

Objectives of the Airline Firm: Theory

James T. Kneafsey
Massachusetts Institute
of Technology
Friday, July 14, 1972

I. Introduction: Models of the Firm

Most analyses of dynamic pricing strategies in the economics literature have adhered to the assumption that business firms seek to maximize profits. Newer models of the behavior of large corporations have recently been developed in which a variety of assumptions about business motivation have been inserted into traditional static frameworks, steady-state growth models of the firm, and non-maximizing "behavioral" analyses. These new models have paid increasing attention to the nature and determinants of the forces governing the size and growth of the companies of which they are composed. In particular, the theoretical models of the growth of the firm are rapidly becoming more rigorous, comprehensive, and widely accepted.

Since firms in the trunk airline industry compete in money and capital markets with numerous other firms in both the regulated and unregulated sectors of the economy, these models of firm behavior can be applied directly to the airline industry. The subject under discussion will revolve around alternative formulations of managerial goals which airline firms may be pursuing in practice. The focus will be on the consideration of different objective functions which the companies may be following in lieu of profit maximization. Since these models reflect the behavior of any single firm in any industry, the analysis is one of partial equilibrium which assumes the activities of

all other competitors as given.¹

This paper has two general purposes. It is intended mainly to provide a frame of reference from which alternative hypotheses can be stated concerning the objectives which managers and executives in the airline industry may be pursuing. It also incorporates as comprehensive a list as possible of alternative objective functions and demonstrates graphically that each separate objective may result in its own unique price (fare) and output (volume) combination when equilibrium occurs.

II. Some Simplified Specifications of Alternative Objective Functions

Using the revered goal (objective) of profit maximization as a base, we propose to analyze the following alternative objective functions:

- A. Short-run profit maximization
- B. Revenue maximization
- C. Sales maximization (break-even)
- D. Volume maximization

¹This restriction is severe with respect to the scope of economic questions, both analytical and practical, that can be answered. Economic analysis also seeks to investigate important subjects which concern systems of many firms, or of all firms, which require consideration not only of how all firms individually behave, but also of how their individual activities interact with and constrain each other in markets, broad sectors and the whole economy.

- E. Cost minimization
- F. Constrained sales maximization
 - 1. Minimum value profits
 - 2. Ascending buffer
 - 3. Descending buffer
- G. "Satisficing"
- H. Other specifications (non-graphical)
 - 1. Utility maximization
 - 2. Growth maximization
 - 3. Stockholder equity maximization
 - 4. Security maximization
 - 5. Market share equalization

Each case will be examined separately to determine the resulting price-output combination which optimizes each alternative objective function. By nature these models are simplistic yet the underlying importance of the basic demand-supply relationships is reflected in the sharply different results of each model. In essence the shapes of the revenue and cost functions (or demand and supply) determines the optimal price-output combination for each alternative objective.

A. Short-run Profit Maximization

Revenues are derived from the demand function and are depicted in Figure 1 (top) as a concave function (to the origin), that is, $RR = P \times Z$ where P is fare and Z represents output (or volume of passengers). Assuming that fares can be changed and that the law of demand applies ($\frac{\partial Z}{\partial P} < 0$), R reaches a maximum at point B.

636

However, to generate profits, a knowledge of costs is necessary. If costs are a function of volume, they can be depicted typically as CC in Figure 1 (top). Profits are simply the algebraic difference between RR and CC at each alternative level of Z, and are maximized when RR exceeds CC by the greatest amount (point A in Figure 1), the result being a profit curve π (Figure 1, middle). The equating of marginal costs (MC) and marginal revenue (MR) (Figure 1, bottom) for those of you who prefer to think in unit terms will occur exactly at point A.

B. Revenue Maximization

With the shape of the present RR curve, revenues are maximized at its peak (point B in Figure 1, top). This result also obtains where $MR = 0$ because additional Z can only occur with a decline in revenues as a result of the law of demand in operation. MR is simply the slope of the RR curve ($\partial RR / \partial Z$).

C. Sales Maximization (break-even)

There are different variations of the sales maximization hypothesis. In this case we are referring simply to carrying as many passengers (Z) out to the break-even point C. For reasons of market penetration, the airline may neither be interested in the short-run in profits nor in revenues, but rather it is interested in trading off less profits or less revenues for more customers.²

²The typical distinction between cost in the economic sense and in the accounting sense should be made. In economic terms, CC includes as a component a normal rate of return such that π really refers to "excess" profit. In the account sense, CC is the conventional income statement figure which excludes profit.

638

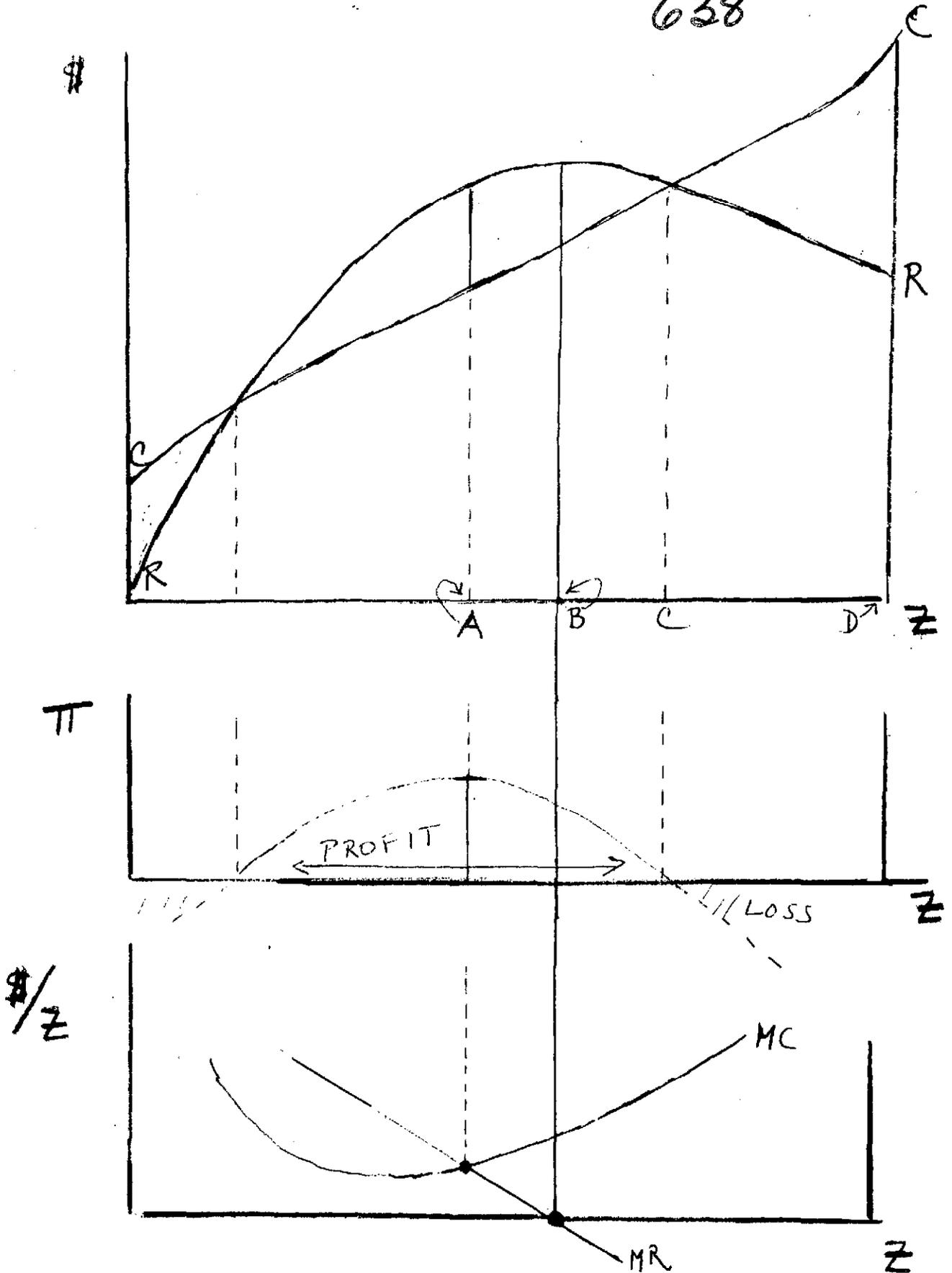


Figure 1: Total Dollars (\$), Profits (π), and Dollars per Unit ($\$/Z$) Plotted Against Output (Z)

D. Volume Maximization

An extension of the sales maximization hypothesis is that an airline firm may wish to carry as many passengers as possible, even if it results in a short-term loss. The result is in effect an objective of maximizing all available capacity (point D in Figure 1, top). Note that a large bias would be incurred with the pursuit of this objective function with the present revenue and cost relationships.

E. Cost Minimization

Sometimes companies become extremely cost conscious and pursue the goal of cost minimization (point E in Figure 2). This output level occurs at the bottom of the average cost curve (AC) where $MC = AC$. It is an objective completely independent of demand influences, unlike the goals discussed above. A danger which companies occasionally and regrettably experience is that they may minimize themselves to death if revenue considerations are ignored. If the demand curve (AR in unit terms or RR/Z) lies far below where it does in Figure 2, then cost minimization as a corporate objective still would not help. As it turns out in the present case, total profits are depicted by the hatched area in Figure 2.

639

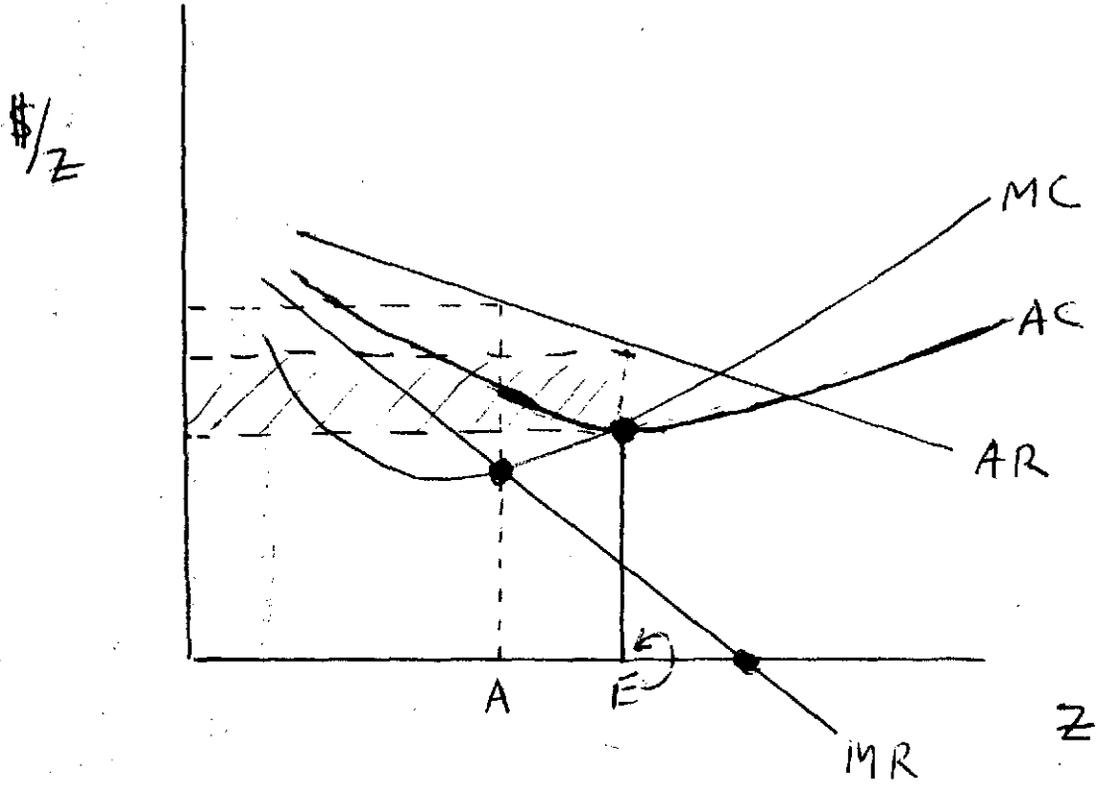


Figure 2: Dollars per Unit ($\$/Z$)
Plotted Against Output (Z)

640

F. Constrained Sales Maximization

1. Minimum Value Profits

This hypothesis has been advanced by a number of economists with W. J. Baumol in the vanguard. In the most complete statement of his proposition, Baumol argued that firms with market power tend to maximize sales subject only to the condition that profits not fall below some specified minimum value.¹ In Figure 3, profits are maximized at A. However, if management feels that a certain level of profits is satisfactory or even necessary to maintain (OM in Figure 3, bottom) irrespective of volume (Z), then the company's goal is over-fulfilled at volume OA. It can increase volume to O(F1) while earning at least OM in profits, enjoying higher "sales" than it would under a short run profit maximization policy. If the company's managers insist on earning profits of ON before seeking to satisfy other objectives such as sales maximization, they will not be in a position to increase revenues beyond the short-run profit maximizing level since the profit objective lies out of reach. The most important implication of this analysis is that if firms in the airline industry in fact strive to increase revenues for its own sake and if they require less profit to meet capital needs (e.g., OM in Figure 3), then they can charge lower fares and offer more volume than they would under the goal of profit maximization. Two variations of this objective are the ascending and descending buffer objectives.

¹ See William J. Baumol, Business Behavior, Value, and Growth, rev. ed., New York: Harcourt, Brace and World, 1967, pp. 45-82 and 86-104.

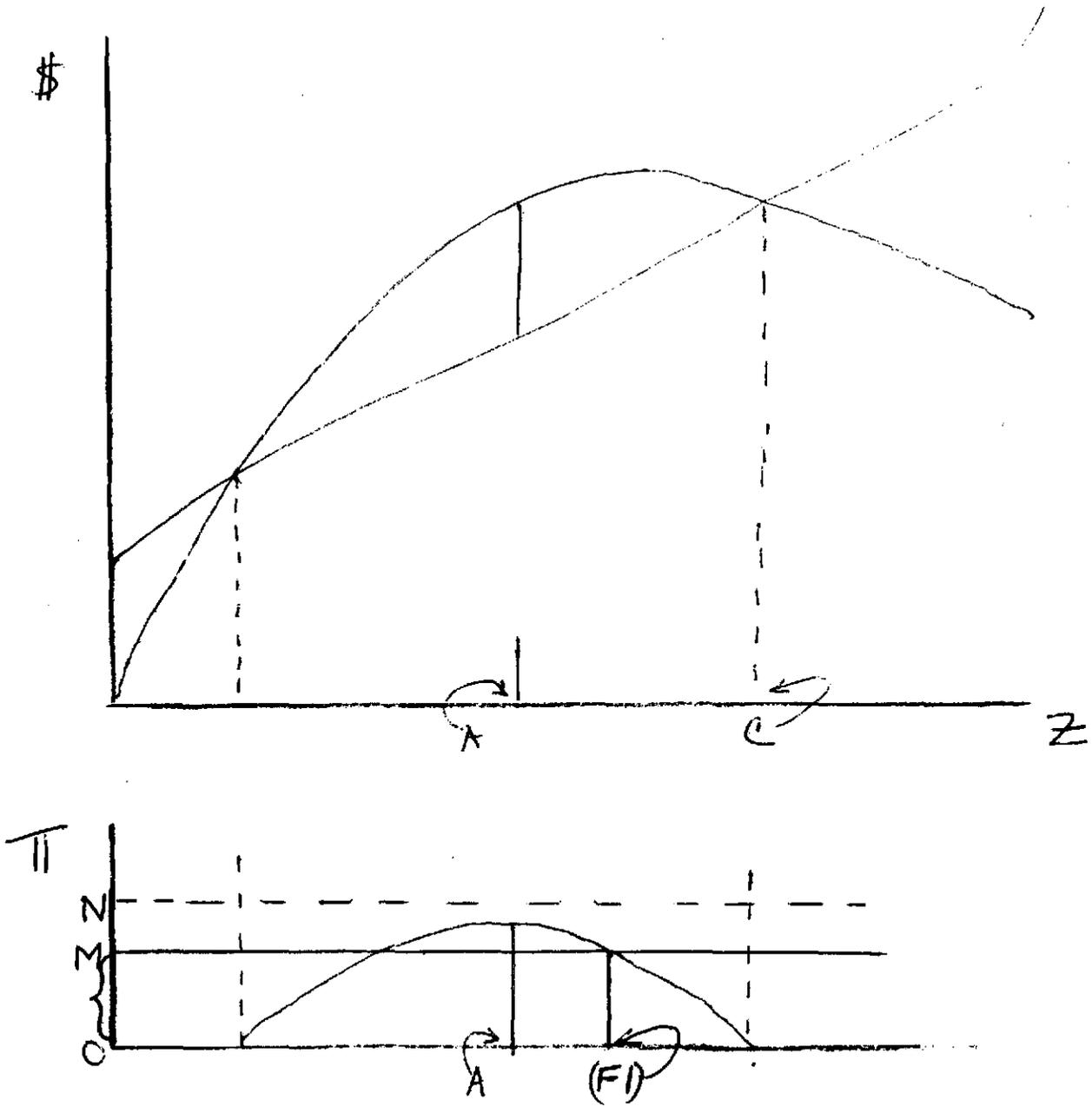


Figure 3: Constrained Sales Maximization

642

2. Ascending Buffer

In Figure 3, OM represents a "buffer" of profits which the firm desires to earn. These profits may be used for unexpected financing purposes, for dividend declarations, or for retained earnings. As long as OM is earned, the company will sacrifice additional profits for more sales. In Figure 4, KK represents a buffer stock of profits which increases with volume. With more and more volume presumably the firm should be in a stronger position to increase dividends or to finance additional expenditures. An allowance for this growth is reflected in the rising slope of KK. In this case the company will select volume (F2) in Figure 4, where sales are maximized subject to the buffer (KK) constraint.

3. Descending Buffer

Alternatively firms may be willing to sacrifice substantial short run profits in order to generate volume which would result in a buffer stock LL that varies negatively with volume. If volume during a given period is decreased sharply, say as a result of a strike, the company may wish to have a larger profit buffer at low ranges of Z. As volume increases though, the tradeoff with profits becomes apparent and the company would opt for output (F3) in Figure 4.

G. "Satisficing"

In the early 1960's, several economists in the Graduate School of Administration at the then Carnegie Institute of Technology developed the "behavioral" theory of the firm. At the heart of this theory lies the concept of "satisficing", usually attributed to the work of Herb Simon.

643

Essentially satisficing refers to the fact that firms may not be maximizing at all but rather may be pursuing a number of goals simultaneously resulting in accepting a "satisfactory" level of profits. Graphically, this means that the firm can select any volume in Figure 4 as long as some satisfactory level of profits is attained. In the case of pursuing any profit at all, the range would be QC within which the firm would be "satisfied".

H. Other Specifications (non-graphical)

Numerous other objectives could be pursued by firms in practice either individually or jointly. These goals might include the maximization of a firm's utility function, of its rate of growth of output, or of its stockholders' equity. Since ownership and management are separate functions of airlines and other large companies, an important objective to analyze might be the maximization of the management's own security and stability. Also, the companies might be satisfied with maintaining or increasing market shares as an objective independent of any other one.

The goals in this section cannot be demonstrated graphically as we have done with the other alternatives. For those objectives which we have discussed, a summary version of each alternative volume appears in Figure 5.

III. Conclusion

No one has yet succeeded in demonstrating conclusively whether or not airlines or other business firms behave in the ways and for

644

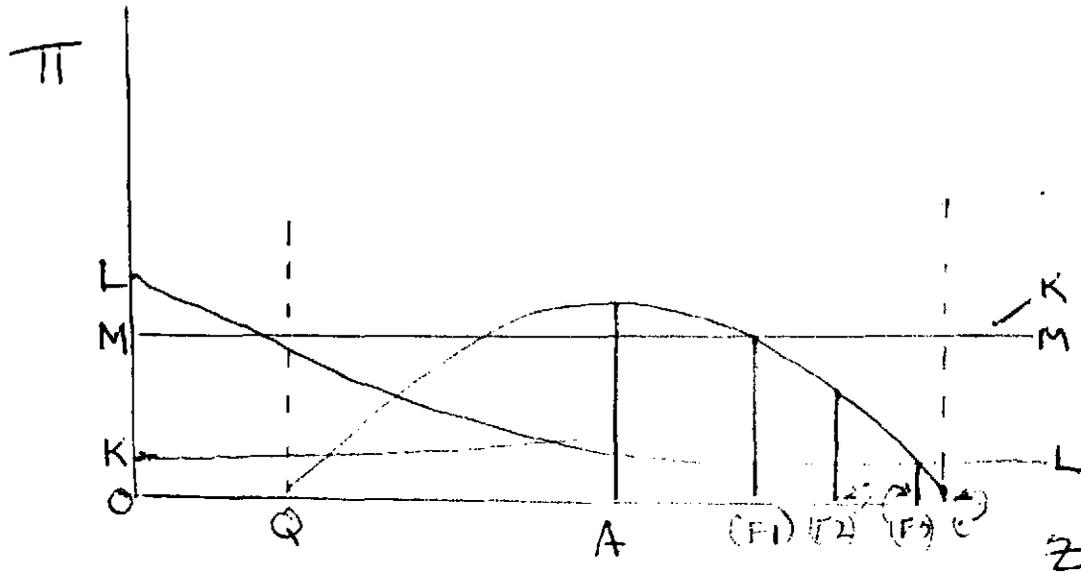


Figure 4: Ascending and Descending Buffer Objectives; and "Satisficing"

645

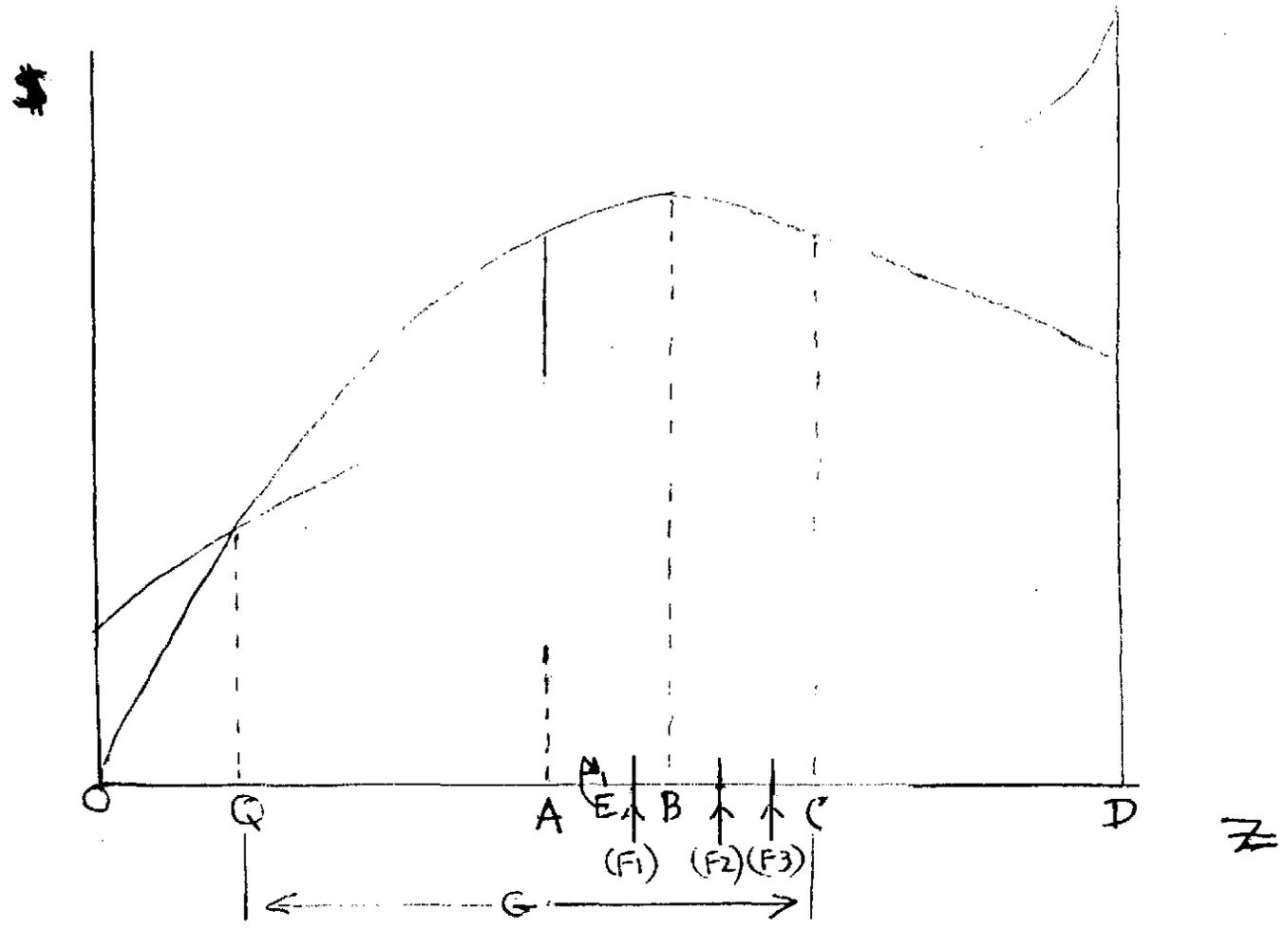


Figure 5: Objectives of the Airline Firm--
Summary (See pp. 2-3)

- A - Short-run profit maximization
- B - Revenue maximization
- C - Sales maximization (break-even)
- D - Volume maximization
- E - Cost minimization
- F1 - Minimum value profits
- F2 - Ascending buffer
- F3 - Descending buffer
- G - "Satisficing"

646

the reasons postulated in the above models of selecting alternative objective functions. One obstacle to enlightenment is that the behavioral differences between long run profit maximization and various short run alternative goals are so subtle that econometric tests with existing data are not sufficiently powerful to discriminate among the contending hypotheses. Since it is clear that airlines do pursue one or more of these objectives in practice, the present state of knowledge certainly must be extended through more sophisticated econometric research and by more detailed case studies than any heretofore attempted.

647