efficiency of i-type labourers.   In the *Princip es*, the task wage became the *efficiency* wage (but see P p. 682, V p. 616, for survivals of the earlier term).   The reader of Book VI of the *Principles* will miss much if he fails to perceive Marshall's use of the efficiency-unit concept.

[2] A rough manuscript fragment related to the growth notes (G) makes this very explicit, reading:

$w_1 \ w_2$, *etc.* ye time wages of grades 1, 2, *etc.*

$n_1 \ n_2$, *etc.* number of labourers

$e_1 \ e_2$, *etc.* average efficiency

[then]

$$\frac{d}{dt} (n_r e_r) = f_r(w_r \ w_{r-1} \ w_{r+1})$$

$$e_r = \rho_r(w_r \ t_r)$$

It seems likely that t_r is the hours of work, but this is not certain.   The omission of commas separating the independent variables was quite common in Marshall's day.   (Marshall Collection, Box 5.)

[3] Actually Marshall prefers to work not with wage rates, but with *net advantages*, defined as the time wage adjusted by the " money equivalents " of the non-pecuniary advantages and disadvantages.   (E pp. 103, 108.)   A subsidiary hypothesis is that competition forces trades belonging to the same grade to have equal net advantages (presumably for workers of average efficiency in each case).   See E pp. 103, 108, 131.

[4] Marshall observes that employers have little incentive to provide training, since they retain the right to the worker's services only in the case of apprenticeship (E p. 112).   He also points out two fundamental differences between parents and slave owners: parents receive little of the pecuniary gain from educating a child; and parents are just as interested in the non-pecuniary returns to the child as they are in the pecuniary gains (E p. 106).

It only became clear later (P pp. 577–9), and was perhaps not clear even to Marshall himself in 1881, that he tended to assume that the standard training would always equip an individual to enter a given occupation, but that efficiency once in the occupation was largely unpredictable.[1]   Thus, the expected return to *average* efficiency in the occupation would be the consideration guiding parents' choice.   The entrant who proved exceptional would earn more than this, but his positive rent (E p. 110) would be offset by the negative rent of entrants who turned out to be inferior, and—providing that parents foresaw correctly the return to average efficiency—no rent would accrue to the occupation as a whole.[2]

The time wages of skilled workers of average efficiency are determined by adding appropriate skill differentials to the time wage of an unskilled worker of average efficiency.   This is taken, in Malthusian spirit, as supply-determined at the level equalling the *standard of comfort*, or conventional subsistence level, at which the unskilled worker is just willing to raise a family: " the wages which afford the means of maintaining this Standard may fairly be called the Normal wages of unskilled labour there and then." (E p. 130.) This standard of comfort will itself change over time—partly in response to upward deviations of wages from their normal level, which habituate workers to new comforts (E pp. 29, 102).   But, for the purposes of the normal theory, Marshall treats the standard of comfort, and also the distribution of worker efficiency, as frozen.   Thus, the normal supply of unskilled labour, whether measured in numbers or efficiency units, becomes a perfectly elastic function of both the time wage and the task wage.

Marshall usually appears to think of the normal wages of the skilled as supply-determined too.   But he sometimes admits a more general rising supply curve for particular occupations (E p. 143).   One reason might be the need to provide inducement to less and less willing parents, thus yielding a kind of rent to the more willing.   But his ideas on this remain far from clear.

We may finally note that a rise in normal wages, due to a higher standard of comfort, would tend to narrow normal skill differentials by making parents in the lower grades more able and willing to sacrifice for their children.   For, " the rate of interest at which parents discount future advantages to their children increases with the narrowness of their education and the pressure of immediate want " (E pp. 107, 130).

There still remains to be considered the supply of capital under normal conditions.   Here, Marshall is prepared to admit that " The annual addition

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[1] As usual, one must qualify slightly.   Marshall did recognise that rare natural talents might be a prerequisite for an occupation (E p. 143).   This implies that innate skill can be recognised in advance of training; also, that the supply curve in efficiency units might be a rising function of the task-wage, because of the need to resort to individuals of inferior endowment, even if the supply of numbers is perfectly elastic in terms of the time wage.

[2] Of course, parents do have difficulty in predicting future earnings.   Their tendency to assume no change may lead to cobweb-like oscillations, in " market " wages, but these would be excluded in the normal theory (E p. 74).

to the capital of a country is not any considerable part of the whole " (E p. 124).   But he does not regard such an approximate constancy as characteris- ing the normal supply of capital.   Nor does he appear to think of normal supply as perfectly elastic, as it would be, given enough adjustment time, if saving fell to zero at some positive interest rate.   Instead, he seems to assume that accumulation will proceed at all rates of interest, saving being relatively interest-inelastic (E p. 125).   Thus, the normal interest rate appears to be interpreted as the slowly-changing trend value of the interest rate in an *on- going* process of steady capital accumulation.

The fact that the capital stock fails to settle at an unchanging normal level is in disagreement with the idea that normal equilibrium involves full adjustment.   It also induces sustained population growth so that (with con- stant supply prices for the different occupations)

> when wages are at the Normal value they are *in equilibrium*; the growth of numbers is neither so fast as to lower them, nor so slow as to raise them.   (E p. 131)

Marshall's framework for a more comprehensive secular analysis of accumu- lation and population growth is set out in the next section, where his idea of normal interest is further considered.   But his conception of it remains cryptic and elusive.[1]

The sketch of the macro-economic theory of normal distribution is now completed.[2]   But traces of a complementary partial-equilibrium theory remain to be noted.   This deals with a factor specific to a particular in- dustry, so that the demand for the industry's output becomes a crucial deter- minant of earnings (E p. 128).   This line of argument—essentially the doctrine of derived demand—is strictly subsidiary in the theory of normal distribution, but it becomes more important in the theory of market dis- tribution (E pp. 165–6), since factor specificity then becomes more promi- nent (E p. 162).[3]

Turning briefly to the *market* theory of value and distribution, there are two focuses for discussion: the effects of " friction " and the effects of " com- bination."   The frictions are partly due to ignorance, custom and inertia, which are only gradually overcome by economic forces (E pp. vi–vii).   But they also reflect the specificity of the capital and skilled labour already com-

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[1] For an interpretation quite similar to that given in the text, see Joan Robinson, *Collected Economic Papers, Volume Two* (Blackwell, Oxford, 1960), pp. 23–4.

[2] It is not necessary to enter into Marshall's attempts to treat the supply prices of labour and capital as measuring the real costs—that is, the effort, parental sacrifice and waiting—involved. This extension is without substantive implications for the distribution theory, and is perhaps best accounted for by Marshall's piety towards the real-cost approach of his classical predecessors.   See in particular his 1876 essay on Mill (M pp. 119–33).

[3] The vexed concept of net product or *net return* of labour is introduced in this connection. Marshall clearly defines it as a tautology, but one which may be useful if supplemented by further assumptions.   This is especially true in the very short period (when production coefficients may be taken as fixed) if the prices of all inputs but one are given.   See E pp. 133–4.

mitted to particular branches of production. Because of such frictions, the wage and interest rates can deviate from their normal values for long periods, though always tending towards them (E pp. vii, 131). Meanwhile, varia- tions in earnings are very much influenced by variations of demand, so that for the individual industry

> we see how the Law that Normal value is determined by Normal Expenses of production is consistent with the fact that market fluctua- tions of value are the cause and not the consequence of market fluctua- tions of Expenses of Production. (E pp. 166–7)

This is the quasi-rent doctrine, though the term is not used, nor is the notion given much prominence. This fits in with Marshall's claims to have originated his ideas on quasi rent as early as 1868 but to have " only grad- ually developed " them (M p. 414).

It appears that Marshall views the effects of " combinations " too as being only transient, so that:

> . . . the Normal action of economic forces is hindered, or even over- ridden, *but never destroyed* by friction, by *combination* or by those passing events which exercise a restless influence on Market value. (E p. *vi*, italics added)

Thus, he asserts that:

> the advantages which custom or social opportunities or *trade organiza- tions* give to the various ranks of industry in bargaining . . . may cause the wages of a trade to diverge *for a considerable time* from their Normal level. (E p. 128, italics added)

It is certainly true that he emphasises the difficulty of restricting entry and enforcing cartel discipline (E pp. 180–6, 210). But he surely goes too far in disregarding cases in which a firmly entrenched monopolist or trade union can cause a permanent deviation from the competitive, normal situation.

The distributional effects of combinations are considered mainly through questions of trade-union action. A single union, controlling a particular trade, can raise wages without restricting numbers by countering the workers' disadvantage in bargaining. It can raise wages even further if it can restrict numbers. The first course is also open to all unions collectively (E p. 200), but the second, if attempted by all unions, would obviously be undermined by unemployment and, in any case, would not increase the wage bill, despite increasing the wage rate.[1]

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[1] See E pp. 196, 212, where it is implied that labour's relative share of the earnings-and-interest fund is approximately constant, so that a reduction in labour supply will reduce labour's absolute share by reducing the absolute size of the fund. There is a parallel assertion about the earnings of capital (E p. 42).

III

The theory of normal distribution, with its macro-economic character, lends itself naturally to incorporating the secular processes of population growth and capital accumulation. Such an extension would come particularly easily to someone as steeped in the thinking of Ricardo and Mill as was Marshall. There are indications scattered through the *Economics of Industry* as to the development of his thinking in this direction, and the manuscript notes on growth, although fragmentary, do lay out in mathematical form the main elements and their interrelations. There is certainly enough evidence to discountenance the common view that " Marshall never produced a theory of economic growth."[1]

In attempting to describe this neglected facet of Marshall's thought, his treatment of population and labour efficiency will be considered first, and next that of the accumulation of capital. His complete system is then easily set out, and the discussion closes with an outline of his views on the future of the rate of interest, and on the growth effects of income redistribution.[2]

Marshall abstracts from the investment of " personal capital " in labour skills and treats all labour as if it were unskilled.[3] If w denotes the *task* wage, and e the efficiency of an average worker, then the average *time* wage is

$$w' = e \cdot w \qquad . \qquad . \qquad . \qquad . \qquad (7)$$

Then, if s is the standard of comfort, and t is time, the growth of working population, N, is given by

$$(dN/dt)/N = f(w' - s, w') \qquad . \qquad . \qquad . \qquad (8)$$

Population growth increases with $w' - s$, through an effect on the marriage rate. It also increases with w', since better living standards lower mortality (E p. 29).[4]

[1] A. J. Youngson, " Marshall on economic growth," *Scottish Journal of Political Economy*, Vol. 3 (February, 1956), p. 1.

[2] No attempt is made here to follow all the details of the original notes, which will be reproduced elsewhere, as explained above.

[3] Alternatively, the single type of labour is an aggregate of types of labour of all skill levels. This would permit the average efficiency of labour to be increased by investment in skill—or " personal capital " as Marshall calls it, viewing it as the main vehicle for saving from wages (E p. 39).

The manuscript fragment partially reproduced in an earlier footnote continues by indicating such an aggregation. (Marshall Collection Box 5, c. 1880.) It relates to the earnings-and-interest fund, rather than the net annual income and runs:

$P =$ (total production after deducting for rent and sustainment of cap[ital], & not including work that is habitually done by members of each grade for themselves)

$= \Phi \; (n_1 \, e_1, \, n_2 \, e_2 \ldots w, \, F, \, A, \, S)$

$= \Psi \; (N \, E \, w \, F \, A \, S)$ for brevity

When $N =$ total no and E average efficiency [of] lab[our]

[Here n_i, e_i denote the number and average efficiency of workers of grade i, w denotes tangible wealth, F denotes the fertility of the soil, A denotes the state of the productive arts, and S denotes the degree to which property is secure.]

[4] The long-run supply price of numbers of unskilled workers will thus be, not s, but a function of

As to the standard of comfort: " s may be taken as a known function of w' and t, for we must take general improvements in s as a known function of t. . . ." (G). The possibility that a rise in wages will induce a rise in s is clearly admitted (E pp. 28, 130). But an immediate adaptation would not be in keeping with Marshall's stress on the importance to the standard of comfort of new habits and induced fundamental changes in outlook and morale (E p. 102). It would thus seem more appropriate to assume that s responds only gradually to w', so that

$$ds/dt = \lambda\{g(w', t) - s\}, 0 < \lambda < \infty. \qquad . \qquad . \qquad (9)$$

The expression $g(w', t)$ gives the equilibrium level towards which s is adjusting at any date, the time-shift being included to capture the effect of general social trends, such as the spread of education, or the knowledge of new goods. Marshall's version is obtained by assuming habituation sufficiently rapid to make $\lambda \rightarrow \infty$ appropriate, so that

$$s = g(w', t) \qquad . \qquad . \qquad . \qquad . \qquad (9^*)$$

The growth in the efficiency of labour is not treated very explicitly. An important strand in Marshall's thought at this time was the belief that an increase in time wages can increase the efficiency of labour by improving living standards, so that task wages may not be increased, or may be increased less than proportionately (E pp. 10, 102, 133).[1] He assumes

$$de/dt = h^*(K, N, e, A, t) \qquad . \qquad . \qquad . \qquad (10^*)$$

where K is the stock of capital and A the state of the arts of production. But a more explicit version, which accords with his general views (E p. 102), would be

$$de/dt = \mu\{h(w', t) - e\}, 0 < \mu < \infty \qquad . \qquad . \qquad (10)$$

Here, $h(w', t)$ is the equilibrium level to which e is adjusting at date t, the wage rate w' being included to allow for the economy-of-high-wages effect, and the time shift to allow for more general social forces, such as the spread of education and good sanitation. It should be noted that Marshall's own specification (10^*) follows from (10), once w' is expressed in terms of its determinants.

Turning to the accumulation of capital, Marshall follows Mill[2] in dis-

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s, $w'(s)$, defined by $f(w'(s) - s, w'(s)) = 0$. The value of $w'(s)$ increases with s, but less rapidly than s. However, $w'(s)$ will remain close to s, providing that the marriage effect is large compared to the mortality effect for w' near s. The marriage effect will be smooth, even if all workers have the same s, providing that there is a distribution of efficiencies, so that some workers achieve the standard of comfort even when the average time wage is below it, and so on.

[1] The " economy-of-high-wages " phenomenon had been stressed in F. A. Walker, *The Wages Question* (New York, 1876), but it appears that Marshall had already developed his own views on it. The writings of Thomas (Lord) Brassey, son of the famous contractor, were probably an important source.   [2] J. S. Mill, *Principles of Political Economy*, Book I, Ch. XI, § 1.

tinguishing the power and the will to save.   The *power* to save is the excess of net annual income, Y, over the amount of consumption required to sustain the efficiency of the population.   This surplus, V, is

$$V = Y - N \cdot j(e) \quad . \qquad . \qquad . \qquad . \quad (11)$$

where $j(e)$ is the minimum amount of consumption required to sustain the efficiency of a worker when average effciency is e. $j(e)$ is increasing with e, but less than proportionately (E p. 37).

The surplus above necessary consumption represents the economy's saving potential, but the amount of the surplus that is actually accumulated depends upon the *will* to save.   This in turn depends upon the degrees to which individuals are imbued with foresight and family affection, upon the security of possession and the social advantages of wealth, and upon the ease with which accumulated assets can be managed (E pp. 37–9).   It may also depend upon the distribution of income between rent, wages and profits (E pp. 39–40).   Finally, it depends upon the rate of interest.   However, ". . . it is a man's temperament, much more than the rate of interest to be got for his savings, which determines whether he makes provision for his old age and for his family, or not " (E p. 41).

All this may be formalised as

$$dK/dt = m(V, r, rK) . \quad . \qquad . \qquad . \quad (12)$$

where rK is added to allow for the possibility of higher saving out of profits. It appears to be assumed that positive accumulation would proceed at any interest rate (E pp. 42, 125, 127).

To complete the system, the theories of production and distribution set out in the last section are called for.   The aggregate production function (1) becomes

$$Y = F(K, N.e, A, \xi) . \quad . \qquad . \qquad . \quad (13)$$

where the parameter ξ represents " the fertility of natural resources above and below the surface of the ground " (G).   Presumably Y increases with K, $N.e$, and A: the diminishing-return properties are not clearly specified. The task-wage rate is given by

$$w = G(K, N.e, A, \xi) \qquad . \qquad . \qquad . \quad (14)$$

and is normally, but not necessarily, decreasing with $N.e$.   It is increasing with K, and also with A, " unless progress causes increased conversion of remuneratory capital into auxiliary or of circulating capital into fixed " (G).[1]   The relationship (14) is presumably derived by taking the aggregate demand function for labour and solving for the wage rate that will just secure the employment of the available labour force.

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[1] The wages-fund preconceptions implicit in this remark should be noted.   Marshall's tendency to cling to these for much longer than he later claimed is discussed briefly in Section IV, below.

The interest rate is determined by a similar equation

$$r = H(K, N.e, A, \xi) \qquad . \qquad . \qquad . \qquad (15)$$

where r will increase with $N.e$ and will decrease with K unless " there is a great natural field waiting to be opened up by capital " (G).   Finally, rent is determined as the residual $Y - rK - wNe$.

The set of equations (7) to (15) (using either the starred or unstarred versions of (9) and (10)) comprises a complete dynamic system yielding time paths for N, s, e, K, Y, V, w, w', r, since Marshall assumes (G) that the progress of the arts of production is a known function of time and the other variables.   The system is closed most simply by adding the equation

$$dA/dt = J(t) \qquad . \qquad . \qquad . \qquad . \qquad (16)$$

There is little to indicate that Marshall devoted substantial attention to the analysis of the system as a whole, or even to the detailed formulation of its several components.   But it is of value in laying out the framework for his thought.   It goes in some ways beyond anything appearing in the modern growth-theory literature, even though its sophistication falls short in other ways.

One of Marshall's chief reasons for setting up a complete system appears to have been a desire to analyse the forces bearing on the future of the interest rate.   If so, the results must have been discouragingly opaque and un-informative, neither confirming nor replacing the loosely-argued prognosis offered in the *Economics of Industry*.   This runs as follows.   Capital can be expected to continue to grow more rapidly than population (E p. 42), but, to offset this, technical progress is likely to be capital-using (E p. 121).   Never-theless,

> Sooner or later the rapid growth of capital must increase the competition of capital for the aid of labour . . . so that capital's share of the total net produce will cease to be proportionately as large as before.   And, at the same time, the total net produce that can be obtained by a given amount of capital and labour will diminish according to the Law of Diminishing Return.   So that ultimately the Normal rate of interest will fall.   (E p. 127)

The fall will probably be slow, and the normal interest rate is likely " never to attain but always to be approaching its *minimum*.   But we have no means of guessing what that *minimum* will be " (E p. 127).   But, the absolute amount received in interest will probably continue to rise (E p. 42).

These views, which, it will be noted, relate to the *normal* interest rate, reinforce the interpretation of that concept given in the preceding section. For, in the absence of " market " disturbances, the interest rate is likely to fall only slowly, so that for considerable intervals of time it may be treated as *approximately* constant.   Perhaps it is significant that Marshall adds the qualification " practically " when observing that the normal rate of interest

is " a practically fixed and uniform amount at any given time and in any given country " (E p. 146).

The other growth-related question he explores is the long-term effect of an income redistribution from profits to wages, secured by trade-union action (E pp. 201–3). He argues as follows. An increased wage share will reduce profits and the interest rate, and so retard the rate of capital accumulation, unless the higher wages induce a sufficient increase in labour efficiency, perhaps through extra investment in human, or " personal," capital. Otherwise, the wages-and-profits fund (alias earnings-and-interest fund) will fall cumulatively below the path it would have followed in the absence of re-distribution. Indeed, he makes this conclusion more striking by gratuitously supposing that wages would have been constant in the absence of redistribu-tion, so that sooner or later ". . . wages will fall, and will probably go on falling until the removal of the causes which checked the growth of the Wages-and-profits Fund " (E p. 201). As he remarks, " An exact treatment of the problem . . . requires the aid of mathematics " (E p. 201) and the need for further analysis may have been a factor inducing him to set out his assumptions more explicitly. But there is no indication that he went on to deal rigorously with the question. Indeed, after 1881, he seems to have devoted little attention to this whole range of questions. The ambitiousness of his vision proved self defeating, for Marshall was not the man to settle for painstaking analysis of anything he would view as even more grossly simpli-fied than this simple, but intractable, set of equations.

IV

Our conclusions must look in opposite directions from 1881: backward, towards the sudden flowering of neo-classical economics in the early 1870s, and the vexed questions of priority it engendered; forward, towards the appearance of *Principles of Economics*, Vol. I, in 1890, and the mature ex-pression of Marshall's economic doctrines.

Marshall's distribution theory of 1881 appears to have been firmly rooted in the tradition of his classical forbears. And he continued through his life to give much credit to " the short but profound study of the causes that govern the distribution of the national dividend " contained in Book IV of Mill's *Principles* (P p. 824). But the process of gradual development and refinement to which his thinking on distribution was subject—up to, and beyond, 1881—achieved a profound transformation of classical thought. There is no good reason to doubt Marshall's frequent claims that the only other significant influence was von Thünen's. But it seems that this in-fluence was less immediate and striking than Marshall's later claims would suggest. Before the full influence of von Thünen's thought could be exerted, Marshall's own mind had to be released from the shackles of wages-fund pre-conceptions. This appears to have been accomplished neither quickly nor

easily—certainly not by the early 1870s (U, c. 1871, c. 1875), and perhaps not
fully by 1879, when the *Economics of Industry* first appeared.

In fact, the *Economics of Industry* retains much wage-fund terminology
(*e.g.*, E pp. 13–20, 199–213) and some lapses into wages-fund preconceptions
(*e.g.*, E pp. 19, 205). Some of the circumlocutions must have been con-
sciously included to preserve apparent continuity with the received Mill–
Cairnes doctrine, but the lapses suggest a lack of perfect clarity in Marshall's
own mind.[1]

The book makes a valiant attempt to present the new theory as a refine-
ment of wages-fund ideas rather than a controversion. Thus, rather than
abandon the idea that wages are limited by capital, it is argued that " in-
crease in the efficiency of labour would really lead to an increase in the
supply of capital " (E p. 17). Only later, in articles published in 1885 and
1887 (V pp. 598–614, 822–7) did Marshall make it clear that he assumed
producers to hold sufficient stocks to cater for unexpected increases in
demand. With output now measured as value added, the constraint of a
limited wages-fund lost its economic significance.

Turning briefly to Marshall's *Principles*, the most striking fact is the extent
to which its Book VI echoes his earlier macro-economic theories. But the
reader without foreknowledge of them will perceive this only dimly.[2] Not
only are they given a subsidiary role, but their outlines are lost to sight in an
expositional style which blurs all sharp distinctions and interweaves many
strands of thought.[3] The book contained much that was new and superior,[4]
but in expounding theories of distribution and growth it fell, if anything,
below the standard of earlier work.

Despite the long evolution of the *Principles*, the gap separating Marshall's
partial-equilibrium theory of value from his aggregative theory of distribu-
tion remained unbridged. Book V laid careful foundations for treating
input demand, and went far towards integrating land with other factors.
But there still remained a staggering jump to pronouncements about the
distribution of the " national dividend " as a whole. In other ways, time
actually told against the *Principles*. Marshall's treatment of the demand side
of the distribution question soon became only one of many tributaries to the

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[1] He later explained: " I was unwilling . . . [in 1879] to write upon distribution at all, because
I did not then see my way clearly as to some parts of it." But he insisted " The general notion of
distribution in the *Economics of Industry* . . . is the same as in my *Principles*." (V 232.)

[2] But it remains hard to imagine how Checkland could arrive at the view that Marshall's first
pronouncement on macro-economic questions of distribution came in his casual 1895 discussion of a
paper by Bowley. (S. G. Checkland, " Marshall and the wages–wealth paradox," ECONOMIC
JOURNAL, June 1957, pp. 330–33.)

[3] This is tied up with a shift in the meaning of " normal equilibrium." Instead of a clearly-
defined theoretical ideal, it becomes whatever position would actually tend to be established, relative
to a specified *ceteris-paribus* impoundment (P pp. 347–8).

[4] There are also some new puzzles, in particular those posed by tantalising hints of a general
theory tying together a new concept, the standard of life, with the standard of comfort, worker
efficiency, and patterns of consumption (P pp. 86–91, 195–8, 504–31, 689–721). This skein of
Marshall's thought still remains far from unravelled.

swelling stream of marginal productivity theory, whilst his treatment of the supply side soon seemed stilted.   No one strove harder to master the rapid institutional change of his era.   But his views on workers and businessmen became increasingly anachronistic and romanticised, and he remained trapped in the world view so patiently constructed during the 1870s.

<div align="right">J. K. WHITAKER</div>

University of Virginia.

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