is smaller as the unutilized resources of the firm which enter into that investment project are greater. That is, an investment project which requires an engine-assembly plant will be cheaper for the firm of the present example to implement than it would be for a firm without spare engine-assembly capacity. The firm of this example would not have to purchase that plant and equipment.

3. The information which the firm already has about engine assembly reduces the ignorance of managers with respect to an investment project requiring the use of engine assembly plant and, therefore, the uncertainty of the project.

4. The identification and choice of Option 3 is compatible with what we know of the development of human institutions, science, technology and art.

The first two of these four points imply that Option 3 is more likely to fall into that class of potential courses of action which yield higher net cash flows because it entails a smaller use of cash to implement and because it spreads fixed costs over a larger output. The last two points are in effect statements about human action and human inventiveness. Their validity is not obvious from economic principles and must therefore be demonstrated. Such a demonstration is offered in the following chapter, where its implications for the relationship between the resources of the firm and the nature and direction of the growth of the firm will be analysed in some detail.

CHAPTER 3

Economic Determinants of Investment Strategies

3.1 INVENTION, INNOVATION AND IMITATION

The economic analysis of technical change — that process whereby new production technologies are introduced and new commodities created and sold — was given its orientation by Joseph Schumpeter (1928, 1934, 1939). Schumpeter argued that the process of technical change could be analysed in three distinct phases: invention, innovation and imitation.

Invention is the creation of new objects which are of potential industrial or commercial use. They might be producers’ goods which embody new production processes or consumers’ goods which satisfy previously unsatisfied desires. Innovation is the introduction of inventions into industrial or commercial use. Imitation is the modification of innovations involving slight changes in the basic design, so that the innovation can be applied to different production activities or to the satisfaction of different consumer desires. Schumpeter argued that these three phases of the process of technical change were distinct because they were undertaken by different individuals.

Invention, according to Schumpeter, is an activity beyond the purview of the economist. Innovation is undertaken by the entrepreneur, who selects inventions to produce for use or sale after considering those inventions which are available as a result of extra-economic activity. The innovating entrepreneur is by definition exceptionally farsighted and imaginative in that he perceives the economic value of particular
inventions which his competitors have overlooked. Imitation is undertaken by the less farsighted and imaginative entrepreneurs once the economic value of a particular invention has been demonstrated.

It is by no means clear that the Schumpeterian view of the process of technical change is historically accurate. Yet the historical accuracy of the analysis of technical change is of considerable importance to the present investigation, since it arbitrarily imposes a limit to the arena of decision-making by businessmen. If inventions are made within firms as part of the normal process of problem identification and solution or opportunity identification and realization, then the nature of the firm’s resources and the uses to which they are put will differ from what they would be if new production processes and new products were simply chosen from some list of inventions.

More recently, Jacob Schmookler (1966) has argued that invention is an economic activity. In brief, his argument is that the profitability of any invention depends on the demand for the services of the invention. Once the demand is perceived, the scientific and technological literature will be searched for a way of meeting that demand. Since any particular service can be provided in a number of ways (or so Schmookler argues), the stock of scientific and technological knowledge is virtually certain to yield to the creative, perceptive and inspired mind some way of satisfying any particular economic demand. According to this view, invention is entirely demand-induced.

When one economist argues that some phenomenon is demand-determined, another is certain to argue that supply is equally important. In this case, supply is the stock of knowledge available to the inventor. Nathan Rosenberg (1974) cited a wide range of historical evidence to show that the state of scientific and technological knowledge does affect both the cost — hence the profit — and the feasibility of satisfying particular demands. Perhaps the most striking example Rosenberg offers is that of the demand for health and longevity, a demand which has perhaps been significant since man was first able to express or to define preferences. Yet until the development of organic chemistry and the microbial research of workers such as Pasteur and Lister, medical science, such as it was, had no significant beneficial effect on either health or longevity, with perhaps the single exception of smallpox vaccination. Now, Schmookler might answer that Pasteur and Lister would have turned their attention to other problems if there had been no demand for health and longevity, and all that is involved here is the timescale required for knowledge to make possible the satisfaction of such demands. If this were his answer — and I do not know that it would be — all that is involved here is a matter of semantics. If the demand has always existed but for almost the whole history of science it could not be met, we might as well admit that the constraint was on the supply side for many millennia. Perhaps it would be even better to restate the whole problem in terms other than those of supply and demand.

Knowledge and objective, not supply and demand

The process of invention is the application of non-specific knowledge to specific objectives. Schmookler identified objectives with demands. Rosenberg identified knowledge with supply. The problem with these identifications is that supplies and demands are often assumed by economists to be independent forces which are reconcilable through the determination of appropriate relative prices and incomes. There is, however, considerable evidence for the proposition that there are no unique and independent roles for knowledge or for objectives which characterize all invention and innovation. Sometimes the roles of knowledge and objective are distinct; sometimes they are not. When they are distinct, the process of invention and innovation will sometimes be dominated by the objective and sometimes by existing or new knowledge.

For example, the discussion of organizational innovation in chapter 2 gave the impression that the innovators (in Schumpeter’s sense) were led to their innovations by problems arising from the management of growing and increasingly diversified firms. However, these innovators were typically the inventors of their organizational structures as well. The
organizational inventor-innovators were usually engineers or, less frequently, financiers. That is not to say that the knowledge on which they drew was engineering or financial knowledge, but both engineers and financiers would have been trained to think in terms of feedbacks, balance and the effects of one part of a system upon another. The accountant is trained to generate information in such a way that it can be used to evaluate financial performance. As Chandler (1977) has pointed out, these individuals would have brought a particular professional approach and outlook to their work and to the solution of managerial problems.

The history of invention is replete with cases of innovating firms which have either specified the objective they desired to inventors or used their own resources to provide the desired invention. In 1825 Richard Roberts invented the automatic spinning mule in response to a request for such a machine from a committee of Manchester cotton manufacturers in the midst of a strike. A strike of gun-barrel welders led their employer to undertake experiments leading to the invention of grooved rolls to make the gun barrels without the skilled welders. Habakkuk (1967, p. 153) cites William Fairbairn, who invented an automatic riveting machine as a result of a boilermakers' strike at his factory, as follows:

the introduction of new machinery and the self-acting principle owed much of their efficacy and ingenuity to the system of strikes, which compelled the employers of labour to fall back upon their own resources [sic], and to execute, by machinery and new inventions, work which was formerly done by hand.

Of course, it is not only labour unrest that leads firms to invent or commission the invention of new production processes. A major new technique in steel production resulted from experiments undertaken by engineers at a steel plant in Austria which had been built by the Germans during World War II and nationalized by the Austrian Government at the end of the war. The usefulness of oxygen in burning off impurities in the ore used to make steel had been suggested by Bessemer in 1856, the year in which he patented his own blast furnace. A number of attempts to use oxygen in steel production had been attempted since Bessemer, all of which had destroyed the furnace in which the steel was made. By adopting a novel approach, a different technology (although one which employed the same scientific principles), the Austrian engineers developed a workable basic oxygen steel converter (Meyer and Herregat, 1974). Other examples are equally impressive, such as the invention by Pilkington Brothers of the float-glass process, whereby plate glass is made by floating the molten glass on a bath of liquid tin. The production process is far cheaper, both in capital and in running costs, than any previous process, and it seems hardly likely that it could have been invented by anyone not already in the glass industry.

It is evidently possible to multiply the instances in which a firm has confronted a particular problem and has caused an invention to be made which has solved the problem, or has perceived an opportunity and has commissioned or created an invention to enable the firm to capitalize on the opportunity. It is not obvious in such cases how one would distinguish the boundary between inventive and innovative activity. Nor is it obvious that one should want to do so. Invention and innovation are part of a single process whereby non-specific knowledge is applied to the meeting of an economic objective. To argue that invention is different from innovation is to argue that one individual is concerned with the knowledge (the inventor) and another is concerned with the objective (the innovator), and that somewhere in the application of knowledge to objective we pass from invention to innovation. When put in this way, the distinction is far from clear. Although different aspects of technical change might be undertaken by different individuals, this is not always the case, and invention and innovation are best treated as a single economic process which can, but need not, entail some division of labour.

If there is no clear and necessary distinction between the Schumpeterian categories of invention and innovation, does anything remain of the distinction between those two categories on the one hand and imitation on the other? I think not. Although many examples could be offered, one will be
sufficient to make the point. At the beginning of the American Civil War, the Providence Tool Company was awarded a contract for the production of Springfield muskets. The production of these muskets required the use of twist drills, which at that time were hand-made. The availability of twist drills was limited and so constituted a bottleneck in the production of the muskets. The superintendent of the company took this problem to Joseph Brown of Brown and Sharp, a firm which used twist drills in the production of sewing-machine components. Brown then invented the universal milling machine for cutting the spiral grooves in the twist drill, the first such machine being sold to the Providence Tool Company in 1862. But this machine was extremely versatile and was also able to cut gears and a wide variety of irregular shapes in metal. Almost immediately, the universal milling machine was introduced into the production processes for hardware, tools, cutlery, locks, arms, sewing machines, textile machinery, printing machinery, professional and scientific instruments, railway locomotives and machine tools (Rosenberg, 1976, pp. 22-3). All of these applications, apart from the cutting of the grooves in twist drills, are examples of Schumpeterian imitation, but in no respect does the process of imitation in this case differ from that of invention and innovation. The universal milling machine had properties which suggested to its inventor and other users that it could be applied to many metal-forming processes. If there is a difference, it is that invention requires a greater conceptual leap than imitation and that innovation involves greater costs and risks. But the nature of the inventive and innovative process is the same as that of the imitative process, in that both represent the application of non-specific knowledge to specific objectives. As economic processes, there is no evidence that there is any material difference in the forces impinging upon them.

The relationship between knowledge and objective is not confined to technological or organizational change, although that is a convenient subject with which to formulate propositions about that relationship. Indeed, it is arguable that these propositions characterize all intellectual advancement.

Anyone who doubts this view would do well to consult any good work on the history of science, mathematics or art. In the present context, the importance of the recognition of the relationship between knowledge and objective is that it facilitates analysis of the determinants of business strategies. What is required now is to define in a general way the determinants of the objectives of business strategies and the determinants of the non-specific knowledge which will be employed in meeting those objectives. It is not to be expected that objectives and knowledge will stand in some invariant relationship to one another but rather that there are some clear economic forces which will predispose businessmen to formulate one objective rather than another and to seek to utilize one body of knowledge rather than another. In the following section of this chapter those forces which arise within the firm will be considered, and then, in section 3.3, I will consider those forces which arise outside the firm but which determine the objectives and knowledge to be utilized within the firm.

No notion of intellectual or technological determinism is postulated here. What is postulated is that there is no exogenous list of potential innovations which have equal chance of being chosen. Inventions and innovations arise in the course of scientific, technological and commercial activity, and those which do arise will be generated and considered in a particular economic context. The immediate investigation is into the relationship between that context and the way in which inventions and innovations are made and imitated. However, the forces identified in this investigation are fundamental to the analysis of all of the issues to be considered in the remainder of this book.

3.2 THE FOCUSING EFFECT: RESOURCES AND THE DIRECTION OF GROWTH

Technical change takes place within firms, and firms operate in markets. Schmookler, we have seen, argued that technical change will be determined by demands and the extent of the market for an invention. Rosenberg extended the Schmookler
analysis to take into account the effect of the state of knowledge on the cost of technical change in general and on invention in particular. Although their views are in many ways more satisfactory than that of Schumpeter, they are deficient in one respect. While Schumpeter was concerned with the role of the firm in innovation and imitation, the firm does not enter Schmookler's and Rosenberg's discussions in any essential way. In this section that deficiency is made good.

Consider again the example of the car and lorry manufacturer discussed in chapter 2. The constraints on that firm's outputs were found to be in car-assembly and metal-stamping capacity. I argued that without any external constraints such as limited demands, the firm would increase these capacities as the most straightforward way of utilizing the whole set of resources comprising the firm. The inclination of the firm to increase existing capacities results partly from cost considerations. The firm of the example could increase its output of cars by increasing the capacity of two production departments — car assembly and metal stamping — whereas firms not already engaged in car production would require to establish new capacity in all four production departments. The car and lorry manufacturer would therefore have an absolute cost advantage at the margin. In addition, the marketing and purchasing resources of this firm will already be well-suited to the production and sale of cars and lorries, so that further expansion into those markets would fit well within the normal range of activities of the firm.

It may be that for one reason or another a firm will seek to diversify rather than to expand its existing activities. In the example of the motor vehicles manufacturer, I argued that diversification would become an objective of the firm if its sales of cars and lorries had exhausted the markets available to the firm. The salient difference between the expansion of existing activities and diversification is that the investment project required for expansion is well-defined from the outset, while the investment project required for diversification must first be defined.

Logically, the choice of any investment project requires the identification of a range of possible projects and then the choice of one or more projects from that range. No particular chronological sequence is required here, since it is always possible to define one potential project, accept or reject it and then to define a second potential project, accept or reject it and so on with a third, fourth or more projects. Indeed, it is not unlikely that the management team of a firm would consider first whether to expand its existing output flows with the existing technology or some new technology and, having rejected that option, then to consider a range of several alternatives. Whatever the particular procedure a firm employs in project selection it is necessary to identify the projects to be considered, then to evaluate them and finally to choose a project to be pursued.

Whatever investment project is selected will involve the application of knowledge to objectives. The question under discussion here is what knowledge will be applied to which objectives. I shall argue that there are forces within the firm which focus the attention of its decision-makers on particular bodies of knowledge and particular objectives. The process whereby this happens I shall call the focusing effect (cf. Rosenberg, 1969).

The motor manufacturer example reconsidered

Consider how the focusing effect might work in the motor manufacturer example.

Firms do not face God-given lists of potential investment projects. In our example, the combination of free managerial resources, fully utilized car-assembly and metal-stamping capacity and limited prospective outlets for increased car and lorry production would effectively force the firm to consider alternative products. Now, any firm will have managers and workers with a particular range of skills, knowledge and experience. The personnel of the firm will know about the technology employed by the firm, and their contacts with suppliers and customers — the firm's 'business connection' — will suit the firm uniquely.

If suggestions for investment projects are not handed down from Heaven, they must come from somewhere. Often, a firm's customers will suggest that a new commodity with particular characteristics would be useful. Such a suggestion
would typically be made, in the first instance, to the firm’s sales staff, who might pass it on to the technical staff. Alternatively, suggestions for new products or new ways of producing existing products will be made by individuals within the firm as a result of the work they are already doing. They might see some shortcomings in existing practices which leads them to seek a remedy for it. Experience with the technology employed by the firm or knowledge of the products of the firm might lead an employee to suggest alternative uses for that technology or modifications to the existing range of products. However such ideas arise, in order to be able to suggest a plan of action with sufficient coherence for it to be considered by the management team, the plan must be specified with a certain concreteness. In the case of the motor manufacturer, an engineer might suggest an alternative use to which the engine-assembly plant might be put. He could provide some justification of the feasibility of his suggestion on the basis of his general knowledge of engineering and of his experience with the technological capacity of the firm and the abilities and skills of its labour force. Another project might be suggested by the marketing department of the firm if the staff in that department believed they had identified a clear demand for an engine with characteristics rather different from those of the engines currently produced by the firm. The marketers could provide some justification of the feasibility of their suggestion on the basis of their knowledge of marketing and the markets in which the firm sells, as well as their experience of the marketing capacity and personnel of the firm.

In general, the initial definition of investment projects will derive from the knowledge of the management and other personnel of the firm and their experience of the activities in which the firm engages. Since these activities are determined by the resources of which the firm is composed, these resources and their employments will give rise to a range of investment projects which the firm might undertake. In general, the objectives of potential investment projects will arise from the existing resources and activities of the firm.

The knowledge employed in achieving such objectives will be both general, objective knowledge of the personnel of the firm and specific knowledge generated within the firm, some of which is a product of the experience gained by personnel as a result of the interactions among the resources which comprise the firm.

The more information about a potential investment project there is available to the management team, the less uncertain will the members of that team feel about their assessment of the likelihood of success of that project — whatever criteria of success they may employ. The cost of obtaining information about any particular plan of action seems likely to be lower if that information relates to existing resources of the firm than if it relates to resources of which the firm has little knowledge and no experience. If, for example, our motor manufacturer were attempting to assess the likely costs of operating a weaving shed, and all of the information about weaving sheds had to be acquired from sources outside the firm, there would be some cost involved in finding the source of this information and then there would be some difficulty in evaluating the reliability of the informant. However, information about the costs of running the engine-assembly plant could be obtained from the plant manager, who could be found via a memorandum or perhaps in the managers’ dining-room. Indeed, it is not unlikely that such costing information would be provided to the management team periodically as a matter of routine. Since the plant manager will be known to the management team and might be a member of it, his reliability and interests would be well-known to the management team, and his information would be assessed in that light. In general, therefore, we would expect the cost of information about potential investment projects to be cheaper to obtain and more reliably evaluated if it is generated by sources within the firm than if it is provided by external sources.

We come now to the choice of investment projects to be implemented.

Suppose that the motor manufacturer of our example has decided to enter the power lawn-mower market, utilizing the spare engine-assembly capacity to make the mower motors.
Clearly, the cost of the project will be lower in this case than it would be if the firm were to construct an engine-assembly plant as part of the project. In general, we would expect that the capital cost of any particular project will be lower as the resources which are already a part of the firm are greater. Not only would the capital costs be lower, but so too would the running-in costs of lawnmower production, since there would already exist a proven labour force with many of the requisite skills and with experience of working with the relevant technology.

Consider what is involved here in the light of the economic and financial literature on investment choice. This literature concentrates on various measures of the rates of return on an investment project rather than on the resources of the firm. None the less, the discussion here has clear implications for the determinants of relative rates of return on investment projects.

Whatever measure of the rate of return is employed — internal rates of return, net present values and so on — we always have a ratio of net earnings to the capital cost of the project where, usually, both are expressed as present values. The foregoing discussion implies that the rate of return on an investment project is increased by the utilization of excess capacities already held by the firm and of knowledge, skills and experience provided by the existing resources of the firm.

There are two ways of increasing a ratio: by increasing the numerator (in this case, the net earnings of the investment project) or by reducing the denominator (in this case, the capital cost of the investment project). The claim made here is that the resources of which a firm is composed — including its excess capacities — have a significant effect on the rates of return from various investment projects. Excess capacities which are utilized in the implementation of an investment project or in the operation of the resulting production processes reduce the capital cost of the project and therefore the denominator of the rate-of-return ratio. The knowledge, skills and experience embodied in the resources of the firm reduce the false starts and the inefficiencies which result from unfamiliarity with new procedures or new and different

plant and equipment. At least in the early stages, one would expect the operating costs of any new activity to be lower if the firm already has knowledge, experience and skills which are relevant to the operation than if it does not. Reduction in operating costs increases net earnings at every level of output prices and so increases the rate of return on an investment project.

Evidently, if investment projects are ranked according to the prospective rates of return on each of them, the projects utilizing the existing resources of the firm or requiring resources similar to those already comprising the firm will be more likely to be chosen than would be the case if the firm were not composed of such resources.

At every stage of the investment decision the attention of the management team of a firm will be focused upon potential courses of action by the resources of which the firm is composed. Three stages of the investment decision were isolated: the identification of potential investment projects, the evaluation of those investment projects which have been identified and the choice of investment projects on the basis of that evaluation. Although economists have concentrated on the choice of investment projects by seeking to develop measures of the likely profitability of each of a well-defined list of potential projects, this is but the last stage in the decision-making process. The establishment of such a list is at least as important as the final choice of projects to pursue.

I have argued that both the knowledge to be employed in any investment project and the objectives to be sought will be determined by the resources of the firm and the services rendered by those resources, including the ‘business connection’ of the firm. The projects which the firm identifies will have objectives determined by the existing operations of the firm or will arise from knowledge developed as a result of employing the firm’s resources. Imbalances appear to be a potent focusing force here. In section 2.3 it was seen that imbalances between the activities of a firm and its organizational structure often lead to organizational invention, innovation and imitation. A number of cases were cited in
section 3.1 in which imbalances in production processes led directly to an invention which then turned out to have properties which were widely useful. The case of the universal milling machine is perhaps the most striking example cited above. In the example of the motor manufacturer, the imbalance lay in the full utilization of car-assembly and metal-stamping capacity and simultaneous under-utilization of engine-assembly and lorry-assembly capacity. Because plant and equipment usually come in indivisible units, increasing the metal-stamping and car-assembly capacities so that these no longer constrain production is likely to leave the expanded capacity under-utilized because the engine and lorry assembly departments have reached the limits of their capacities. Whether or not an investment project involves invention and innovation or only imitation or the expansion of the existing activities of the firm, imbalances among the resources comprising the firm, or, more accurately, among the services rendered by those resources, focus the attention of managers upon particular objectives which entail the elimination of bottlenecks, the utilization of by-products, the reorganization of the administrative structure and so on. The knowledge which will be employed in attaining these objectives will be determined by the knowledge, skills and experience of the human resources of the firm. One possible sort of imbalance is that the human resources of the firm might embody knowledge which is not being utilized, in which case objectives might be formulated which entail the use of such knowledge. In such cases, the identification as well as the evaluation of investment projects will be knowledge-dominated. Otherwise it seems likely that the identification of investment projects will be stimulated by objectives upon which the attention of managers or other personnel within the firm has been focused.

The existence of imbalances within the firm is in effect the imposition of some constraint upon the scale and scope of the activities of the firm. Such constraints can be the result of indivisibilities of resources, or they can be technological or organizational, or they can result from limitations of supplies of labour or other inputs to the production processes of the firm. When invention and innovation are undertaken to eliminate organizational or technological bottlenecks or supply constraints, they do not typically create some new balance, any more than the addition of new plant and equipment is likely to result in all of the production activities of the firm exercising equal constraint on the volume of output. Indeed, it is an implication of the fundamental theorem of linear programming that the number of constraints upon the outputs of a firm will be at most equal to the number of commodities produced.

In summary, then, the elimination of one set of constraints will typically result in different constraints upon the scale and scope of activities of the firm. The existence of these constraints, or imbalances, will focus the attention of the management team upon means of eliminating or circumventing these constraints. Success in achieving this objective will bring new constraints into force, creating new imbalances. The precise nature of these constraints and imbalances will depend upon the resources of which the firm is composed, as will the knowledge which is applied to overcoming the effect of these constraints. Whether the application of knowledge to objective involves invention, innovation or imitation, the economic forces involved are the same. The activities of invention, innovation and imitation are normal business activities, although the creativity, the inspiration and the farsightedness with which knowledge is applied to the objective will differ from firm to firm. The difference is probably a result of the different qualities of different management teams.

3.3 THE INDUCEMENT EFFECT: MARKETS AND THE DIRECTION OF GROWTH

The focusing effect described in the preceding section relates to the resources of the firm and is, therefore, an effect which is wholly internal to the individual business. Moreover, in discussing the nature of the focusing effect, I assumed that the management team was invested with some will to grow. That discussion is incomplete in two respects. In the first place, the properties of investment projects are determined
only in part by the resources comprising the firm, since there are market forces which either force or predispose the firm to follow one course of action rather than another. In the second place, it is not clear that all growth or technical change by firms is a result of the 'animal spirits' — the ambition and willingness to take a risk — of the management team of the firm. While some investment activity, perhaps most, derives from an entrepreneurial desire to dominate one's surroundings and to climb ever greater heights, surely some investment will be required if the firm is merely to remain in existence? At the very least, the firm must undertake that level of investment which will maintain the fabric of its plant and equipment.

Perhaps the clearest statement of an example of the inducement effect is to be found in Schumpeter's analysis of the diffusion of technical change or, as he called the process, imitation. Schumpeter argued that technical change will be undertaken by one firm, thereby enabling it to reduce its costs and, hence, output prices relative to the costs and prices of that firm's competitors. The forces of competition will then induce the competing firms to employ either the same innovations or innovations yielding equivalent cost reductions in order to maintain their positions in the market.

One quite general inducement mechanism turns on backward and forward linkages (Hirschman, 1958). A backward linkage is a technological relationship between one production activity which is being expanded (or perhaps contracted) and the production processes which provide its inputs. A forward linkage is a technological relationship whereby the outputs from newly introduced or expanding production activities can enter other production activities as inputs. It makes no difference to the effects of forward linkage if the output from the new or expanding activity is an end-product or a by-product.

Backward and forward linkages give rise to important effects which are relevant to the economic analysis of business strategies.

Backward linkages provide growing markets for outputs from other production processes and, therefore, a profitable opportunity for producers of commodities used as inputs to expanding processes. If these inputs are in short supply relative to the demands for them, their prices might rise in the short run, thereby making increased output flows more profitable. If prices do not rise, the increased demands will reduce the uncertainties of investment in capacity expansion. In either case there will be some incentive to increase outputs. If the backward-linked commodity is produced subject to economies of scale, then individual producers will have an incentive to increase their output flows either to achieve increased profitability (if prices do not fall in proportion to unit costs) or to be able to remain in business as other producers increase the scales of their respective outputs and so reduce their relative costs. Since high-cost producers are always vulnerable to the effects of price competition, every producer who can do so will have an incentive to increase his scale of operations lest other producers increase theirs and then use their cost advantage to force him out of the market.

Economies of scale also enter into the inducement effect of forward linkages. The expansion of a production process yielding forward linkages might provide forward-linked producers with opportunities for greater profits and growth. The standard examples here are the provision of cheap electricity following the commissioning of a large hydroelectric generating plant, thus encouraging the establishment or growth of power-intensive industries, or the building of large-scale iron and steel works which then encourage the development of processes for fabricating ferrous metal. If, for example, there are increasing returns to scale in metal fabrication, and the appearance of a large-scale steel works leads some firms to expand their fabricating capacity, those firms that do not expand will end up producing under relatively unfavourable conditions of cost. As in the case of backward linkages, economies of scale in the production of forward-linked commodities would induce competing producers of such commodities to expand their production capacities lest they should find themselves in a competitively vulnerable position.

This line of argument is not entirely hypothetical. It
arises from, and is used in, practical work in development economics. In addition, the economic effects of forward linkages clearly underlie the present concern with micro-processors. For micro-processors not only reduce the costs of production processes in which they are employed, but they also alter the nature of consumption goods such as calculators, wrist-watches and washing machines and, not improbably, will lead to the development of new consumer goods. That competition in cost reduction (and hence in relative price reduction) and product innovation is one result of the micro-processor revolution is easily demonstrated and difficult to deny. These competitive effects of an obvious forward linkage are paradigmatic inducement effects.

This sort of inducement effect arising from technical change dominates the history of the machine-tool industry. Rosenberg (1963) has shown how imbalances within a production process have led to the design of new machine tools, which have then had wide applicability in production processes requiring the same operations. In so far as cost reductions reduce the competitive vulnerability of a firm, or the failure to achieve cost reductions increases competitive vulnerability, firms operating forward-linked production processes will be induced by competitive pressures to adopt cost-reducing technical changes. Such inducement effects, based on inventions and innovations, do not require economies of large-scale production. The common element among the inducement effects based on backward or forward linkages is the interaction between competitive processes and cost reductions, whether the latter are derived from economies of scale or technological advances which reduce unit costs — including capital costs — at any scale of output.

3.4 FOCUSING EFFECTS, INDUCEMENT EFFECTS
AND BUSINESS STRATEGY

Focusing effects turn on imbalances arising from the resources and administrative structure of the individual firm. Inducement effects turn on technological linkages among the production activities of different firms and forces arising from competition among firms. These linkages and competitive forces focus the attention of management teams upon new markets or new ways of producing commodities for existing markets and so pre-empt internal imbalances as objects of managerial attention. However, the response of a firm to linkages and competitive pressures will surely depend on the resources and administrative structure by which the firm is distinguished. Particular imbalances within the firm, and the character of the knowledge and experience of its personnel, will focus the attention of the management team on particular criteria in the selection of the means by which to meet the problems or the opportunities created by inducement effects.

Although in the two preceding sections of this chapter the discussion concentrated first upon pure focusing effects, ignoring competitive pressures as much as possible, and then upon pure inducement effects, ignoring the characteristics of the firm’s resources, this approach is certainly too simplistic. It seems better to define focusing effects as the result of purely internal factors and inducement effects as the result of competitive pressures and focusing effects operating conjointly. The proposition advanced here is that both types of effect involve the application of non-specific knowledge to specific objectives. When focusing effects alone are involved, both the knowledge and the objectives which attract the attention of the management team do so entirely because of the composition of the firm’s resources and its administrative structure. When inducement effects are involved, either the knowledge, or the objective, or both are forced upon the firm as a result of events taking place outside of the firm.

In order to develop the concept of the inducement effect further, it is evidently necessary first to understand the nature of competitive pressures and, therefore, relevant aspects of the competitive process. That is, we must turn our attention to markets: what they are and how they work. In so doing, we shall find that focusing and inducement effects are relevant to analyses of horizontal and vertical integration as well as analyses of the definition and choice of techniques and organizations within the firm.
All of these matters are elements in the business strategy of the firm. It is precisely in relation to strategic considerations that focusing and inducement effects are important. These effects determine some of the objectives which investment projects must meet if they are to be selected. Since these objectives involve changes in the composition of the firm's resources to eliminate, in the long run, constraints which bind the firm in the short run, it is not stretching the meaning of the word if we call these objectives 'strategic'.

It will be seen below that focusing and inducement effects are crucial to the analysis of an important class of investment strategies — those strategies involving either the expansion of existing activities of the firm or related diversification.

Diversification is related if there is some element in the diversifying strategy which entails activities and/or resources which are common to the existing activities and resources of the firm. Diversification is unrelated if investment projects have nothing in common with other activities of the firm or if the resources of the firm, and the experience gained in using those resources, are not applied to new activities undertaken as a result of an investment strategy. Strategies of unrelated diversification give rise to conglomerate firms.

Some of the earlier conglomerates were often accused of pursuing diversification as an entirely financial operation. The conglomerates would diversify by taking over smaller firms in order to sell off their more valuable assets rather than to maintain them as going concerns. Other conglomerates have probably arisen because the focusing and inducement effects arising from their operations have not exhausted either their financial strength or their managerial resources. In such cases a growth-oriented management team might well opt for unrelated diversification.

Some of the advantages and disadvantages of conglomerate growth (or unrelated diversification) will be considered in chapter 9. For the most part, however, further consideration of investment strategies in this book will concentrate upon strategies of related diversification.

3.5 A DIGRESSION ON THE NOTION OF EQUILIBRIUM

There are two concepts of equilibrium in economics in general and the economic theory of the firm in particular. As the title suggests, the analysis of this book is compatible with neither of these concepts.

The first concept of equilibrium is that of all economic agents successfully optimizing subject to constraints. As I pointed out in chapter 1, both the objective function and the constraints of any constrained optimizing problem must be exogenous to that problem if it is to be soluble. In the course of this and the preceding chapters, I have developed the argument that it is normal business activity to identify constraints — indeed, to have one's attention focused upon them with increasing urgency — and then to seek to circumvent or eliminate them. Successful business activity renders the constraints under which the firm operates endogenous. The point is not that the managers of the firm choose which constraints shall be binding but rather which constraints shall cease to be binding.

In neo-classical and certain other theories of the firms, such as Baumol's (1959, 1962), one of the constraints under which the firm is assumed to operate is its production function. In chapter 1 I identified the exogeneity of the production function as a condition of application of the neo-classical theory of the firm or, as Machlup (1967) has it, the neo-classical theory of competitive market prices. Now, in so far as the firm can be represented by a production function, the technological relationship between inputs and outputs which it describes must result from the complement of resources comprising the firm. When the services of any of these resources become binding, the management team of the firm can alter those resources or use them in activities which are new to the firm. Furthermore, when market forces alter the availability of supplies or the state of demand for, respectively, the inputs and outputs of the firm's production processes, the firm will be induced to attempt to alter the characteristics of those production processes in response to those market forces. The way in which the characteristics of the production processes are altered will
depend on the objectives and knowledge of the firm, and these, I have argued, will be determined at least in part by the resources comprising the firm when the effects of these market forces become apparent to the management team. Thus, even if the subject of analysis is the formation of prices in competitive markets, any assumption that commodity producers operate under exogenous technological constraints is not in general warranted, and any dependence upon such an assumption will vitiate the entire analysis if the inducement effects described in the preceding two sections of this chapter are general and normal aspects of business activity.

I am not arguing here that constrained maximizing procedures are never appropriate to the analysis of business behaviour. In the short run, defined by the constancy and unalterability of the resources of which the firm is composed, constrained maximizing procedures are useful. Indeed, the example of the motor manufacturer constructed in this and the preceding chapter was based on such a procedure—in this case, linear programming. For with a given organization of the firm and a given complement of plant and equipment, the maximization of 'profits' by the application of programming techniques is nothing other than the maximization of cash flows, with the unchangeable resources comprising the firm. The allocation of these profits to the various fixed resources employed directly in the production processes of the firm (that is, the determination of the shadow prices) indicates the extent to which each of these resources imposes a constraint upon the productive activities of the firm and the value to the firm from overcoming each of these constraints. For a firm with a growth-oriented management team, the solution of the short-run programming problem suggests the nature of the long-run elimination of that problem.

In so far as equilibrium is simply short-run profit or cash-flow maximization subject to the constraints imposed by the existing complement of the firm's resources, it appears to be a useful concept. But it has no long-run analogue. In the long run, the constraints upon the scope and scale of the firm's activities depend upon the management team's motivation, imagination, expectations, ambition, willingness to incur risk and to act in the face of uncertainty. These are qualities about which we do not now have any general theory, and it is by no means likely that we ever shall have one.

The second concept of equilibrium turns upon the confidence with which expectations are held by businessmen.

As applied to the theory of the firm, this concept of equilibrium is an outgrowth of Joan Robinson's (1969) macro-economic concept of golden-age equilibrium growth. This is not a notion which was ever intended to be realistic—hence the name. It is a state in which everything is growing at the same, constant, proportional rate, including demands and supplies in general and demands for and supplies of investment goods in particular. The essential idea here is that if everything is growing at the constant rate g, so that entrepreneurs will have been increasing their production capacities and actual levels of output at that rate, there will be no reason to alter plans for growth, or at least there will be nothing to force entrepreneurs to change the rate of growth of production capacity or output. In the terminology adopted in this book, there are neither focusing effects nor inducement effects. As long as no entrepreneur seeks to increase the rate of growth of his firm above the universal, steady growth rate g or to reduce it below growth rate g, this equilibrium can be maintained forever.

The purpose of models which rest on the concept of steady-growth equilibrium is to analyse not sequences of events in historical time but, if anything, the structures of economies and relationships among economic magnitudes in an analytical context which abstracts from the difficulties introduced by the need to form expectations about uncertain future events (cf. Moss, 1978).

A number of writers (for example, Marris, 1964; Wood, 1975; Kahn, 1972) have formulated models in which they assume that firms intend to achieve a constant rate of growth in all of their activities over some specified period of time, sometimes called the planning period, that this rate of balanced growth is in fact achieved and, moreover, that the stock exchange (more precisely, institutional and personal rentiers collectively) accepts that the firm will grow at this
intended, balanced rate over the prescribed period. In his seminal work in this field, *The Economics of Managerial Capitalism*, Marris explicitly accepts the Penrose theory upon which the present analysis is largely based and then adopts this particular variety of equilibrium analysis in order to engage in long-run theorizing. As a method of formulating analytical categories, this method might have something to commend it. Indeed, the use of equilibrium for taxonomic development was arguably the purpose for which the neoclassical theory of the firm was invented (see Moss, 1980). However, it is not the method which will meet the requirements of an economic theory of business strategy.

The analytical categories upon which the economic theory of business strategy is founded are, broadly, stimuli to the growth of the firm and impediments to the growth of the firm as manifested in focusing and inducement effects. These presuppose some imbalance among the resources comprising the firm, the administrative structure of the firm and the markets in which the firm buys and sells. The fundamental hypothesis here is that changes in the scale and scope of the activities of the firm are encouraged, restricted and channelled by these imbalances. In consequence, the theory reported in this book is incompatible with balanced-growth models in general and steady-growth models in particular.

One implication of the foregoing discussion of equilibrium is that the economic theory of business strategy is not likely to be expressible in mathematical terms. For mathematical models in economics are typically based on either constrained maximization procedures or the assumption of balanced growth and, hence, the continuous fulfilment of managerial expectations. But the conditions in which the objective and constraint functions faced by the firm are exogenous to it and the conditions in which balanced growth is sustained are precisely the conditions to which the present analysis does not apply. A powerful analytical tool is lost in this state of affairs, but a considerable increase in generality is gained. It is for the reader to decide whether the value of the gain exceeds that of the loss.

The Competitive Process

4.1 WHAT IS COMPETITION?

The focusing and inducement effects identified in chapter 3 are essentially dynamic concepts, in the sense that they summarize factors which affect the direction of changes in the resources and activities of individual firms. Since inducement effects are the dynamic result of focusing effects and competitive pressures, it is clear that we require a dynamic description of the processes giving rise to those competitive pressures. In other words, we require a dynamic analysis of the competitive process and one which does not rely upon either of the two conceptions of equilibrium considered at the end of the preceding chapter.

As always, it is best to start by establishing clear and relevant definitions. The best definition of competition I have found which meets the needs of the present analysis was devised by John Maurice Clark (1961, pp. 13–16):

> Competition between business units in the production and sale of goods is the effort of such units, acting independently of one another (without concerted action), each trying to make a profitable volume of sales in the face of the offers of other sellers of identical or closely similar products.

Clark identified three interdependent forms of sellers' competition. These are