Milton Friedman is the 1976 Nobel prize-winner. As noted in Chapter 1, his [1953] self-conscious methodology is now famous for being an explicit form of Instrumentalism. Economists usually characterize Instrumentalism as the 'as-if methodology' but too often confuse Instrumentalism with the sequence-of-models version of Conventionalism. Both do begin with simplifying assumptions. In the sequence-of-models version of Conventionalism, there are many steps to follow whereby the simplifying assumptions are replaced with more complex ones that are hoped to make the models 'more realistic'. Instrumentalism, instead, would see no need to replace them although sometimes there are two or more simple assumptions to choose from. For example, Friedman advocates explaining imperfect competition by mixing or choosing between an ideal perfect competitor (i.e., a firm too small to affect its market-given price) and a perfect monopolist (i.e., a firm that is the only producer in the 'industry'). Alfred Marshall, approvingly quoted by Friedman [pp. 34–5], said that:

> At one extreme are world markets in which competition acts directly from all parts of the globe; and at the other those secluded markets in which all direct competition from afar is shut out, though indirect and transmitted competition may make itself felt even in these; and about midway between these extremes lie the great majority of the markets which the economist and the business man have to study.

But for Friedman, that these ideal types were descriptively false is of no concern and we are encouraged to consider them to be the first and last tools needed to explain the real world. No sequence of models is necessary. Elsewhere in his methodology essay Friedman [p. 18] explicitly invokes one of the physicist's ideal types, the assumption of a vacuum, to demonstrate that its lack of realism does not matter:

> The formula $s = \frac{1}{2}gt^2$ is valid for bodies falling in a vacuum and can be derived by analyzing the behavior of such bodies. It can therefore be stated: under a wide range of circumstances, bodies that fall in the actual atmosphere behave *as if* they were falling in a vacuum… Yet … [the] hypothesis can readily be rephrased to omit all mention of a vacuum… The formula is accepted because it works, not because we live in an approximate vacuum – whatever that means.

Friedman appears here to be trying to avoid admitting that the first step of an explanation might be based on a false assumption by simply declaring that the assumption of a vacuum made solely to justify using the formula is an unnecessary assumption. Just assume the formula works since that is all that will be needed to calculate the distance traveled by a falling object.

One could adopt the same strategy by just assuming decision-makers in economic models are price takers and make no mention of possibly false assumptions that one might use to justify this assumption. To invoke the price-taker assumption would normally require the assumption of perfect competition or of the existence of a long-run equilibrium (where every producer is just covering costs with its price and would thus lose money by lowering its price or go out of business by charging a higher price). This hiding of a needed assumption is a strategic trick and is the same trick used by Alchian [1950] to

producing a larger quantity of output, then the current output is not being efficiently produced. Maximum efficiency in this sense then occurs only at the level of output where average cost is minimum. This is the key to connecting the individual's concerns to the social objective. It is also the key to understanding the role of natural constraints.

Since the individual maximizer is only concerned with marginal values, we need to note an elementary point: the behavior of the average is not independent of its relationship to the margin. Specifically, to cause the average to fall, the margin must be below the average. Similarly, if the average is rising (as it is to the right of Q_e in Figure 7.2), it can only be because the margin is above the average. Thus, with this elementary point in mind, we see that whenever the average is at a true minimum and thus temporarily unchanging with respect to output, the margin equals the average. So, in order for model builders to have the firm using its resources efficiently, they need only have the firm producing where the marginal cost equals the average cost – namely, at output level Q_e in Figure 7.2.

But profit maximization, our individualist incentive, only assures the equality of marginal cost with marginal revenue – and this equality is a matter of simple calculus. Similarly, reducing profits to zero only assures that average cost equals average revenue – this equality is a matter of simple arithmetic. So far, there is nothing here to bring average and marginal cost into equality. Now here is where the idea that firms (and buyers) are price-takers becomes crucial. If a firm is a price-taker – that is, the price is given by the market (which is an exogenously given institution) and does not change in response to the single firm's behavior (which is the case when either there are very many very small firms or prices are externally fixed) – then marginal revenue will necessarily equal the average revenue (the latter of which is just the fixed or unchanged price). In this *special* case, if the individual firm's profit is maximized, the price (which equals both marginal and average revenue) will equal its marginal cost. If the individual firm (perhaps by its entry into the market) inadvertently causes profits to be reduced to zero, its average revenue (i.e., the price) will equal its average cost. Thus, indirectly we obtain the socially desired efficiency in the use of society's resources; the firm's marginal cost will equal its average cost *without the deliberate action by any individual* in that regard!

The elementary analysis of the last paragraph can also be illustrated with a simple diagram – Figure 7.3. The idea that the firm is a price taker is represented by a horizontal line. There is one drawn for P_1 and one for P_e – and in both cases, since the price is given and fixed (i.e., by assumption, the firm must take it as given), the price is both the average revenue (AR) and marginal revenue (MR). A profit-maximizing firm will choose the quantity of output that maximizes profit per unit of output (viz., where the price equals marginal cost). When it faces the given price P_1 it will then choose Q_1 and it will be making an average profit (AP), which in this case is calculated and represented by the distance between the marginal cost curve (MC) and the average cost curve (AC). When facing P_e it will choose Q_e; but in this case it makes zero profit and so marginal cost and average cost coincide.

market), it is now assumed to have an effect on the price it faces. For example, if it wishes to increase its output, it will have to lower its price in order to generate sufficient demand. This inverse relationship between the level of output and the price is represented by the downward-sloping average revenue curve (AR). Since the average revenue falls with increasing output, the marginal revenue must be less than the average and this is also illustrated with the marginal revenue curve (MR). (It is a straight line only because I drew a straight-line average revenue curve.)

Figure 7.4 clearly shows the firm's profit maximizing output (i.e., where marginal cost equals marginal revenue) to be at a level Q_1. Note that at Q_1, the average cost curve is negatively sloped (i.e., to the left of the bottom of the U-shaped average cost curve). Reducing average cost means reducing the average use of resource inputs per unit of output – that is, reducing the ratio of inputs to outputs. If that ratio can be reduced, then its inverse – the returns for each unit of input – can be increased. This possibility is what was called a situation of increasing returns and this possibility presents a social problem. From a society's viewpoint, the possibility of reducing costs would surely benefit everyone in society. So, from the perspective of society, increasing returns imply a social disequilibrium, since the existing potential cost reduction is an unexploited incentive. Increasing returns, then, imply that we have not yet reached a social optimum. But here is the problem. Society may not have reached an optimum (in terms of the efficiency of the use of its resources), but the individual firm sees no incentive to change its use of its resources. That is, each firm can be in a state of equilibrium (profits are both zero and maximum), yet the imperfectly competitive *equilibrium* appears necessarily to entail increasing returns (since it is to the left of Q_e).

Although this is an elementary point of price theory, it must be treated with care. Let us then look again at imperfect competition from the perspective of the individual decision-maker who is supposed to pursue profit maximization. If a firm is an imperfect competitor, then by definition it cannot be assumed that the output chosen has no effect on its price. Whenever the price varies with the level of output, marginal revenue is not equal to the price. Furthermore, since it is always assumed that the demand curves are downward sloping, marginal revenue is always less than average revenue. Now, keeping this in mind, recognize again that profit maximization implies the equality of marginal revenue with marginal cost. If we also recognize that a competitive equilibrium painted in any color implies the absence of excess profits (over the cost of producing the chosen level of output) – and hence, the absence of incentives for new firms to enter the competition – then the price must equal average cost. Putting all these implications together means that profit maximization with competitively imposed long-run zero profits does not entail the lowest possible average cost – as we can clearly see in Figure 7.4. In particular, since marginal revenue is below the price and since profit maximization means that marginal revenue must equal marginal cost, then necessarily marginal cost is below average cost – which means that average cost must be falling (i.e., there are increasing returns) *whenever there is an imperfectly competitive equilibrium*. Thus, whenever there is an imperfectly