

# Revisiting Alderson's Formula for Measuring the Productivity of a Marketing System: An Historical Analysis in Marketing Thought

Eric H. Shaw, Florida Atlantic University, Boca Raton, FL, USA

*Sixty years ago Wroe Alderson proposed a formula to measure productivity in marketing. This input-output formula represented a major advance over marketing productivity measures that had gone before or have come after. Alderson's conceptual contribution was to add a measure of household purchasing productivity—as marketing system output—to the standard economic measure of firms' marketing productivity, which he regarded as system input. There were, however, conceptual, operational and empirical problems with the productivity formula, particularly on the household side of the ratio. Mostly because of insurmountable difficulties of measurement, Alderson's formula has long been relegated to the scrapheap of marketing history.*

*Advances in data collection and availability of data sources now make testing Alderson's productivity formula possible. Consequently, it is worth revisiting the formula to identify and hopefully repair the conceptual challenges, scattered throughout the marketing literature, so that one of Alderson's most brilliant contributions may be conceptually resurrected and empirically tested.*

## INTRODUCTION

Marketing may be analyzed from the standpoint of an individual unit, such as a firm or household, called micro analysis, or from the aggregative perspective of a nation, called macro analysis, or from a variety of levels in-between, such as a channel of distribution or an industry. Irrespective of the level of investigation, measuring how well any process works is called productivity (or efficiency) analysis. Productivity is defined as a ratio of outputs divided by inputs and measures the through-put of a process (Taylor 1911, Gilbreth 1911).

Because all of the difficulties of measuring productivity at lower levels of analysis are collectively and cumulatively subsumed at higher levels, productivity studies of the macromarketing system have proven the most intractable. Combining humorlessness with seriousness, the difficulties and importance of measuring aggregate marketing productivity was expressed by Vaile, Grether and Cox

(1952, 652): "Anyone who undertakes to apply quantitative methods to [macromarketing productivity] analysis needs to preserve full freedom for the operation of his judgment, his sense of balance, and his sense of humor." But they concluded on a more serious note: "The need for factual studies is great, however, and efforts to promote them cannot be abandoned."

Despite the difficulties, there have been several attempts to measure the aggregate productivity of the macromarketing system. Measures of aggregate marketing productivity usually involve measuring the total value added by marketing as output and total marketing labor costs as input (called partial factor or labor productivity). In a meta-analysis of seven empirical studies measuring productivity, covering one hundred years, from 1869 to 1968, Shaw (1990, 290) concluded, "aggregate marketing productivity in the United States has increased significantly over the past century."

However, there was a caveat. The buying activity of households, particularly the increase in self-service, was not reflected in actual measurements of aggregate marketing productivity (Shaw 1990, 290-291). This omission pointed to a fundamental flaw in the theoretical framework. "Any market transaction involves tradeoffs between buyer and seller concerning the performance of marketing activities," as Grabner and Layton (1973, 167-68) pointed out, but productivity "theory deals only with sellers ... [hence] the theory really does not deal with marketing performance in total." Such a limitation means that "productivity improvements," as Bucklin (1975, 560) observed, "might be due more to beneficial changes in consumer buying behavior rather than to the adoption of any new meaningful technology by marketing management." To resolve these concerns, Shaw (1990, 291) proposed: "Future research needs to incorporate both the work of service industries and of household purchasing activities into measures of aggregate marketing productivity."

More than a half century ago, apparently in a brilliant flash of insight, Alderson (1948) proposed a formula to measure the productivity of a marketing system. The formula was intended to measure the aggregate marketing system of the United States, but was so versatile that it could be regarded as a general formula to measure the

productivity at any level of marketing activity, from micro units to macro units. It would work for measuring the marketing activities of a firm or the buying activities of a household, an individual market transaction between a firm and household, a set of transactions between firms and firms, and firms and households in a channel of distribution, up to the aggregate marketing process of a nation or group of nations.

The usual approach to theory construction is to start by laying a descriptive theoretical foundation; however, Alderson (1948, 442) choose an "alternative approach...to begin by proposing a specific formula for computing an index [of productivity] and then to consider the grounds on which it is based." Although his paper provided some justification for the formula, a single article was just too short to do it justice. A fuller discussion of the logic upon which the formula is based would require the remainder of his life, particularly Alderson's (1957, 1965) two most noteworthy books: *Marketing Behavior and Executive Action* and *Dynamic Marketing Behavior*. Unfortunately, Alderson never returned to his earlier formulation and completed the linkage between his theoretical constructions and his productivity formula.

Far more sophisticated than previous or subsequent measures of marketing productivity, Alderson's formulation was never empirically tested. There were a number of conceptual, methodological and empirical problems with the formula. Because some of these problems appeared insurmountable, at least one crucial data series was completely unavailable and another extremely difficult to obtain, the formula was marginalized with only a few limited attempts to address the conceptual challenges.

Because they present so many challenges to the uninitiated, that there are conceptual difficulties with Alderson's marketing theories and productivity formula have not gone unnoticed in the literature. Aldersonian scholars such as Barksdale (1980, 3) commented: "Alderson was a creative scholar and an innovative thinker; however ... his publications are difficult to read and understand. The concepts that he advanced were not well developed and his ideas were not closely reasoned." Even theoreticians who otherwise hold Alderson's theoretical work in high regard have conceptual concerns about his productivity formula. For example, Hunt (1979, 677) opined "take Alderson's notion about the efficiency of marketing systems. It is not a particularly well thought out piece and students after they have got some [philosophy of science] tools can destroy it." Such sentiments apparently express the judgment of history. Alderson's formula for measuring productivity, and the theoretical foundation on which it is based, however, offers greater depth to students of marketing thought than appears on the surface.

With the formerly unavailable data becoming available; and with the advantage of sixty years of conceptual developments by many scholars, especially Alderson's ensuing dozens of books and more than a hundred articles,

it is now time to revisit Alderson's great insight into a method for measuring the aggregate productivity of the marketing process. Consequently, the purpose of this work is to discover if Alderson's formula can be resurrected from the scrapheap of marketing history by resolving the numerous conceptual, operational, and empirical difficulties with the formula. The present paper begins this task by taking an historical approach to identifying and attempting to resolve the conceptual issues with Alderson's (1948) "A Formula for Measuring Productivity in Distribution."<sup>1</sup>

## AN ALDERSONIAN THEORY OF THE MARKETING PROCESS

Although bits and pieces of Alderson's general theory of marketing are strewn throughout his numerous writings, and a formalization of some of Alderson's general theory was proposed by Hunt, Muncy and Ray (1981), particular emphasis here is placed on just three of Alderson's many powerful constructs: (1) firms and households as "organized behavior systems" who perform marketing activity (the inputs) as a means of (2) overcoming "discrepancies" in product/service assortments, information, time, and space between between sellers and buyers (rationalizing the marketing process) by (3) creating "transactions and transvections" (the outputs).

First, firms and households describe who performs marketing activity and for whom it is performed. Next, discrepancies explain why marketing activity is undertaken. Finally, transaction and transvections describe what marketing is and does by explaining how the marketing process works. Alderson (1965, 83) used the "market transaction as a fundamental building block [to construct] a more rigorous type of marketing theory." He created the theoretical structure for building selling and buying activities into market transactions, and then building transactions into transvections, and finally building transvections into the aggregate marketing process. More constructs could easily be added to make the theory richer (e.g. heterogeneous markets, sorts and transformations), but with space limitations, only a general outline is proposed here based on the three constructs.

Over the decades, a number of scholars have also proposed theoretical explanations of the marketing process similar to Alderson's (1957) "discrepancies of assortment." These authors have used a variety of differing terminology (e.g., "maladjustments" by Shaw (1912) and Clark (1922), "obstacles," "resistances," and "channel circuits" by Breyer (1934, 1949), "flows" by Vaile, Grether and Cox (1952), Fisk (1967) and Dixon (1982), and "separations" by McInnes (1964); however, the underlying logic was fundamentally the same.

The explanation of the marketing process, using the terms expressed by Alderson (1957, 1965) and McInnes (1964) appear the most clear, concise and convincing.

Beginning with the relationship between makers and users of goods, it is argued that the potential for market transactions are created when producers become separated from consumers by the division of labor. "It is the power of exchanging that gives occasion to the division of labor" (Smith 1776 [1937], 17). As specialization increases, the division of labor becomes deeper, the gaps between producers and consumers become larger, and the network of potential trading relationships becomes more complex. The potential for exchange, however, is not the same as an actual market transaction. Discrepancies (maladjustments, gaps, obstacles, resistances, separations) between the parties provide the opportunity for market activity to be performed by middlemen to bridge the gaps (adjust maladjustments, overcome obstacles, close circuits, channel flows) separating original sellers from final buyers, thereby transforming transactional potentialities into actualities.

At the micro level of an individual unit, the direct result of marketing activity is to match a household buyer's "small segment of demand" with a business firm's "small segment of supply" in a market transaction (Alderson 1957). In his electro-magnetic analogy, Breyer (1934, 107), described this retail sale and consumer purchase transaction as a "simple circuit closing;" and McGarry (1950, 273) called the retail consumer transaction the "termination function...the consummative act for which all other functions have been preparatory in the marketing process."

Alderson (1965, 86) coined the term "transvection" to include the set of individual transactions from an original seller of raw materials, through intermediate purchases and sales, to the final buyer of a finished product or service. Breyer (1949, 7) called closing this circuit: "A full cycle of marketing, one that spans the full stretch from producer to consumer, of channel dimension in its vertical aspect." Consequently, the transvection includes all the marketing activities taking place in a single channel of distribution. Therefore, aggregating the set of parallel channel-transvections in a particular nation, say the United States, for a particular time period, say a year, provides "an exhaustive description of the [macro]marketing process" (Alderson 1965, 92). Thus, viewing the marketing process as a whole, the direct result of marketing is to match aggregate supply with aggregate demand (Shaw 1912).

Since the desired result of the marketing process is actualizing potential transactions, then the potential transactions actualized provides a meaningful expression for the output of the marketing process and the costs to the parties, both sellers and buyers, of engaging in marketing activities expresses the inputs.

### **ALDERSON'S CONTRIBUTION TO THE MEASUREMENT OF MACROMARKETING PRODUCTIVITY**

Productivity is simply a ratio of outputs divided by inputs, measuring how well a process transforms inputs into

outputs. Productivity improves by (1) increasing outputs, with inputs constant or declining, (2) reducing inputs with outputs constant or increasing, (3) increasing outputs more than proportionally to an increase in inputs, or by decreasing outputs less than proportionally to a decrease in inputs. Although productivity is a simple concept, when considering something as multifaceted as the aggregate marketing system the issues become far more complex and often perplexing. Not surprisingly, there has been considerable discussion and division in the literature as to what constitutes marketing inputs and outputs. Historically, marketing productivity had been conceptualized and measured by aggregating the marketing activities of individual business firms or industries (Bucklin 1978).

Alderson's most significant contribution to the measurement of macromarketing productivity was the inclusion of final household buyers in the productivity formula. This was a major advance whose omission was immediately recognized. It was pointed out as "as a matter of common observation," by Cox, Goodman and Fichandler (1965, 181), that "consumers do a great deal of the work of marketing." Yet "the unpaid effort put out by consumers," as Vaile, Grether and Cox (1952, 657), state is "probably the most fugitive aspect of input [in marketing]." But how to deal with marketing activity shifting from firms to households was not self evident: "Self-service affects productivity levels," as Claque (1965, 19) tried to clarify, "but ... cannot be viewed as a [retail] output, because it is not a service rendered to the purchaser but an activity performed by the consumer;" and his proposed solution was to "add the consumers' time spent in selecting and obtaining merchandise to productivity measurement." But he did not explain how it could be added.

If measurement of marketing performance covers only parts of the system rather than the marketing system as a whole, then it is possible that gains or losses in productivity as measured by some isolated parts represent only a transfer of work to or from the unmeasured segment. To the extent that marketing activities are shifted from one sector to another, say from the business sector to households, as in self service for example, measures of marketing productivity will appear to improve; because household buyers performing marketing tasks are not counted as a cost, when the theoretical framework of marketing performance is defined to exclude the buying activities of household consumers.

**EXHIBIT 1****ALDERSON'S "FORMULA FOR MEASURING PRODUCTIVITY IN DISTRIBUTION"**

$$\text{Marketing Productivity} = \frac{\text{Index of unit sales per shopping hour [Household Purchasing Productivity]} \times \frac{\text{number of retail unit sales}}{\text{number of shopping hours}}}{\frac{\text{Index of man hour equivalents [Firm Marketing Productivity]} \times \text{total expenses of distribution [GM]}}{\text{Average hourly wage rate}}}$$

This point is not as evident as it would appear, and it has become further obscured with the advent of generic marketing (Kotler 1972), which Grabner and Layton (1973, 167) emphasize "deals only with sellers." A number of writers have attempted to restate the obvious, for example Nervik and Black (1951, 3) were unambiguous: "It should be obvious to all that selling and buying are the essence of marketing. Without both selling and buying there is no marketing. There must be two parties to any transaction." That this line of reasoning requires continual reemphasis in the marketing literature is highlighted by occasional articles with such titles as: "Consumer-Purchaser Costs—Do Retailers Recognize Them?" (Bender 1964) or "Buying is Marketing Too!" (Kotler and Levy 1973).

However, the difficulties of conceptualizing and measuring total marketing productivity, as Narver and Savitt (1971, 373) noted "become even more complex when we include the consumer as should be the case. This is perhaps the most difficult task." Thus we return to Alderson's great contribution, a method to measure the productivity of both firms and households in the aggregate marketing system.

**ALDERSON'S FORMULA TO MEASURE THE PRODUCTIVITY OF MARKETING**

In a unique attempt to incorporate the purchasing activities of households along with the marketing activities of firms, Alderson proposed "A Formula for Measuring Productivity in Distribution" <sup>1</sup> (1948, p. 442). The original formulation stated in Alderson's own terminology is shown in Exhibit 1.

In Alderson's productivity formula the input-output ratio is sub-divided into two input-output ratios. The numerator input-output ratio is an index of unit sales per shopping hour, expressing the demand side of the market. It represents the costs and benefits of the purchasing activities of households. Taking a household's viewpoint in trying to

identify what the marketing system actually provides consumers, Alderson (1948 443) argued that if no marketing system existed then each household: "would have to visit the farm or factory or handicraft shop in which desired products were made; make their own selections; and arrange for transportation to their homes. What actually happens may be compared against this standard of zero distribution and the difference represents the output of the distribution system."

The denominator input-output ratio is an index of man hour equivalents, expressing the marketing activities of firms or the supply side of the market. Most studies of aggregate marketing productivity focus solely on the firm or denominator side of the input-output ratio. The usual expression that has developed since Alderson's formulation is Gross Margin or Marketing Value Added divided by the number of man hours employed in marketing; technically termed labor productivity (or labor efficiency) of the macro marketing system (Bucklin 1978). Neither the numerator nor denominator in Alderson's formulation has escaped criticism in the literature.

**CRITIQUE OF THE NUMERATOR OF ALDERSON'S FORMULA: HOUSEHOLD PURCHASING PRODUCTIVITY**

A number of objections to the numerator, or household demand side, of the productivity formula have been identified in the literature (e.g. Vaile, Grether and Cox 1952, Narver and Savitt 1973, Bucklin 1978, Hunt 1979). The reservations of most marketing scholars may be traced back to Black and Houston (1950) who raised "three serious objections" to Alderson's formulation of household purchasing productivity.

Two objections related to the output concept in the numerator of the formula. First, "retail unit sales are not specifically defined, but it appears that a unit sale is any purchase regardless of size," and Black and Houston (1950, p. 42) argued, "the size of the purchase surely needs to be taken into account." This objection is well founded, because number of transactions ignores the price, which reflects a retailer's cost of product plus the services provided, which varies widely from full service to self service. Rather than number, the output construct should take into account the size of the purchase reflecting the amount of services provided. Thus, what is required is to replace Alderson's measure of the number of transactions with a dollar measure of their value.

Bucklin (1978, 21), like Alderson (1965), provided several arguments in favor of transaction value as the marketing output measure. Conceptually, a transaction represents "an agreement to exchange goods (or personal services) and carry with them an obligation for an array of marketing services." Operationally, the transaction provides a "unique and identifiable phenomena." Empirically, the transaction is countable and "analogous to the physical unit in production." Thus, to resolve the objection to marketing output as the number of consumer transactions, it is here proposed to replace Alderson's original measure with the total value of retail-household transactions.

The second objection made by Black and Houston (1951, p. 42) to number of transactions as marketing output, is that "it fails to take into account the services that accompany the sale." Again, the objection is well taken but also simply resolved. Services included with the sale are captured in the retail sales price when using value rather than number of retail-household transactions. Thus, changing from number of retail sales (or its equivalent—purchases or transactions) to dollar value of sales resolves both objections in the literature to the output measure of household purchasing productivity.

On the input side of the efficiency ratio, Black and Houston (1950, 42) criticized the number of shopping hours; because "it assumes that the consumers time is all cost and no benefit." Obviously some consumers enjoy shopping, even window shopping. Alderson (1948, 444) anticipated this objection and answered with an analogy: "All shopping time in retail stores would be included [as a cost] despite the fact that consumers may enjoy shopping. Some salesmen may enjoy selling ... but ... this time is preempted against any other use." Thus, shopping time is an opportunity cost representing an alternative foregone, irrespective of any intrinsic or instrumental satisfaction derived from the process.

Moreover, it is reasonable to assume that any intrinsic satisfaction derived from some types of shopping, such as a woman buying expensive jewelry or a new dress (and there is not much joy for the companion when accompanied by a boyfriend or husband who is making the payment), is more

than offset by the drudgery involved in other types of buying, such as the weekly grocery shopping. Even expensive shopping items, such as a house, automobile or television, which are regarded as desirable products to acquire are likely to produce as much or more dissatisfaction from the physical and mental burdens of searching, traveling, comparing and negotiating, as well as the attendant cognitive dissonance which accompanies high involvement purchases. Thus, the net benefit of shopping time is almost certainly negative, it is a real cost to buyers of doing business. Consequently, taking all the objections and resolutions into account, the household purchasing productivity ratio may be reformulated as shown in Exhibit 2.

## EXHIBIT 2 HOUSEHOLD PURCHASING PRODUCTIVITY

$$\text{Household Purchasing Productivity} = \frac{\sum \text{Retail-Household Transaction Value}}{\sum \text{Household Purchasing Time}}$$

The numerator, Retail-Household Transaction Value, represents the total range of products and services offered to and accepted by household buyers. The denominator, Household Purchasing Time, reflects the opportunity cost of acquiring the products and services offered.

At a very low level of marketing system output, household members would have to provide almost all of the shopping inputs. As the market expands, the households service. For example, if a store does not provide delivery or installation service, then the buyer must cart the product home and install it himself thereby incurring greater purchasing costs and home production costs as well.

On the other hand, the buyer can reduce purchasing opportunity costs by shopping at a store which provides delivery and installation, pay a higher retail price and buy more marketing service output. Thus, an increase in the productivity of the macromarketing system, assuming that firm marketing productivity is held constant, varies directly with total household acquisitions in the market, and inversely with the cost of household shopping inputs to obtain these product and service assortments.

## CRITIQUE OF THE DENOMINATOR OF ALDERSON'S FORMULA: FIRM MARKETING PRODUCTIVITY

There have been various criticisms of the denominator, or firm side, of Alderson's productivity ratio. (For a more detailed discussion of these issues than space permits here, see Bucklin 1978 or Shaw 1990.) On the output side, what

Alderson termed the "total expenses of distribution" is today more commonly called gross margin or value added by marketing. Gross margin and value added are slightly different conceptually but roughly equivalent empirically (Bucklin 1978). Gross margin represents the firm's contribution to the selling price less the cost of goods sold, while value added represents the firm's contribution to the selling price less the cost of goods and other purchased services. Empirically, the difference between gross margin and value added is so small as to be negligible when considering agricultural or manufactured goods; however, when considering many service industries, where there are few goods sold but many purchased services, the difference becomes significant.

Turning to the input side of the ratio, in current measures of labor productivity, Alderson's average hourly wage rate has been replaced by either number of people employed in marketing, or an even better measure: the number of man hours employed in marketing (Shaw 1990). Since a single factor cost is used to express the inputs (capital and land are other factors that are usually excluded because of measurement difficulties), this has technically become known as labor productivity. It should be noted that it represents not the productivity of labor, because capital and land are not included, but the productivity with which labor is used (Black and Houston 1950).

The number of man hours employed in marketing has an obvious benefit when counterpoised against the number of shopping hours included in the household purchasing productivity ratio. It makes explicit the tradeoff between the number of hours' employees of firms work and the number of hours households buyers work in the marketing process. Taking the various objections and resolutions into account, the firm marketing productivity ratio may be recast as shown in Exhibit 3.

**EXHIBIT 3  
FIRM MARKETING PRODUCTIVITY**

$$\text{Firm Marketing Productivity} = \frac{\sum \text{Value Added by Marketing}}{\sum \text{Hours Employed in Marketing}}$$

Thus, an increase in the productivity of the macromarketing system, assuming that household purchasing productivity is held constant, varies directly with the total marketing value added by firms and inversely with the total hourly marketing labor inputs to supply it.

**REFORMULATING ALDERSON'S  
PRODUCTIVITY RATIO**

Taking all the objections and resolutions to Alderson's efficiency measure into account, and recombining the

numerator, household purchasing input-output ratio, with the denominator, firm marketing input-output ratio, the final form of the formula to measure the productivity of the aggregate marketing system is shown in Exhibit 4.

Semantically, the formula states that marketing productivity is the ratio of household purchasing productivity (output) divided by firm marketing productivity (input). Household purchasing productivity, in turn, consists of the total value of products and services that households' purchase (output) in the market relative to their cost of acquiring it (input). Firm marketing productivity consists of the total marketing value added that firms' supply (output) to the market relative to their labor costs of supplying it (input).

Essentially, the formula captures total household demand for products and services acquired in the market (and their purchasing costs in shopping hours) divided by total business firm supply of marketing services (and their labor costs in hours employed). It is, of course, realized that marketing services are captured in both the output of the numerator household ratio, as a component of the total value of products and business services purchased as well as the output of the denominator firm ratio as products and services sold. Firm total marketing value added could as easily be subtracted out of the numerator, but that leaves the unwieldy output term 'retail-household transaction value less marketing value added' and makes the measure sound more confusing than it actually is. To avoid confusion, and because it does not create any measurement bias either way, marketing value added is included in both the household numerator output and the firm denominator output. Thus, an increase in the productivity of the macromarketing system varies directly with total retail-household transaction value per shopping hour and inversely with total marketing value added per employee hour.

**CONCLUDING COMMENT**

This paper set out to discover if Alderson's formula to measure the aggregate productivity of the Marketing System could be resurrected from the scrapheap of marketing history by identifying and attempting to resolve the conceptual concerns with his formula. These conceptual issues were identified in the marketing literature and hopefully resolved by a modern reformulation reflecting Alderson's original conceptual formula built on his theory of the marketing process.

Conceptually, the reformulation captures total household demand (and related purchasing costs) for products and services transacted in the market divided by total business firm supply of marketing services (and related labor costs). An increase in the productivity of the marketing process varies directly with total retail-household transaction value per shopping hour and inversely with total

marketing value added per employee hour. It now remains to resolve the operational and empirical issues with the formula and progress onward to actually measuring the

aggregate productivity of the macromarketing process in the United States over time.

#### EXHIBIT 4 REFORMULATED MEASURE OF THE PRODUCTIVITY OF THE AGGREGATE MARKETING SYSTEM

$$\text{Aggregate Productivity of Marketing} = \frac{\text{Household Purchasing Productivity}}{\text{Firm Marketing Productivity}} = \frac{\frac{\sum \text{Retail-Household Transaction Value}}{\sum \text{Hours in Household Purchasing}}}{\frac{\sum \text{Value Added by Marketing}}{\sum \text{Hours Employed in Marketing}}}$$

#### ENDNOTE

<sup>1</sup> Alderson used the terms productivity and distribution, rather than the terms he normally used—efficiency and marketing, respectively, because of his original audience.

The April 1948 *Journal of Marketing* article was a revision of an earlier unpublished paper presented at the “Conference on Productivity” sponsored by the Bureau of Labor Statistics (October 1947). Except for the two papers presented by Wroe Alderson and Reavis Cox, the conference was attended almost exclusively by economists. The terms productivity and distribution were more familiar to economists than were the terms efficiency and marketing and the former terms were carried over into their *Journal of Marketing* articles by each writer.

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