

the world should not only scrutinize both the theory and the experimental methods, but also set up their own experiments (Ziman, 1978, pp.67–8). It is correspondingly dangerous to rely on a single piece of apparatus (such as a particle accelerator of great size and cost) as the sole source of evidence, especially if access to it is tightly controlled, perhaps on the grounds of avoiding wasteful duplication of effort (Ziman, 1978, pp.63–4). The search for economy may prove very expensive. State science is especially prone to such dangers. But, although Whitley's principal argument for the significance of his study is that different systems of organization and control lead to different types of knowledge, he does not seem to be aware that they also influence its reliability.

If epistemology leads to the conclusion that what we call scientific knowledge is necessarily the product of a social process, then the study of the growth of knowledge is a scientific field which is open to sociologists and also to organizational theorists and psychologists. (Is it no more than a fragmented adhococracy? At least it is a fairly open society.) Whitley's contribution seems to me helpful and important. It could have been still more helpful had he not conceived it solely as a study of scientific fields as reputational work organizations. Although critical appraisal from another viewpoint may demonstrate (as it usually does) the need for some reconstruction, and even perhaps some demolition, there appear also to be good prospects of extension and integration. The analytical framework of this book already appears sensible; it should not be difficult to enhance its sensibility, which is a necessary stage on the way to more reliable knowledge.

4 Knowledge and organization: Marshall's theory of economic progress and coordination*

Style and purpose

'It's all in Marshall.' There is more truth in that once-familiar claim than there would be in a similar claim about any other economist; yet, as Samuelson (1967, p.25) rightly observed, what is in Marshall cannot be revealed by the reading of Marshall alone. What one sees is very largely a reflection of one's own viewpoint; often it is only after thinking about a specific issue that one realizes that Marshall had thought about it too, and had set down his ideas in his usual unemphatic way, as if they were already common property. His manner is very different from that of Hicks, who always explains what he is doing and why; neither in the *Principles of Economics* (1961) nor in *Industry and Trade* (1919) does Marshall attempt to distinguish his own contributions – though frequently acknowledging those of others – and his clear views on how economists should proceed are not allowed to mark out a distinctively Marshallian programme. Consequently, although he gained a great reputation, many of his ideas have had very little influence.

Marshall's method of presentation was adjusted to his primary objectives: to secure the position of economics as an academic discipline of the first rank, and to promote economic policy which should be securely based on economic knowledge. The first objective was achieved: he became the leader of the profession in Great Britain, and created both the Royal Economic Society and the Economics Tripos at Cambridge. One major purpose of the Tripos, it may be noted, was to provide a broad preparation for business (1961, II, pp.167–71). On economic policy he was less successful, partly because his own sense of the complexity of issues made him increasingly reluctant to commit himself to particular measures, apart from the preservation of free trade. The

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achievement of these objectives put a substantial premium on both consensus among the professionals and acceptance among the leaders of business and politics, and these desiderata meshed well with his own belief in the gradual improvement of knowledge and his personal aversion from controversy. In the footnotes to the *Principles*, his sharpest criticisms are reserved for those who, in his view, are unjustly critical of others.

Marshall's determination to build a consensus, like many carefully considered policies, had unintended consequences. One major sequel is examined in the following chapter; here the emphasis is rather on what did not happen – the analysis which dropped out of use. It seems to be generally agreed that the core of Marshall's *Principles* is contained in Book V: 'General Relations of Demand, Supply, and Value'. If one judges past economists by their contribution towards the development of modern microeconomic theory, which for many is the intellectual glory of our subject, then this is natural. But from such a perspective, Marshall's contribution must appear hesitant, fumbling, and sometimes even wilfully perverse. He fails to pursue the logic of his analysis, seems not to understand the formal requirements of perfect competition which are nowadays listed in elementary textbooks, wanders into imperfect competition without realizing it, and by his insistence on the prevalence of increasing returns exposes his whole theoretical scheme to destruction by Sraffa (1926). No wonder Samuelson (1967, p.24) believed that 'much of the work from 1920 to 1933 was merely the negative task of getting Marshall out of the way'. That task was very effectively done. It was only much later that Joan Robinson (1951, pp.vii–viii) realized that what had been 'got out of the way' included a richly detailed theory of economic development. As we shall see in Chapter 6, it was left for G.B. Richardson (1960) to demonstrate that Marshall also had at least the elements of a theory of the way in which equilibrium could be established – the missing half, as Hahn has so often reminded us, of general equilibrium theory.

Economic development

The analysis of this chapter is based on the proposition that much of what is in Marshall is far more clearly revealed if we approach him from Adam Smith rather than from modern microeconomics. For Marshall, like Smith, was primarily concerned with a topic alien to modern microeconomics, namely the nature and causes of the wealth of nations. The coordination problem – the prime issue of general equilibrium theory – is for both Smith and Marshall a secondary, though crucial, issue. It arises precisely because the increasing wealth of nations

is promoted by the division of labour; for, unless the resultant specialized activities can be effectively coordinated, the division of labour will lead not to prosperity but to chaos and misery. But the means of coordination should be chosen in such a way as to encourage, rather than frustrate, increasing productivity, and, as seems to be increasingly (albeit often dimly) recognized, a perfectly competitive general equilibrium does not obviously meet this requirement. Marshall's Book V is intended to do so; it must therefore appear unsatisfactory from Samuelson's perspective.

As we shall see towards the end of this chapter, Marshall's theory of value appears in a very different light when read in its proper sequence, after the relatively neglected Book IV of the *Principles*, which is entitled 'The Agents of Production. Land, Labour, Capital and Organization'. That Book too (supplemented by *Industry and Trade*) must be considered in the context of Marshall's motivation for studying economics – that characteristic Victorian desire to improve 'the condition of the people'. Marshall saw three means of improvement. I shall briefly consider the first two, before examining the third in some detail.

The first means of improvement was state and voluntary action. The idea that Marshall's economic theory was intended to demonstrate the impossibility of improving on the contemporary economic system is absurd. Although much influenced by Darwin, he was no uncritical admirer of the social consequences of Darwinian processes.

We must call to mind the fact that the struggle for survival tends to make those methods of organisation prevail, which are best fitted to *thrive* in their environment; but not necessarily those best fitted to *benefit* their environment. (Marshall, 1961, pp.596–7)

In a competitive market, rewards go to those who offer direct and immediate service, and many businesses – especially cooperative associations, in which Marshall saw great potential for improving the lives of working people – do not survive long enough to generate their valuable but more distant benefits. Nor are inventors always adequately rewarded, for reasons which are now standard (1961, pp.597–8). 'There is no general economic principle which supports the notion that industry will necessarily flourish best, or that life will be the happiest and healthiest, when each man is allowed to manage his own concerns as he thinks best' (Marshall, 1919, p.736).

Adam Smith, as Marshall reminds us,

... frequently stated or implied that it would be possible for an omniscient and omnipotent Government to direct the actions of merchants, and other

people, in a course more conducive to public well-being than that in which they would be led by their own interests. (1919, p.744)

But Adam Smith did not believe that governments could command either the knowledge or the moral integrity that would be necessary. Neither did Marshall:

... the State is the most precious of human possessions; and no care can be too great to be spent on enabling it to do its special work in the best way: a chief condition to that end is that it should not be set to work, for which it is not specially qualified, under the conditions of time and place. (1919, pp.647–8)

Adam Smith acknowledged the limitations of those moral sentiments which he had examined at length before turning to the effects of self-interest. 'In civilised society [man] stands at all times in need of the cooperation and assistance of great multitudes, while his whole life is scarce sufficient to gain the friendship of a few persons.' That, as is often forgotten, is why 'it is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest' (Smith, 1976, I, pp.26–7). Self-interest, which is relatively abundant, must be substituted, according to the principle of comparative advantage, both for love and the beneficent power of the state, which are relatively scarce. Marshall agrees with Smith. Although we should take all regularly acting motives into account as far as possible (1961, p.vi), we must not forget 'the one fundamental principle: viz. that progress mainly depends on the extent to which the strongest, and not merely the highest, forces of human nature can be utilized for the increase of social good' (1919, p.664). Demonstration of market – or organizational – failure is no more than the statement of a problem: the suggested remedies may not only be imperfect but also have unwanted side-effects.

Marshall's second means of improvement was through the encouragement of higher-quality wants. Marshall's wish to encourage personal reform is reflected in the moralizing tone which pervades the *Principles*, and which most readers now find unattractive (as well as a violation of the rules of 'positive' economics); but he also placed much emphasis on the sociology of wants. Stigler and Becker's (1977, p.76) proposition that wants should be treated as uniform and unchangeable, whatever its attractions as a rule of model-building, would surely have been rejected by Marshall as stultifying his purpose.

Environment is important.

There is no better use for public and private money [note that both state and voluntary action are invoked] than in providing public parks and playgrounds in large cities, in contracting with railways to increase the number of workmen's trains run by them, and in helping those of the working classes who are willing to leave the large towns to do so, and take their industries with them. (Marshall, 1961, p.200)

But what is especially striking is Marshall's concern for the social consequences of the industrial system. He reverses the now-standard causation by claiming that 'each new step upwards is to be regarded as the development of new activities giving rise to new wants, rather than of new wants giving rise to new activities' (1961, p.89); thus, 'it is to changes in the forms of efforts and activities that we must turn when in search for the keynotes of the history of mankind' (1961, p.85).

As Parsons (1931), Whitaker (1977) and Chasse (1984) have emphasized, the influence of activities on wants is central to Marshall's view of human progress, and his concern with forms of economic organization is partly motivated by their supposed long-run effect on human character. In particular, schemes for encouraging the advancement of working men – which included the reform of English spelling, estimated by Marshall (1919, p.352) to set free at least one year of elementary schooling – were to be welcomed as much for their stimulus to greater care and forethought in consumption decisions as for the additional output which could be secured by redeeming otherwise wasted human ability. Marshall (1961, p.310) characteristically observes that the effects on consumption and character may be better if the rise of a family from the working classes is spread over two generations: he shared the Victorian gentleman's dislike for the *nouveaux riches*. Best of all, perhaps, was a worker's cooperative, where workers could learn to direct a business without being exposed to the temptations of unaccustomed wealth and power. The emphasis throughout, it may be noted, is on the working man; women are usually thought to be doing work of higher value in moulding the character of their children at home – perhaps a reflection of Marshall's own early experiences (Coase, 1984). Although Marshall was primarily responsible for extracting economics at Cambridge from the Moral Sciences Tripos, it remained, for him, a moral science.

The division of labour

We come now to the third means of improving the condition of the people, and the main theme of Book IV of the *Principles*. This means is not the promotion of an efficient allocation of given resources to given production sets through the creation of a competitive economy

(or its Siamese twin, the perfectly planned economy). Indeed, in the introductory chapter of the *Principles*, Marshall argues that competition – especially price competition – ‘is only a secondary, and one might almost say, an accidental consequence from the fundamental characteristics of modern industrial life’ (1961, p.5). These characteristics are listed in a marginal summary as ‘self-reliance, independence, deliberate choice and forethought’, and Marshall observes that they may tend in the direction either of competition or cooperation. What matters is the replacement of custom by enterprise.

The framework of progress, for Marshall as for Smith, is provided by the division of labour, continually extended by the growth of the market, to which its results contribute in turn. Marshall praises Smith for giving ‘a new and larger significance to an old doctrine by the philosophic thoroughness with which he explained it, and the practical knowledge with which he illustrated it’ (1961, p.240). As the author of *The History of Astronomy* (1980) (discussed in Chapter 1), Smith would surely have been gratified by the form of this compliment; he would also have appreciated the potential appeal of Marshall’s characteristic invocation of biology in order to propound

... a fundamental unity of action between the laws of nature in the physical and in the moral world. This central unity is set forth in the general rule, to which there are not very many exceptions, that the development of the organism, whether social or physical, involves an increasing subdivision of functions between its separate parts on the one hand, and on the other a more intimate connection between them. (Marshall, 1961, p.241)

The important distinction between social and physical organisms, which is very clear from Marshall’s discussion but to which he does not draw explicit attention, is that social development is fostered by human initiative and creativity: it is for this reason that ‘while the part which nature plays in production shows a tendency to diminishing return, the part which man plays shows a tendency to increasing return’ (1961, p.318). Since the former has a physical and the second a social basis, it is dangerous to treat them both as technological data.

That increasing return has to be worked for, and cannot be selected from a previously defined production set, is implicit in Marshall’s (1961, p.318) definition: ‘The law of increasing return may be worded thus:—An increase of labour and capital leads generally to improved organization, which increases the efficiency of the work of labour and capital.’ Nor is increasing return a return to scale, in the standard sense of a relationship between equi-proportional increases in all inputs and the resultant increase in output. It is indeed a relation between inputs

and outputs; but the ‘quantities cannot be taken out exactly, because changing methods of production call for machinery, and for unskilled and skilled labour of new kinds and in new proportions’ (1961, p.319). Marshall excludes ‘any economies that may result from substantive new inventions; but we include those which may be expected to arise naturally out of adaptations of existing ideas’ (1961, p.460). He suggests, by way of example, that ‘if the volume of production were greater, it would perhaps be profitable to substitute largely machine work for handwork and steam power for muscular force’ (1961, p.344).

Thus, increasing returns result from the exploitation of possibilities of substitution which are opened up by production on a larger scale. This thoroughly confuses the distinction which we try to impress on our students between the law of variable proportions and returns to scale; but it happens to be the sensible thing to do. The falling unit costs that we habitually attribute to economies of scale do arise from the possibilities of changing proportions; and what we loosely call diseconomies of scale result from the inability to increase all inputs in the same proportion. The examples provided in textbooks typically rely on changing proportions despite their authors’ intentions. Koutsoyiannis, after defining returns to scale in terms of equi-proportional increases in inputs (1979, p.77), states baldly (1979, p.81) that ‘increasing returns to scale are due to *technical and/or managerial indivisibilities*’. Samuelson proceeds directly from equi-proportional change to examples which clearly imply factor substitution (Samuelson and Nordhaus, 1985, p.37). If we insist on our rigorous definition, then the only reasonable assumption to make about returns to scale is that they are constant.

Wealth through knowledge

The distinction between substantive new inventions and those naturally arising out of adaptations of existing ideas is clearly not precise, and Adam Smith’s own discussion of the scope for the invention of machinery – one of the ‘three different circumstances’ which explain the increases in productivity which generally follow a greater division of labour (1976, I, pp.17–22) – suggests the rather different notion of a framework for continuing invention and discovery. Such indeed is Marshall’s general theme in Book IV, and it is announced in the second paragraph of its opening chapter.

Capital consists in a great part of knowledge and organization. . . . Knowledge is our most powerful engine of production: it enables us to subdue nature and force her to satisfy our wants. Organization aids knowledge: it

has many forms, e.g. that of a single business, that of various businesses in the same trade, that of various trades relatively to one another, and that of the State providing security for all and help for many. (1961, pp.138-9)

The twin themes of the Book are the effects of the growth of knowledge on organization and costs of production, and the effects of the organization of production on the growth of knowledge. These effects are not adequately represented within the structure-conduct-performance version of equilibrium analysis which, for many years, dominated economists' thinking – itself a striking example of the effects of the organization of economic theory production on the growth of economic knowledge. For Marshall, quite as much as for Schumpeter (1934, p.63), economic development was not a response to external stimuli but arose 'by its own initiative, from within'.

'The older economists took too little account of the fact that the human faculties are as important a means of production as any other kind of capital' (1961, p.229). We now have human capital theory to supply this deficiency, but it does not do all that Marshall would want, because human capital is not allowed to change the parameters of the system within which it is analysed.

To be able to bear in mind many things at a time, to have everything ready when wanted, to act promptly and show resource when anything goes wrong, to accommodate oneself quickly to changes in detail of the work done, to be steady and trustworthy, to have always a reserve of force which will come out in emergency, these are the qualities which make a great industrial people. (1961, pp.206-7)

They are not obviously the qualities required in a system of general equilibrium, although they might be useful in a sequence economy. But this is not all:

... the manufacturer who makes goods not to meet special orders but for the general market must, in his first rôle as merchant and organizer of production, have a thorough knowledge of *things* in his own trade. He must have the power of forecasting the broad movements of production and consumption, of seeing where there is an opportunity for supplying a new commodity that will meet a real want or improving the plan of producing an old commodity.

But secondly in this rôle of employer he must be a natural leader of men. He must have a power of first choosing his assistants rightly and then trusting them fully; of interesting them in the business and of getting them to trust him, so as to bring out whatever enterprise and power of origination there is in them. (1961, pp.297-8)

Now it is the manufacturer supplying the general market who is

supposed to be represented by the perfectly competitive firm of later theory, and, in that theory, it is certainly no part of his business – still less the business of his senior managers – to be introducing either novel products or novel methods. But, for Marshall, that is precisely what he is expected to do. Marshallian competition is a Hayekian discovery process.

The role of the ordinary competitive manufacturer in contributing to the growth of knowledge, in production and in the market, pervades the analysis.

At the beginning of his undertaking, and at every successive stage, the alert business man strives so to modify his arrangements as to obtain better results with a given expenditure, or equal results with a less expenditure. In other words, he ceaselessly applies the principle of substitution, with the purpose of increasing his profits; and, in so doing, he seldom fails to increase the total efficiency of work, the total power over nature which man derives from organization and knowledge. (1961, p.355)

The principle of substitution is not just a characteristic of a production function, defining a set of alternatives from which the businessman chooses according to the relative prices of inputs; it is a research programme which suggests how he might discover, or invent, one or more elements of better production functions, which are hitherto unknown.

Moreover, it is highly desirable that different manufacturers should try different experiments: for the 'tendency to variation is a chief cause of progress; and the abler are the undertakers in any trade the greater will this tendency be' (1961, p.355). The organization of various businesses in the same trade fosters the growth of knowledge because neither manufacturers nor the businesses which they control are homogeneous. 'Each man's actions are influenced by his special opportunities and resources, as well as by his temperament and his associations' (1961, pp.355-6). This differentiation, which is not easy to specify in a conventional model, rarely enters economists' discussion of the relative merits of concentration and dispersion of industrial research, where it may be crucial. Of particular importance are 'three closely allied conditions of vigour, namely, hopefulness, freedom, and change' (1961, p.197); 'and the advantages of economic freedom are never more strikingly manifest than when a business man endowed with genius is trying experiments, at his own risk, to see whether some new method, or combination of old methods, will be more efficient than the old' (1961, p.406).

These advantages could be substantially enhanced by improving the

education of the working classes. 'There is no extravagance more prejudicial to the growth of the national wealth than that wasteful negligence which allows genius that happens to be born of lowly parentage to expend itself in lowly work' (1961, p.212). Nor was inadequate education the only obstacle. Greater insistence on social distinction in the South of England than in the North had allowed fewer working men into management, and thus hampered progress, which 'is most rapid in those parts of the country in which the greatest proportion of the leaders of industry are the sons of working men' (1961, p.212).

Marshall even indicates the circumstances which are likely to encourage new ideas.

By converse with others who come from different places, and have different customs, travellers learn to put on its trial many a habit of thought or action which otherwise they would always have acquiesced in as though it were a law of nature. Moreover, a shifting of places enables the more powerful and original minds to find full scope for their energies and to rise to important positions: whereas those who stay at home are often over much kept in their places. Few men are prophets in their own land. . . . It is doubtless chiefly for this reason that in almost every part of England a disproportionately large share of the best energy and enterprise is to be found among those who were born elsewhere. (1961, pp.197-8, note 2)

The outsider's advantages in perceiving, instituting or adopting new ideas is not an unfamiliar theme in studies of the growth of knowledge or the diffusion of innovations; neither is it irrelevant to Marshall's account of the rise and fall of individual businesses, to which we shall shortly turn.

Much of the capital of a business (defined either by the investment of time and skill required or its ability to generate income) is to be found in its internal organization, which both reflects the knowledge which has been gained and provides the framework for the development of further knowledge. Nelson and Winter's (1982) analysis of organizational routines is thoroughly Marshallian, not least in its recognition of the importance of time and its irreversibility. Much is also to be found in what Marshall calls its 'external organization' (1961, p.458) or its trade connections (1961, p.377), which likewise both embody knowledge and offer a basis for new experiments. Trade connections are, of course, incompatible with perfect competition; their absence is almost equally incompatible with progress, which perfect competition cannot encompass. 'External organization' is perhaps the better term, because it suggests the network of social, technical, and commercial arrangements which link a business with its customers, suppliers (who

are usually of many kinds), and also its rivals, whose own experiments provide it with both incentive and information. Marshall draws attention to 'the length of time that is necessarily occupied by each individual business in extending its internal, and still more its external organization' (1961, p.500): it cannot choose its optimal position on ready-made demand and cost curves, but has to create them through the application of a well judged policy.

Marketing, in any sense that would be understood in a business school, is scarcely ever mentioned in economic analysis. It can clearly have no place in perfect competition; imperfect competition, in which there appears to be some scope for buying a demand curve, may allow for selling costs, including advertising, but these are rather simple concepts. Moreover, such costs are usually (but not quite always) considered to be wasteful, and sharply contrasted with production costs. Marshall's view is very different.

Production and marketing are parts of the single process of adjustment of supply to demand. The division between them is on lines which are seldom sharply defined: the lines vary from one class of business to another, and each is liable to modification by any large change in the resources of production, transport, or the communication of intelligence. (1919, p.181)

This is a modern perspective, though one not widely shared by economists. If customers are to be induced to buy a new product, then that product must be designed and manufactured in a way which will make it acceptable, and the costs of doing so may very plausibly be assigned to marketing. Alternatively, if the object is to deliver satisfaction to the customer, then marketing, like transport and the services of retailing, may be considered as part of the process of producing that satisfaction. Marshall does not explicitly argue in these terms, for that would threaten the basis of his theory of value, which, like all subsequent theories, depends on a clear analytical separation of supply and demand; but he lays great emphasis on the importance and the expense of marketing, both of which help to explain the course of industrial development.

Internal and external economies

The businessman's development of his internal and external organization is the means by which he gains access to internal and external economies. From the point of view of the individual business, the internal economies which it may achieve are predominantly complements, while external economies often substitute for internal economies which might be within the reach of bigger competitors. It is by

exploiting external economies that small firms may be able to compete effectively with large, even in some industries in which large firms have important specific advantages. Both large and small firms, however, usually require to build up effective external as well as internal organizations – and that takes time.

Despite the apparent threat to a long-run equilibrium model of perfect competition (nowadays misleadingly abbreviated to 'a competitive economy'), Marshall himself never suggested that internal economies were relatively unimportant, or that they were likely to be exhausted at relatively low outputs. 'The chief advantages of production on a large scale are economy of skill, economy of machinery and economy of materials; but the last of these is rapidly losing importance relatively to the other two' (1961, p.278). The large-scale manufacturer can make more effective use of specialized machinery, and can afford to experiment in the design of improvements in methods of manufacture; he can also bear the costs and risks of undertaking 'a characteristic task of the modern manufacturer, that of showing people something which they had never thought of having before; but which they want to have as soon as the notion is suggested to them' (1961, p.280). (Enterprising firms may thus contribute directly to improving effective preferences.) Buying and selling on a large scale also generally produce economies; moreover a wider market provides more sources of information, and a wider product range allows a reputation to be more quickly created and more effectively used (1961, p.282). Thus the large firm may have advantages over the small, not only in its internal, but also in its external, organization. To secure them, however, will require time and effort: indeed, Marshall observes that the 'marketing reputation and connection of a business may be a larger property . . . than is the fixed plant' (1919, p.270). Once again, we must not think of predetermined demand curves and production functions.

Economies of skill parallel economies of machinery; but Marshall places particular emphasis on the large-scale employer's advantages in 'the selection of able and tried men, men whom he trusts and who trust him, to be his foremen and heads of departments' (1961, p.283). He is clearly thinking, to use modern terminology, primarily in terms of internal labour markets. These are the people on whom the reputation of the employer's business chiefly depends; and if he is confident that it is safe in their hands, he can concentrate his own attention on what would now be called the problems of organizational design and corporate strategy.

If the head of a large business is able to exploit the internal division of labour by freeing himself from detail, then the ability to attend to

detail, when detail is crucial, and to avoid the problems of communication and control which so often plague large organizations, is the peculiar advantage of the owner of a small business (1961, p.284). Moreover, greater specialization between businesses, and greater subdivision of industries, may allow each process to be worked on a scale which permits 'the economic use of expensive machinery' (1961, p.271) so that a group of small firms may collectively enjoy the economies which are available to a large manufacturer.

Such increasing subdivision, according to Marshall's general rule quoted earlier, requires a more intimate connection. Marshall accordingly draws attention to two factors which facilitate such connection.

Probably more than three-fourths of the whole benefit [England] has derived from the progress of manufactures during the nineteenth century has been through its indirect influences in lowering the cost of transport of men and goods, of water and light, of electricity and news; for the dominant economic fact of our own age is the development not of the manufacturing, but of the transport industries. (1961, pp.674–5)

The second factor is the concentration, not just of single industries, but often of clusters of industries, in particular localities – an important example of the organization of various trades relative to each other. Each locality develops a 'special industrial atmosphere' (1919, p.287), in which the inhabitants unconsciously absorb the aptitudes which its industries require. Moreover, within an industrial district, it is easier for each firm to create the network of personal contacts which will give it the confidence to integrate its activities with others – relying perhaps as much on moral sentiments as financial incentive. As Richardson (1972) was to remind us, personal contact is especially important when goods and services are not standardized (Marshall, 1919, p.285). This network also forms an invisible college, which fosters the development, appraisal, and application of new ideas.

Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. (Marshall, 1961, p.271)

The industrial district is an appropriate environment for fostering and exploiting the tendency to variation on which Marshall, as we have seen, laid emphasis.

The anonymity of perfect competition is clearly incompatible with these activities, which are very helpful – perhaps indispensable – to the

achievement of external economies. The attempt to reconcile falling long-run costs with perfect competition by attributing the fall in costs to external economies thus appears fundamentally misconceived: the presence of external economies is itself an indication that competition is not perfect. This is not, of course, a problem for Marshall, only for those who misinterpret him.

The rise and decline of firms

Marshall did not envisage any early exhaustion of the principle of increasing return; nor did he wish to, because it promised to make a major contribution to the improvement in standards of life which he wished to see. He did, however, envisage – and, indeed, had observed in his extensive study of British industries – a general tendency for the exhaustion of each individual firm's ability to achieve further internal economies. The problem lay not in the potential for further advance, but in the skill, incentive, and imagination needed to exploit that potential. As has been emphasized, the economies had to be worked for – indeed, they had to be created; and Marshall believed that there was a natural life-cycle of creativity which could be observed in very many, if not quite all, firms. The energy and flexibility of a newcomer gave him advantages which, when linked to a thorough knowledge of 'things in his own trade' (which might take some time to acquire), would allow his business to grow rapidly by the creation of internal, and the exploitation of external, economies and by the development of a pattern of internal and external organization which facilitated both.

The principal restraint on the firm's rate of growth, once it had reached a moderate size, might well lie in difficulties of marketing. These difficulties cannot be adequately represented by a falling long-run demand curve – which Marshall did not use – for they are the difficulties of building a market. For businesses, such as cotton spinners, which operate at several removes from the final consumer, building a market entails creating and maintaining a coalition. The problem is not best tackled by price alone; and the price reductions which are likely to form part of their marketing policy are intended not merely to attract customers who are already willing to buy at a lower price, but to build up a demand among those who had not previously considered the product but need to be encouraged to experiment. This use of pricing policy is a standard component of modern marketing; it was well understood by Victorian businessmen, and by Marshall, who had studied their policies and performance.

Thus, it takes time to build up a large business, and for each businessman time is short. His peculiar skills and abilities may dwindle,

or become less applicable as circumstances change; or he may become less able, or less inclined, to make the effort needed. Enterprise may relapse into custom. Having created a large and profitable organization, he may therefore begin to lose ground to newer firms, just as, in the beginning, he had been able to expand at the expense of established businesses. He may choose to hand over to his son (rarely to his daughter) but, although sons of businessmen may have many advantages in business knowledge, they often fail to develop the special abilities or temperament necessary for success. They may not even be very interested, preferring a different kind of life. That, Marshall lamented, had hitherto been particularly likely if they were sent to university, where they would learn to despise their fathers' trades (1961, pp.298–300).

Decline might be averted by converting the business into a joint-stock company; and the family might be very willing to hand over management, or even ownership. But, although joint-stock companies provided access to people who had business skills but no capital (provided that they could convince others of those skills), they were unlikely to match the enterprise of the best private businesses. That joint-stock companies could prosper at all, Marshall thought, was a great tribute to the growth of business morality, which he regarded as a notable Victorian improvement (he clearly did not believe in the adequacy of capital market discipline); but, as with government, the bureaucratic methods which joint-stock companies were likely to adopt would discourage creative ideas and experiments (1961, pp.303–4). That view goes back to Adam Smith; Marshall's further concern that joint-stock companies would be tempted into excessive enlargements of the scope of their activities seems peculiarly apposite today (1919, pp.321–3).

Process and equilibrium: Marshall's theory of value

Marshall's law of increasing return was a summary of his own general and detailed observations of the course of industrial progress. It may also be derived from two basic Marshallian propositions: that people (especially, but not only, in business) strive to find better ways of doing things and better things to do, and that evolution tends to favour ever more complex patterns of differentiation and integration. Thus, efforts at improvement are particularly likely to be successful when they take the form of greater specialization; and that, as Adam Smith pointed out, is facilitated by an increase in the aggregate volume of business. Increasing return is therefore the form which improved productivity is especially likely to take, and any analysis of the working of a progressive

economy must accord it a central place. But it is the outcome of a competitive process, and that too must somehow be handled.

Most economists would agree with Sraffa's (1926) charge that Marshall's insistence on increasing return destroyed his theory of value. I wish to suggest that Sraffa simultaneously claimed too much and too little. Sraffa established the standard doctrine that economies of scale which extend over more than a modest range of output are incompatible with perfect competition. But he was quite wrong to assume that perfect competition was the basis of Marshall's theory of value. On the other hand, Sraffa failed to notice that Marshall's conception of increasing return – unlike the modern concept of scale economies – included changes in factor proportions and depended on human effort and modest discovery; and these differences are even more difficult to reconcile with perfect competition.

We can go further – much further. Perfect competition requires an initial specification of preferences, resources, and technology which, for Marshall, were not only outputs of economic processes but outputs which could not conveniently be specified as dependent variables, since they derive from the knowledge which is generated within the processes themselves. Moreover, Marshall's description of the organization which aids knowledge is quite clearly the description of an imperfect market structure: indeed, it is a description of that most recalcitrant market structure – oligopoly. Thus, the conflict between Marshall's theory of economic progress and the requirements of perfectly competitive equilibrium is far deeper than Sraffa imagined or Samuelson has recognized. But for Marshall – unlike his successors – the problem was not that his theory of the growth of knowledge was incompatible with perfect competition, but that perfect competition was incompatible with the growth of knowledge. Book V of the *Principles* has to be accommodated to Book IV, rather than the reverse.

Marshall's attempt to provide an institutional structure which would provide a framework for progress has an important advantage for his theory of value. It allows him to suggest an answer to the problem which increasingly bothered Walras – the problem of adjustment. Walras (1874, pp.48–50) originally proposed a process of *tatonnement* as a theoretical formalization of the operation of organized markets. However, by the time of his last revision of the *Elements* (Walras, 1900, p.215), he was persuaded that the adjustment of production entailed both production and sale at non-equilibrium prices, which could invalidate the equilibria calculated from initial conditions, so he substituted a fictional *tatonnement* and implicitly withdrew his theory of adjustment (Walker, 1987). Nowadays we recognize (and usually ignore) the

problem of path dependency and its associated difficulty that it is only in equilibrium that perfectly competitive analysis is logically valid. Perfect competition does not formally solve the coordination problem because it does not explain how coordination is to be achieved. The Marshallian organization of industry at least suggests how it might be done. Marshall's industries are information structures, which, unlike perfect competition, are capable of generating reliable expectations. Reliability is here used in the same sense as Ziman (1978); and it rests on an analogous process of discovery within an imperfectly specified structure (see Chapter 3).

Equilibrium models

As a mathematical scholar of distinction, and a major contributor to formal value theory, Marshall could hardly fail to be impressed and attracted by the power of equilibrium analysis; but he was aware of its limitations. Even in a static setting, it did not provide as complete an answer to the problem of coordination as at first appeared, and it had serious deficiencies as a method of analysing the generation of new knowledge.

Marshall's awareness of these deficiencies helps to explain his scepticism about the advantages of general equilibrium analysis.

The element of time is a chief cause of those difficulties in economic investigations which make it necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle. (1961, p.366)

The theoretical successes of general equilibrium have been achieved only by the exclusion of time as anything more than another kind of space; and this exclusion is one of the main reasons why the applicability of general equilibrium remains so problematic.

We know what Marshall thought of the non-rigorous general equilibrium model known as a stationary state. This produced a simple doctrine of value, but 'in the real world a simple doctrine of value is worse than none' (1961, p.368). Its defects result not from a lack of formal rigour, but from the inadequacy of the conception – the exclusion of endogenous change and of the processes which embody it. Partial equilibrium methods, however, enable us to look at particular processes on the provisional assumption that everything else is at rest (1961, p.369). 'This scientific device is a great deal older than science: it is the method by which, consciously or unconsciously, sensible men have dealt from time immemorial with every difficult problem of ordi-

nary life' (1961, p.xiv). The principal limitation of a partial equilibrium model is not that it is partial, but that it is constrained by the method of equilibrium.

We should not therefore be surprised that Book V of Marshall's *Principles* is very far from a systematic demonstration of equilibrium modelling. The exposition does not qualify for the modern accolades of elegance and rigour; instead it is discursive and thoughtful. Equilibrium is treated as problematic throughout, and each particular model of equilibrium is supported by reasons why we might reasonably expect that equilibrium to be attained. Marshall's approach may be illustrated in the three contexts of temporary, short-run and long-run analysis.

Temporary equilibrium

Marshall begins with the temporary equilibrium of a market on a particular day (1961, pp.332-6); and he chooses for his example the corn-market in a country town. For this market he derives equilibrium price and output from demand and supply schedules of the type long since familiar. However, it should be noted first, that only in temporary equilibrium do Marshall's schedules purport to represent ordered pairs of price and quantity which can be simultaneously chosen, as is the standard interpretation of all such schedules in modern equilibrium theory and second, that even these schedules are influenced by the current expectations of buyers and sellers about the prospects for future prices.

Marshall immediately goes on to consider whether the price arrived at in the market will indeed approximate to the equilibrium price which he has calculated, and concludes that the process of 'higgling and bargaining' is likely to lead to this result, provided that the buyers and sellers are roughly equally matched and tolerably well-informed. Thus, we see that Marshall was well aware both of the need to explain how equilibrium is reached and of the crucial role of information in the explanation. His example was well suited to this purpose; for the corn-dealers in a country town are likely to be few enough to know each other fairly well, and to have been in business long enough to acquire a reliable fund of experience. They do not have to be infallible, for Marshall did not claim that the equilibrium price would always be attained. As in all Marshall's work, equilibrium rests firmly on expectations, and expectations derive from experience - which accumulates over time. Here too, organization aids knowledge: the organization of the market helps to produce the knowledge which is needed to achieve equilibrium.

Nowadays, of course, we have much better proofs of the existence

of equilibrium, but we can say very little about its attainability. And this is no accident; for the very assumptions of perfect competition which strengthen the proof of its existence deny the possibility of the special local information which Marshall used to explain how it was reached. As G.B. Richardson has observed, 'the possibility of forming reliable expectations is not independent of the particular market conditions which define the model employed' (1960, p.29). Perfect competition, so convenient for demonstrating the existence of equilibrium, is a very poor basis for expectations.

The short run

Marshall's treatment of short-run costs is recognizably akin to that in modern texts. But his short-run supply curve is not at all the same. The fact that time has to be allowed for movement along it is of some importance, but of far more significance is the argument that, in times of bad trade, price will not follow the marginal cost curve down to the level of average variable cost. On the contrary, Marshall asserts that in times of bad trade:

... the true marginal supply price for short periods ... is nearly always above, and generally very much above the special or prime cost for raw materials, labour and wear-and-tear of plant, which is immediately and directly involved by getting a little further use out of appliances which are not fully employed. (1961, pp.374-5)

Prices are kept above marginal cost (as that is defined nowadays) first, by the individual producer's fear of spoiling his market, and, second, by his 'fear of incurring the resentment of other producers, should he sell needlessly at a price that spoils the common market for all' (1961, p.374). Both reasons are formally incompatible with perfect competition: the former because no individual producer can protect his future market by attempting to maintain his present price; the latter because the 'common market for all' is a public good, to the maintenance of which the individual producer in a perfectly competitive market has no incentive to contribute.

But, as we have seen, Marshall's world is one in which firms have regular customers and regular suppliers, and might thus expect to be able to transfer some business from a time of depressed prices to one in which they could cover rather more of their costs. Such trading relationships need not imply any possibility of obtaining a persistently higher price than one's competitors; this restraint operates only when demand is generally believed to be temporarily below its normal level, and when it is therefore not in the interests of a customer who is

expecting a revival of demand to drive a hard bargain which may put his regular supplier out of business. The connections between buyer and seller, and connections between competitors, which facilitate the development and testing of new ideas, also make the public good of maintained prices rather more of a private good and reduce its private cost. Nor should we forget that, for Marshall, 'normal action is always to be viewed as the consequence of all motives, not the economic one alone' (Whitaker, 1977, p.196).

Like his very short-run theory, Marshall's short-run analysis is firmly based on an information network of a kind which is nowadays automatically dubbed oligopolistic. But it is precisely this 'oligopolistic' information network which makes possible a competitive solution – not the perfectly competitive solution, but not that of imperfect competition either. As Richardson (1960) has explained, the precise outcome for any particular market will depend upon the characteristics of that market, and in particular its information structure; the failure to deduce a general solution from the inadequate assumptions of orthodox theory does not imply that the outcome is indeterminate.

The long run

Long-run effects receive much the most detailed consideration in Marshall's Book V, not only because the long run is the natural home for a theory of economic development, but also because the problems of combining process and equilibrium are most pervasive in the long period. At one point in his exposition, Marshall observes that 'we are here verging on the high theme of economic progress' (1961, p.461) and immediately adds a warning that 'economic problems are imperfectly presented when they are treated as problems of static equilibrium, and not of organic growth'. The limited applicability of his formal apparatus is a recurrent concern in these chapters. Marshall points out what Arrow and Debreu have since demonstrated, that the complete set of direct and indirect adjustments required for a theoretically perfect long period involves the assumption 'that the requirements of a future age can be anticipated an indefinite time beforehand' (1961, p.379). But no such assumption can be justified for industries which are discovering new combinations, especially those which give rise to increasing returns. Therefore the long-run equilibrium of the industry cannot be rigorously defined. For the firms within it there can be no long-run equilibrium at all.

Now, as has been argued, the pervasiveness of increasing returns was strictly essential to Marshall's view of the economic system, whereas static equilibrium was no more – though also no less – than an extremely

convenient analogy. He attempted to preserve the analogy in three ways. First, as we have seen, he put substantial – but by no means exclusive – emphasis on the significance of external economies. Second, he pointed out that the generation of increasing returns through improvements in organization necessarily takes time; one of his marginal summaries affirms that 'the tendency to increasing return does not act quickly' (1961, p.455). His long-run supply diagrams are implicitly three-dimensional; when reduced to two dimensions the horizontal axis measures time as well as output. This practice, which has caused much confusion, symbolizes the impossibility of any adequate discussion of costs which neglects time; but Marshall acknowledged its weakness, and looked for 'a great advance if we could present the normal demand price and supply price as functions both of the amount normally produced and of the time at which that amount became normal' (1961, p.809). The third, and boldest, move was to base the equilibrium of the industry on the transience of its component firms.

Samuelson (1967, p.25) has argued that Marshall's emphasis on increasing returns, and his references to fears of spoiling the market, convict him of pretending 'to handle imperfect competition with tools only applicable to perfect competition'. This is a double error: Marshall neither relies on perfect competition, nor is he discussing imperfect competition as that term has come to be understood. Increasing returns necessarily belong in the long period; the individual businessman's fears of spoiling his market in the short: they never enter the same model.

Every manufacturer, or other business man, has a plant, an organization, and a business connection, which put him in a position of advantage for his special work. He has no sort of permanent monopoly, because others can easily equip themselves in like manner. (Marshall, 1919, p.196)

The resemblance to conventional textbook models of imperfect competition is only superficial. Not only is quantity demanded a function of elapsed time as well as price; demand, even in this time-dependent form, is demand for a specialized product, not for the output of a particular producer. The ease with which many other firms can replicate his offering excludes any possibility of a falling demand curve for his own brand, as Andrews (1964, p.75) has pointed out. Thus, positions of advantage are not permanent: monopoly, in which they are, is treated quite separately. Firms remain open to competition, and, as they lose vigour, become less able to resist it. Industries survive, and may continue to expand; firms do not. Thus the history of the individual firm cannot be made into the history of an industry any more than the

history of an individual man can be made into the history of mankind' (Marshall, 1961, p.459). No more can the long-run equilibrium of the industry be explained – or replaced, as happened in the theory of imperfect competition – by the equilibrium of the individual firm.

Nevertheless, an industry is composed of firms, 'and the aggregate production for a general market is the outcome of the motives which induce individual producers to expand or contract their production' (1961, p.459). Marshall sought to encapsulate these motives and their effects in his concept of the representative firm, which represents the reasonable expectations of those considering whether to enter the industry, and the standards of cost which competitors believe they have to meet. The price set by the representative firm covers both prime and supplementary costs, and the price at which it is just willing to undertake a discrete expansion is the long-run supply price of that industry.

Marshall's long-run supply schedule is then derived by examining the effects of different levels of demand on the costs of the representative firm. 'We expect a gradual increase in demand to increase gradually the size and efficiency of the representative firm; and to increase the economies both internal and external which are at its disposal' (1961, p.460). The increase in internal economies arises through the modification of the typical firm's life-cycle. An expansion of demand, by making its environment more favourable, tends both to prolong the period of growth and to increase the rate of growth during that period; and the longer the typical firm is able to grow before its inevitable decline sets in, the lower the level of costs it will achieve in its prime. This favourable shift in the lifetime pattern of costs is reflected in the costs attributed to that analytical fiction, the representative firm, and produces a fall in the industry's supply price. 'This then is the marginal cost on which we fix our eyes' (1961, p.460), not the modern timeless long-run marginal cost.

It is because the pace of growth and the period of growth for individual firms are both severely limited that a growing industry can yield the benefits of falling long-run costs without imposing the penalties of monopoly. In general, it is only when the whole industry is growing fast that the limits are significantly relaxed; and in these circumstances greater size need imply no increase in market share. That is Marshall's solution.

Method and vision

Marshall warns that

... such notions must be taken broadly. The attempt to make them precise over-reaches our strength ...

The Statical theory of equilibrium is only an introduction to economic studies; and it is barely even an introduction to the study of the progress and development of industries which show a tendency to increasing return. (1961, pp. 460–1)

Nevertheless, economists were so impressed with the power of the equilibrium method that they began to enquire whether Marshall had made the best use of it. The currently received wisdom is that he did not, although it is not universally agreed whether the best policy is to enshrine perfect competition or to discard it. The initial response was to redefine Marshall's theory of value as a theory of perfect competition, add to it a long-run equilibrium model of the firm, and demonstrate that increasing returns were not compatible with this theory, thus stimulating the extension of monopoly theory into the theory of imperfect competition. (Chamberlin's analysis of monopolistic competition had somewhat different origins. Indeed it has been argued that Chamberlin's firms search for customers in a network of oligopolistic interdependence (Robinson, 1971, pp.33–4, 44–5) – a Marshallian analysis of competitive processes disguised as static equilibrium.)

Economists rediscovered Cournot, without rediscovering the difficulties which Marshall had found in his analysis. 'My confidence in Cournot as an *economist* was shaken when I found that his mathematics re I.R. led inevitably to things which do not exist and have no near relation to reality' (1961, II, p.521). Marshall had sought among businessmen the sources of Cournot's error; when Oxford economists talked to businessmen they likewise found something wrong with imperfect competition – although some Cambridge economists suggested that it was business practice that was wrong.

As was recognized from the outset, the shift to monopoly equilibria, which increasing returns was deemed to require, implied that the market system was not working well. Samuelson (1967, p.39) summarizes the accusation. 'Increasing returns is the enemy of perfect competition. And therefore it is the enemy of the optimality conditions that perfect competition can ensure.' If Marshall were to permit his spirit for once to engage in controversy, he might reply that perfect competition is the enemy of increasing returns (and also, as Chamberlin emphasized, of the product variety which consumers appear to want), and optimality is the enemy of economic progress. Perfect competition is like the perfect tense; it refers to action which is already complete. In Richardson's words, 'it might reasonably be regarded as a denial of Smith's central principle erected into a system of political economy' (1975, p.353). It is a denial of Marshall's central principle too. For a world of

perfect competition is a world in which there is nothing further to hope for. As Marshall (1919, p.195) realized, it implies more than the end of economic progress. A 'perfect adjustment is inconceivable. Perhaps even it is undesirable. For after all man is the end of production; and perfectly stable business would be likely to produce men who were little better than machines.' Economics is part of the study of man; and that is why 'the central idea of economics, even when its Foundations alone are under discussion, must be that of living force and movement' (1961, p.xv).

5 Joan Robinson's 'wrong turning'*

In the introduction to the first volume of her *Collected Economic Papers* Joan Robinson declared that when she 'worked out *The Economics of Imperfect Competition* on static assumptions' she 'took the wrong turning'; the correct path would have entailed 'abandoning the static analysis and trying to come to terms with Marshall's theory of development' (1951, pp.vii-viii). This chapter is intended to suggest how she came to take what later appeared to be the wrong path, and to indicate some of the consequences of this error (if error it was). To do so it is necessary to examine the path for some little distance before the turning, and the features of the landscape and the guidebooks which made the wrong path appear so obviously right. We must therefore pay particular, if selective, attention to Marshall, Pigou, and Staffa.

Marshall

As John Whitaker (1988) has emphasized, Joan Robinson's first book is a product of Cambridge economics; and Cambridge economics was dominated by Alfred Marshall, both directly and in reaction to his work. We therefore begin by considering the aspects of Marshall's thought which influenced the development which we are attempting to explain. Three aspects appear to have been of particular importance: his views of economics as a science, of the purposes of economic study, and of the dominant characteristics of the economic system which he was seeking to analyse.

Pigou (1925, p.86) observed of Marshall's *Principles* that on a first reading 'one is very apt to think that it is all perfectly obvious. The second time one has glimpses of the fact that one does not understand it at all.' Keynes (1972, p.212) made a similar judgement. 'It needs much study and independent thought on the reader's own part before he can know the half of what is contained in the concealed crevices of that rounded globe of knowledge.' This is not accidental; for the 'rounded globe' was deliberately constructed as a contribution to the establishment of economics as a science, which was a prime objective

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