MONASH UNIVERSITY

DEPARTMENT OF ECONOMICS

FIXED AND VARIABLE COSTS

In many textbooks, the discussion of a firm's profit-maximizing behaviour in the short run slides over a number of distinctions and can cause some confusion.

It will be convenient to begin by quoting some statements by authors of well-known textbooks:

> The SHORT RUN is defined as the period of time over which the inputs of some factors cannot be varied. The most usual meaning is that a firm is committed to paying for the use of a specified quantity of FIXED FACTORS whether or not it needs them, and that it cannot get the use of more of this factor than it has on hand.
>
> - Richard G. Lipsey, *An Introduction to Positive Economics*, 2nd Edition, p.266.

> FIXED COSTS are those costs that do not vary with output; they will be the same if output is one unit or one million units. The costs of any fixed factor will be a fixed cost: since the factor cannot be varied the costs associated with it cannot be varied. Fixed costs are also often referred to as overhead costs or unavoidable costs.
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> - Lipsey, p.275.

Since in the short run we classify resources into fixed and variable categories, we break up the firm's total costs of production in the same way. The costs of fixed resources are <u>total fixed costs</u> and those of variable resources are <u>total variable costs.</u>

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> The magnitude of a firm's total fixed costs depends upon its scale of plant and not upon the level of output produced with that scale of plant. The firm's scale of plant is defined in terms of given quantities of fixed resources, so that the costs of these will not vary as output is varied.....
>
> Suppose that the firm's scale of plant ... are (*sic*) such that it is obligated to pay 100 dollars a week for (the fixed resources used). Whether the output is zero or 10 units per week, the obligation remains the same.
>
> - Richard H. Leftwich, *An Introduction to Economic Thinking*, (Holt, Rinehart & Winston, 1969), pp.125-126.

Fixed costs, as defined by the above authors are fixed both in the sense of being those costs associated with fixed factors, and in the sense of being unavoidable. These two senses of "fixed" are quite distinct, and to avoid confusion, reference will be made in what follows to "costs of fixed factors", on the one hand, and to "unavoidable costs", on the other. Are these two categories of cost co-extensive, as our authors imply? A simple example will suffice to show that they are not. The minimum time necessary for a firm to extend its factory, purchase and install new equipment, etc., may be 6 months. For a length of run less than 6 months, then, its buildings and plant must be regarded

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as fixed factors. But it may be able to sell its existing buildings and plant more or less immediately - a rival may have made an offer for them, for example. The costs associated with retaining these fixed factors would then be avoidable costs.

Once it is recognized that costs of the fixed factors are not necessarily unavoidable, we have to make a terminological choice. If we retain the term "fixed costs" to mean "costs of the fixed factors", the theorem that the firm will not close down so long as its receipts cover variable costs is no longer valid. The close-down point becomes that which revenue ceases to cover avoidable costs, defined as variable costs plus "avoidable fixed costs". This is the approach taken by Vickrey, who splits the costs of the fixed factor into "avoidable fixed costs" and "sunk costs", the former being "the amount of the charges on the fixed factor that the entrepreneur can save or salvage by scrapping it, the remainder being charges that go on regardless of what is done to the fixed factor. The avoidable costs will consist of interest or normal profit on the salvage or scrap value of the fixed factor, plus whatever current expense for maintenance overhead is associated with the use of the fixed factor.[1] By subtracting average sunk costs from average total costs, Vickrey defines a curve he calls "average current costs", lying above AVC but below ATC. If average revenue falls below ACC, the firm will close down.[2]

Another choice of terminology is to define "fixed costs" as meaning unavoidable costs. Avoidable costs associated with the fixed factors then become part of variable costs (and unavoidable costs associated with variable factors become part of fixed cost) and the theorem that the firm will continue to produce so long as average revenue exceeds average variable cost remains valid. This is the approach adopted by Friedman, who writes:

> ... costs incurred on account of "fixed factors" do not necessarily correspond with "fixed costs", and costs incurred on account of "variable factors" do not necessarily correspond with "variable costs". If the firm need pay nothing to the owner of a fixed factor if it uses none of it, all of the payments for such a factor are to be included in variable costs. Or again, a fixed factor may be a factory building owned by the firm. If the firm were to give up completely the use of the building - which might require that it go out of business - it could sell the building, but otherwise it might be able to receive no return outside its own business from it. In this case the annual or other time-unit equivalent of the sale price would be a variable cost incurred on account of the building. Similarly, the firm may be committed to paying a fixed sum to the owner of a variable factor whether or not it uses any of that factor. Such a sum would be included in fixed costs.[3]

If Friedman's approach is adopted, variable costs consist (a) of costs which vary continuously with output and approach zero as output approaches zero, and (b) of costs which vary between zero (if the firm goes out of business) and some

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1. William S. Vickrey, *Microstatics*, (Harcourt Brace, 1964), p.195.

2. But see below for a qualification of this statement.

3. Milton Friedman, *Price Theory: A Provisional Text*, (Cass, 1962), p.101.

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positive value (if the firm stays in business) but which do not vary with level of output while the firm remains in business. If variable costs contain some component(s) of type (b), variable costs do not approach zero (but rather some positive value) as output approaches zero, and the AVC and MC curves do not originate from the same point on the y-axis - AVC starts from a point higher than MC.

Another solution to our terminological problem is to scrap the usual fixed-variable cost dichotomy altogether. This is the solution favoured by Alchian and Allen, who divide costs into three categories, acquisition cost (corresponding to sunk or unavoidable costs), possession cost (corresponding to avoidable cost of fixed factors) and operation cost (corresponding to variable cost, in its narrow definition).[4]

In summary, the analyses of Alchian and Allen, of Friedman, and of Vickrey are all correct, but differ in their terminologies. The usual text-book analysis is correct only on the assumption that there is a perfect correspondence between unavoidable costs and costs of fixed factors on the one hand, and between avoidable costs and costs of variable factors on the other. The analysis is thus unduly restrictive and may be misleading.

One additional point perhaps requires elucidation. Vickrey points out that "if avoiding the avoidable costs involves taking some irreversible step such as scrapping a plant or allowing it to deteriorate seriously for lack of proper maintenance, and if there is some prospect that demand may recover so that the plant can be profitably used later on, then the plants can be kept in operation even if the price (of the product) falls below (average current costs)".

Does this argument challenge the universality of the rule that the firm seeking to maximize profit (or minimize loss) should close down if average revenue falls below average variable (i.e., avoidable) cost? Not really. Both of the quoted arguments combine elements of longer-term analysis with the short-run analysis. When the problem is restated in a more formal way, it is apparent that the recommended course of action does not contradict the rule. One such restatement is as follows:

> If a decision is made not to sell fixed assets on the grounds that their retention is the least-cost way of taking advantage of an expected future rise in price of the commodity in the production of which they are used -- i.e., if it is cheaper to retain existing assets, incurring avoidable possession costs, than to sell them and buy similar assets at a future date when the expected product price rise eventuates[5] - then the cost of retaining them (possession cost) should properly be charged against the revenue expected to accrue in the future. These costs are in the nature of an investment outlay, a return on which is expected in the future, and they cease to be costs, avoidable or unavoidable, with respect to the decisions concerning the firm's current operations. Hence the only costs relevant to the short-term operation of the firm are its operating costs. So long as revenue exceeds operating costs it pays to continue in operation.

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4. Alchian and Allen, *Exchange and Production : Theory in Use*, (Wadsworth. 1969), Ch.14

5. It may be cheaper to retain existing assets rather than to disinvest and later reinvest in them because of differences between buying prices and selling prices of such assets in imperfect markets; or because of uncertainty as to whether it will be possible to buy the assets just when they are needed.