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ARE LONG-RUN AVERAGE COST CURVE EVER U-SHAPED? - A CRITICAL REVIEW OF LITERATURE

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Abstract
According to the traditional theory, the long-run average cost curve is also 'U' shaped like the short run average cost curve. But some economists have found from empirical study that the LAC curve is L shaped rather than being 'U' shaped .The LAC curves first fall rapidly in the beginning. But after a point it becomes fully flat or may slopes downward slowly.

According to most of the empirical studies, there is increasing returns to scale in lower level of production. But when output increases, the economies of scale decline and the consist returns to scale operates in higher level of production. This implies that as the output increase, the Long-run Average Cost curve slopes downwards at the diminishing rate and finally becomes horizontal. The operation of decreasing returns to scale or output of average cost curve is rarely found.

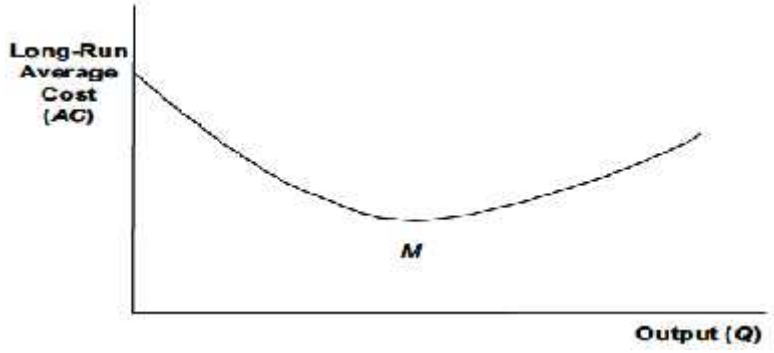
P.J.D.Wiles has concluded on the basis of his that the average cost like the branch of left side of capital letter 'U' first rapidly and then slowly slopes downwards. The decline in cost with size is almost universal. But 'U' never turns upward. The rapid increase in cost with size is practically unknown and even little rise as rare. He remarks "Most of the cost function obey what we may call the L-shaped costs."Johnston has also derived same conclusion from his study. From the study of cost estimate of electricity production in Great Britain, he has found the average cost to decline in the beginning and then becoming leveled off.

Thus, the aims to investigate the relevant reviews of eminent authors who were tried put light on this problem through the literature survey.

INTRODUCTION

A good theory in Economics should be both powerful and simple. It should be powerful in being able to answer a wide range of questions from the 'real world' and should be simple in that, it can be easily explained, understood and used. Demand and supply is such a theory. The traditional U-shaped cost structure can be considered to be a poor theory since it is both weak and complex and its relevance to the real world of business economics seems to be limited. An alternative cost structure – certainly simpler, possibly more powerful and based on looking at modern businesses – is the 'L-shaped' cost curve.

Marshall, Scherer and Ross (Neoclassical) Relationship between Unit Cost and Output[1]



As the output *Q* increases, the average cost decreases due to economies of scale. At a certain point (*M*) the economies of scale are exhausted, while diseconomies of scale, presumably driven by diminishing returns to management, start to influence the unit cost. As output increases, the unit cost increases. In a competitive market, this implies an equilibrium output *M* where marginal cost not only equals marginal revenue, but also intersects long-run average cost at its minimum.

R.F. KAHN'S DISCOVERY OF L-SHAPED AVERAGE COST CURVE[2]

R.F. Kahn is probably the inventor of the L-shaped cost curve. In his study of the effects that a fall in demand had on the behavior of firm in the 1920s' depression, he looked at the two methods by which production could be reduced in the short-run, they are 1) Quasi-fixed costs which include Salaries and maintenance costs 2) Prime costs which include wages and raw materials costs. With these two types of costs, he observed that, each firm is faced with two alternatives: either (i) It reduces the number of machines employed within a given plan; or (ii) it reduces the number of days during which the machines in a given plant are employed. Two elements are relevant in the firm's decision: the size of quasi-fixed costs and the characteristics of the machines. In the latter case, there are two possibilities: either (1) the machines are uniform or (2) the machines are not uniform. Thus, if condition (1) holds, then the firm has a continuously decreasing average cost of daily output per unit, reaching its minimum point at full capacity level. If condition (2) prevails, then the average cost reaches a minimum at a point to the left of full capacity. In the latter case the cost curve takes the familiar U-shaped form.

Further, he argues that, if the machinery is uniform, the constant marginal costs prevail. Hence it is always more profitable to reduce the number of days of production method, since working for only a few days a week involves a reduction of quasi-fixed costs.

Conversely, if the machines are not uniform, the marginal costs rise after a point. Then method (ii) is more profitable only at low output levels. It is more profitable as long as the gain deriving from lower weekly quasi-fixed costs is offset be the use of the less efficient machines when the plant is worked at full capacity. The most efficient method of reducing costs when demand is particularly low is, then, to work full time some days and suspend production during other days of the week. With these analyses, Khan discovered that, this was precisely the behaviour of the firms in the Cotton and Coal industries during the 1920s, depression in England. The reason is that, Method II, the average prime cost (ratio between the daily total prime cost and daily output) does not change as output varies. When the machines are used every day, production cannot be further increased and the average cost becomes infinite. The Average and Marginal cost curve than has the shape of an inverted L.

R.F. Kahn, after studying the effects of the Great Depression on English firms noticed that those firms preferred to shut down their plants for some days and work full time the remaining days of production whenever they needed to cut costs due to reduced demand. He concluded that the reason for this behavior was that firms, by having to deal with some form of fixed costs (or quasi fixed costs in his terminology) and uniform equipment, naturally avoided working every day for fewer hours. This, in practice meant that firms tried to adjust their levels of output to some range of production, where variable costs were not increasing with output until a point of full capacity utilization, suggesting a cost curve in the form of an inverted L. Further, Kahn claimed that, in normal conditions, 'the marginal cost curve is rising steeply. So the L-shaped average cost curve is presented as the extreme case of the more general assumption of rising marginal costs.

ROTHBARD ON V SHAPED AVERAGE AND TOTAL COST CURVES[3]

Rothbard refuted the important economic fallacy that excess capacity is a normal consequence of profit maximizing behavior by businesses in some industries when they are in long-run equilibrium. And, in so doing provided a manifest example of misuse of mathematics in modern economics. According to standard theory, given a U-shaped, average-cost curve (AC), in equilibrium, a firm whose demand is perfectly competitive will operate at the point where its horizontal demand curve is just tangent to the average-cost curve; i.e., at the point

where average cost (AC) is at its minimum. Alternatively, a firm in an industry characterized by monopolistic competition will face a downward- sloping demand curve. In that case, again in equilibrium, the firm will operate where the demand curve is just tangent to the U-shaped AC. However, in that case, the point of tangency will occur at lesser quantity than that at which AC is at its minimum.

Rothbard, however, puts an end to this notion, despite its vast popularity within the profession. He notes that, a necessary condition for the above conclusion is that the Average Cost Curve be smooth. This smoother Average Cost Curve backed only with differentiation and integration calculations. Further, he argues that, using of such fetish tools by neoclassical is woefully wrong. However, he argues that human action occurs discretely, not in infinitesimally small steps. Thus, the smooth curve assumptions promote mathematical techniques for the sake of neoclassical, to the denigration of economic considerations. And it is due to the mathematical tail wagging the economic dog, and not the other way around that leads us to the fallacy that perfect competition is needed in order to ensure location at the minimum point on the Average Cost Curve.

Finally, he criticizes the neoclassical as 'reductio ad absurdum' (a method of proving the falsity of a premise by showing that its logical consequence is absurd or contradictory) since they mislead the theory with smooth calculations. He further added, conclusions reached were the result of trumped up mathematics, not economics. Rothbard refuted the standard position by challenging its assumption of U-shaped cost curves by substituting for them a quasi-V-shaped cost curve. In so doing, he implicitly called into question the assumption of differentiability, as manifested in U-shaped cost curves.

JOHN JOHNSTON'S L SHAPED COST CURVE[4]

In their study, they argued that if average cost curves are U-shaped, then small and large firms would have higher costs than medium-sized firms. In reality, large firms rarely seem to be at a substantial cost disadvantage relative to smaller rivals. The noted econometrician **John Johnston** once examined production costs for a number of industries and determined that the corresponding cost curves were closer to L-shaped than U-shaped. When average cost curves are L-shaped, average costs decline up to the minimum efficient scale (MES) of production and all firms operating at or beyond MES have similar average costs. Sometimes production exhibits U-shaped average costs in the short run, as firms that try to expand output run up against capacity constraints that drive costs higher. In the long term, however, firms can expand their capacity by building new facilities. Average Cost Quantity If each facility operates efficiently, firms can grow as large as desired without driving up average costs. This would generate the L-shaped cost curves observed by Johnston. According to him, when a cement company builds a plant in a new Location or when a DVD manufacturer builds a new disc-pressing facility would lead the Average Cost to be L-shaped.

Further he added that, if the firm has U-shaped average cost curve which captures the relationship between averages costs and output. So that average costs decline over low levels of output but increase at higher levels of output. Thus, the combination of factors may cause a firm to have U-shaped costs. A firm's average costs may decline initially as it spreads fixed costs over increasing output. Fixed costs are insensitive to volume; they must be expended regardless of the total output. Examples of such volume-insensitive costs are manufacturing overhead expenses, such as insurance, maintenance, and property taxes. As output increases, these costs are averaged over greater volumes, tending to drive down average costs. Firms may eventually see an upturn in average costs if they bump up against capacity constraints or if they encounter coordination or other agency problems.

STEVEN A. FINKLER'S STUDY ON THE HOSPITAL INDUSTRY[5]

Steven A. Finkler's empirical study of the hospital industry has produced conflicting results with respect to the shape of the industry's long run average cost (LRAC) curve. In his study he concluded that, the LRAC curve of large hospitals which have a greater potential for scale economies are indicating much closer to being L-shaped

long run average cost (LRAC) curve. Further he added that, the basis for the much closer L-shaped long run average cost (LRAC) curve is the recognition of the failure of individual hospitals to produce all their individual product lines at efficient volumes. Such inefficient production is feasible and perhaps common, given the incentive structure which exists under current cost reimbursement systems.

JOEL DEAN'S STUDY ON STATISTICAL COST ESTIMATION[6]

Joel dean has examined the short run behaviour of operating costs which are the blend of pure production costs and selling cost in various factories such as Furniture Factory, Hosiery Mill, Belt Shop and Department store to test the traditional cost-output hypothesis of economic theory. Joel Dean in his cost function studies found that, long run average cost curve is L-shaped. His empirical studies show that, the behaviour of cost when plan size cannot be changed and when adaptation to rate of output is therefore incomplete. At the end of his study, he concluded that the L-shape of the long-run average cost curve implies that, in the beginning when output is expanded through increase in plant size and associated variable factors, cost per unit falls rapidly due to economies of scale. Even after a sufficiently large scale of output, the long-run average cost does not rise; it may either remain constant or it may even go on falling slightly. At a very large scale of production, the managerial cost per unit of output may rise, but the technical or production economies more than offset the managerial diseconomies so that the total long-run average cost does not rise or may even fall continuously, though at a very small rate.

J. JOHNSTON'S EMPIRICAL STUDY OF COST FUNCTIONS[7]

J. Johnston in his empirical study of cost functions found strong evidence for L-shaped long-run average cost curve. He reveals the reason for the L-shape is that, in the long-run, there is a minimum optimum level of production at which all related economies are obtained. These economies results into fall in costs. After minimum optimum level of output, costs become constant.

VINOD GUPTA'S STUDY ON LONG-RUN AVERAGE COST FUNCTIONS FOR 29 MANUFACTURING INDIAN INDUSTRIES[8]

Vinod Gupta who studied long-run average cost functions for 29 manufacturing Indian industries found that in 18 of them long-run cost was L-shaped. In his studies, he pointed out that, there are substantial technical economies of scale enjoyed by a firm when it expands its scale of output in the beginning. This causes the long-run average cost to fall steeply with the initial increases in scale of production. Hence, it has been asserted that even after most of the economies of scale have been achieved and the firm reaches a minimum optimal scale, given the technology of the industry, the unit cost of production may fall due to some technical economies which it can continue to enjoy even after the minimum optimal scale.

COST CURVES IN REALITY – A SURVEY BY WILFORD J. EITEMAN AND GLENN E. GUTHRIE IN 1952[9]

In a survey by Wilford J. Eiteman and Glenn E. Guthrie in 1952 managers of 334 companies were shown a number of different cost curves, and asked to specify which one best represented the company's cost curve. 95% of managers responding to the survey reported cost curves with constant or falling costs. Alan Blinder, former vice president of the American Economic Association, conducted the same type of survey in 1998, which involved 200 US firms in a sample that should be representative of the US economy at large. He found that about 40% of firms reported falling variable or marginal cost, and 48.4% reported constant marginal/variable cost. They concluded that the U-shaped cost curves have no basis in fact.

CONCLUSION

In most Economics text books, the U-shaped cost curve is derived not from any study of a particular business but by using somewhat arbitrary figures which are themselves assumed to be valid. The researchers have attempted to show – by using some reviews of previous studies that the L-shaped cost curve might be more accurate and relevant. Further, in the recent studies, the long-run cost curves are generally L-shaped rather than the traditional

U-shaped. However, with increase in output, production costs fall continuously, which implies that, at the beginning when the output is raised through increase in plant size and associated variable factor, cost per unit falls rapidly due to economies of scale. Even after a sufficient large scale of output, the long run average cost does not rise. It is either remains constant or it falls marginally. At a very large scale of production, the managerial cost per unit of output increases, but the production economies more than offset the managerial diseconomies. Hence, the long run average cost does not rise. Further, the empirical evidence gathered by economists like Joel Dean, Jonston and Vinod Gupta confirm that the long run average cost curve is L-shaped. Also observed evidence on cost function indicates that initially the long run average cost curve falls rapidly but after a point it remains flat throughout at its right-hand end and it even slopes gently downward. Further, technological progress along with sustainable production practice enables the firm to maintain the cost of production at a minimum level in the long run. This makes the LAC curve first to fall and then remain flat which makes it L-shaped. When output increases, LAC first diminishes at a faster rate and become flat as the output reaches its optimum level. Hence it can be said that the industries can represent indefinite economies of scale or L-shaped Long run average cost curve, if they utilize their factors of production at optimum level.

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