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Market Structure, Conduct and Performance Paradigm Re-applied to the Ethiopian Cement Industry

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This is to certify that the project paper Prepared by Sisay Thomas, entitled: Market Structure, Conduct and Performance Paradigm Applied to the Ethiopian Cement Manufacturing Industry and submitted in partial fulfillment of the requirements for the Degree of Masters of Arts (Competition Policy and Regulatory Economics) compiles with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by:

Dr. Tassew Woldehanna	_____	_____
Advisor	Signature	Date

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List of Tables

List of figures

Abstract

This paper presents a market structure, conduct, performance (SCP) analysis of industrial economics to study the relationships that existed between market structure, conduct and performance within the Ethiopian cement industry by employing a simultaneous equations framework. Based on data gathered from twelve cement manufacturing industries for five years, the paper has developed market share, advertising and profitability equations as its three simultaneous equations and estimates the coefficients using Three Stage Least Squares (3SLS) estimation method. Though estimation of the system uses a small number of observations and lacks data on additional instrumental variables the main 3SLS results from the analysis of the system of equations are found out to be : (1) there is a positive, significant and two way causes and effects relationship between market structure (market shares) and firms' strategic behavior (advertising intensity); (2) a similar positive and two way causes and effects relationship is found between profitability and advertising intensity; and (3) there is no any significant effect of market structure on firms profitability though the latter affects the former negatively and significantly.

Key words: Cement Industry, market structure, conduct, performance.

Table of Contents

1. Introduction

The role the construction industry plays in socio-economic development is significant. The industry is a distinct sector of the economy, which makes its direct contributions to economic growth. It provides the basis upon which other sectors can grow by constructing the physical facilities required for the production and distribution of goods and services and has a significant multiplier effect on the economy as a whole (Moavenzadeh & Rossow,1975).

Cement as being one of the principal building and construction materials in the construction sector, is essential to meet society's needs for housing and basic infrastructures such as roads, hydro-dams, irrigation, water treatment facilities, government buildings, universities and hospitals.

In Ethiopia, the construction sector is enjoying a boom which is due to heavy government investments on the construction of hydroelectric dams, housing projects, irrigation and roads. Accordingly, cement as being one of the critical ingredients, has a huge part to play on the construction of these large scale investment projects.

According to the five year cement production target, the government has envisioned to raise the national cement production capacity to 13.7 million tons by the year 2015 which aimed to satisfy the increasing cement consumption that had been increasing by an average rate of around 30% during the past five years. (MoI,2011)

In Ethiopia, the first cement factory, Dire Dawa Cement and Lime Factory, was established by the Italian occupying forces in 1938. The plant had an initial capacity of 120 tones of clinker (the intermediate product obtained by burning limestone) per day. In response to the increasing demand for cement, the Addis Ababa and Massawa cement factories were established in 1964 and 1965 respectively, each with a capacity of 70,000 tones of clinker per

year. In 1984, the State-owned Mugher Cement Factory was constructed and commissioned with a capacity of 300,000 tons per year, which created a large increase in capacity of the country's cement supply. Following Eritrea's independence in 1991, the Massawa cement factory was no longer in Ethiopia and Mugher was the only manufacturer in the sector until Messebo Cement was established in 1996. (Sutton & kellow 2010).

For about twenty years, cement production was dominated by the two large players Mugher and Messobo cement factories. This low level of investment in the sector has created problems in relation with the supply and price of cement. Cement prices have been on a steady upward trend until the beginning of 2012 when the new cement giant Derba Midroc Cement entered the business. In addition, severe shortages of power supply which resulted the closure of the two major cement producers for a month period in the year 2009, and a continual growth in demand has forced the government to turn its attention on attracting investments towards the sector. (MoI, 2011)

Based on the data from the Ministry of Industry, up to March, 2004 EFY the number of cement manufacturers in the country has reached eighteen manufacturing industries (including five newly opened establishments) with a combined production capacity of nearly 12.22 million tons per year. The sector has shown a radical increase in the number of establishments over the past six months (september to february 2004 EFY) alone when the five new and expansion projects joined the sector with a capacity of 5.2 million tons per annum. But currently, out of this total capacity, the factories can only manage to produce around 6.4 million tons by the end of the same year. (MoI, 2011)

1.1 Statement of the problem

The classification and analysis of industries on the basis of their structure, conduct and performance helps on understanding the corresponding type of behavior and performance expected from each market. Once the boundaries of a market are known, the structure of a market can be determined, thereby determining the performance associated with that market structure. (Ferguson & Ferguson, 1994)

Since 1940's, industrial economists analyze different industries and markets using structure - conduct – performance (SCP) paradigm. A structure – conduct – performance paradigm was first used by Bain (1951) to account for inter- industry differences in profitability. The basic premise of the SCP is that structure (factors that determine the competitiveness of the market) affects conduct (production and marketing practices including Pricing, advertising, R&D), and finally conduct affects performance (the success of an industry in producing benefits for the consumer) which assumed a one – way causal relationship from structure to conduct and then performance. (Lee, 2007)

Traditionally, analysts assumed a one way causal relationship between market structure and market performance via market conduct. Market structure was exogenously treated to be determined by basic market conditions such as technology and demand. However, more recent studies recognize the existence of a feedback effect in which performance affects both conduct and structure, and conduct in turn affects structure. (Delrome et al. 2002)

Therefore, this paper proposes a re-examination of the original SCP model and explore whether a multiple feedback effects exists between the cement market structure, firms' strategic behavior (conduct) and performance by developing a simultaneous equations framework composed of three equations one each for structure (as measured by market share),

conduct (as measured by advertising expenditures), and performance (as measured by profits) making use of firm level data.

1.2 Objective of the Study

The main objective of this study is to apply the Structure – Conduct - Performance (SCP) paradigm of industrial economics within the context of the Ethiopian cement manufacturing industry and investigate the existence of a causal flows and feedback effects among the cement market structure, firms‘ strategic behaviour (conduct), and performance.

1.3 Significance of the Study

This study is significant, in the first place, in its empirical analysis of the cement industry by employing the Structure Conduct Performance (SCP) paradigm and on providing evidence on the causality or feedback effects among market structure, conduct, and performance which makes it important for industry players, researchers and also the government in its policy interventions towards improving the sector.

1.4 Scope and Limitation of the Study

This paper uses firm level data collected from all cement manufacturing firms that started operation during the year 1999 to 2003EFY. In doing so it excludes manufacturers that started production by the year 2004 EFY which limits the inclusion of significant developments to the sector in to the analysis.

1.5 Organization of the Research

This research paper is organized in to six chapters. The first chapter deals with an introductory part of the research in which, the problem statement, objectives, significance, scope and limitations of the study are incorporated. The second chapter covers the reviewed literatures on the market structure, conduct, and performance paradigm and on the nature of

the inter-relationships that exist between market structure, conduct and performance. The third chapter provides an overview of the Ethiopian cement industry. Analysis of the specified model and a clear description of the variables used and the method of estimation is covered in the fourth chapter. The econometric estimation and results from the model are presented and discussed in the fifth chapter and finally conclusions and policy implications part is presented in the sixth chapter.

2. Review of Related Literature

2.1 The Concept of Market Structure - Conduct - Performance Paradigm (SCPP)

Currently the central focus in the field of industrial organization (IO) is the relationship between firm behavior and market structure. This focus, to a large extent is influenced by economists like Edward Mason and his PhD student Joe S. Bain who formulated a framework for empirically analyzing how the key aspects of market structure relate to each other, which is called the Structure - Conduct - Performance (SCP) paradigm. Lee (2007)

Structure Conduct Performance (SCP) is a method to analyze certain industrial organization. Industrial organization is a special fraction from economics that describes how a market or an industry is formed into a particular organization and how this organization affects the market's performance. (Wikipedia)

The Structure Conduct Performance (SCP) Paradigm is a tool developed in the 1940s and 1950s to analyze the allocation of resources within industries. Based on neoclassical economic theory the SCP model stipulates that there is a causal relationship between the structure of an industry the behavior of the firms and ultimately the performance of that behavior. In essence, therefore, the economic efficiency of an industry is dependent on its market structure, i.e. its competitive environment. (Finlay, 2007)

The SCP paradigm was the brain child of the Harvard school of thought and popularized during 1940-60 with its empirical work involving the identification of correlations between industry structure and performance. This SCP hypothesis has

lead to the implementation of most anti-trust legislations. This was followed by the Chicago school of thought from 1960-80 which emphasized on the rationale for firms becoming big, price theory and econometric estimation. During 1980-90 game theory took center stage with emphasis on strategic decision making and Nash equilibrium concept. After 1990, empirical industrial organization with the use of economic theory and econometrics lead to complex empirical modeling of technological changes, merger analysis, entry-exit and identification of market power. (Shaik et al. 2006)

The "Structure-Conduct-Performance" paradigm is a road map for identifying factor that determine the competitiveness of a market, analyzing the behavior of firms, and assessing the success of an industry in producing benefits for consumers. "Structure" refers to the market structure of an industry which is indicative of the degree of competition in the industry. "Conduct" refers to business practices adopted by firms in the industry to implement their competitive strategies and to create competitive advantage (the ability to outperform competitors in the industry). "Performance" refers to measurements by which the industry or firms in the industry can be judged as to whether they have achieved their stated goals (Gwin, 2001).

There are two competing hypothesis regarding the structure conduct performance paradigm. These are the efficiency structure hypothesis and the structure performance hypothesis. According to the structure performance hypothesis, there is a positive relationship between market structure (as measured by concentration ratio) and performance (as measured by profits). Thus firms operating in a more concentrated market will earn higher profits than that of less concentrated markets, irrespective of their efficiency. But according to the alternative efficiency structure hypothesis, the

performance of the firm is positively related to its efficiency. This positive relationship is attributed to the gains made in market share by more efficient firms which leads to increased market concentration. Therefore, as the efficiency structure hypothesis assumed that, the increase in firms performance (as measured by profits) is not due to the collusive activities resulting from changes in market concentration as was suggested by the traditional Structure performance hypothesis, but is due to the efficiency of firms leading to an increase in profits. (Shaik et al., 2006)

Before going through different theoretical and empirical findings from previous studies regarding the inter-relationships among structure, conduct and performance, it is helpful to separately define market structure, conduct and performance from an industrial economics context.

2.2 Market structure

As can be agreed by many industrial economists the term market structure is best defined as a description of the characteristics and composition of a market which includes the number and size distribution of buyers and sellers, level and form of competition, extent of product differentiation, ease of entry into and exit from the market, the degree of collusion among sellers, the nature of costs and the degree to which an industry is vertically integrated which are assumed to influence the nature of competition and pricing within that market. (Ferguson & Ferguson, 1994)

Based on the number and size distribution of firms, extent of product differentiation, and the level of barriers of entry market structures can be classified in to four major types. These are perfect competition, monopolistic competition, oligopoly and pure monopoly. Table 2.1 below shows the different types of market structures and their characteristics.

Table 2.1: Types of market structures

Basis of classification	Perfect competition	Monopolistic competition	Oligopoly	Pure monopoly
Number & size distribution of firms	Many	Many	A few	One
Extent of product differentiation	Identical	Different	Identical or Different	No close substitute
Barriers to entry	None	None	Moderate to difficult	Blocked

Source: Ferguson & Ferguson, 1994

2.2.1 Elements of market structure

2.2.1.1 Number and size distribution of firms

One of the most important components of a market structure is the number and size distribution of firms. Firms are expected to exercise more market power if there is only one or a few firms or if a small number of firms are very large relative to the remaining firms. A full description of the number and size distribution of firms in an industry is commonly measured by using market concentration measures like the concentration ratio (CR) and the Herfindahle-Hirshman Index (HHI). (Ferguson & Ferguson, 1994)

The concentration ratio is the percentage of market share owned by the largest *m* firms in an industry, where *m* is a specified number of firms often four, but sometimes a larger or smaller number. The concentration ratio is often expressed as CR_m, for example, CR_4.

The CR_m can be expressed as:

$$CR_m = S_1 + S_2 + S_3 + S_4 + \ldots\ldots + S_m$$

Where S_i = market share of the i^{th} firm.

As in most studies it is, of course, arbitrary to focus attention on the top four-firms (CR_4) in defining concentration ratios than other concentration measures like eight-firm concentration ratio (CR_8),twenty-firm (CR_{20}) and fifty-firm(CR_{50}) concentration ratios. If the CR_4 were close to zero, this value would indicate an extremely competitive industry since the four largest firms would not have any significant market share As a convention, if the CR_4 measure is less than about 40 (indicating that the four largest firms own less than 40% of the market), then the industry is considered to be very competitive, with a number of other firms competing, but none owing a very large chunk of the market. On the other extreme, if the CR_1 measure is more than about 90, that one firm that controls more than 90% of the market is effectively a monopoly. (ICMBA)

Even though useful, the concentration ratio presents an incomplete picture of the concentration of firms in an industry because by definition it does not use the market shares of all the firms in the industry. It also does not provide information about the distribution of firm size. (Barthwal, 2000).

The other most commonly used concentration measure is the Herfindahle-Hirshman Index (HHI). The HHI provides a more complete picture of industry concentration than does the concentration ratio. The HHI uses the market shares of all the firms in the industry, and these market shares are squared and summed in the calculation to place more weight on the larger firms. If there are *n* firms in the industry, the HHI can be expressed as:

$$HHI = S_1^2 + s_2^2 + S_3^2 + \ldots\ldots\ldots + S_n^2$$

Where S_i is the market share of the i^{th} firm.

Unlike the concentration ratio, the HHI will change if there is a shift in market share among the largest firms. According to the HHI, if there is only one firm in the industry, that firm would have 100% market share and the HHI would be equal to 10,000 – the maximum possible value of the index. On the other extreme, if there were a very large number of firms competing, each having nearly zero market shares, the HHI would be close to zero which indicates nearly a perfectly competitive market structure. As a guideline, many competition authorities in different countries use a specific numerical value associated with the degree of competition in a given industry. An HHI of less than 1000 represents a relatively un-concentrated market and HHI between 1000 and 1800 represents a moderately concentrated market and markets having an HHI greater than 1800 are considered to be highly concentrated. (ICMBA)

Another measure of concentration is called the Lorenz Curve and Gini coefficient. In this measure producers are counted cumulatively from the smallest sized firm to the largest in percentage along the horizontal axis and market shares are cumulated from the smallest sized firm along the vertical axis. This curve will then be compared with a diagonal line which indicates an equal size distribution. When there is unequal distribution of firms, the Lorenz Curve will diverge from the diagonal line and vise versa. The area between the Lorenz Curve and the diagonal line is called area of concentration. A summary statistics of the the area of concentration to the total area under the diagonal line is measured by the Gini Coefficient. As the the Lorenz Curve approach the diagonal line, area of concentration shrinks and the Gini Coefficient approaches the value 0. Conversly, as the greater the inequality, the area of concentration expands and the Gini Coefficient approaches a value 1. (Ferguson & Ferguson, 1994).

2.2.1.2 Buyer concentration

Buyer concentration refers to the number of buyers in a given market. Measuring market concentration is as equally important as seller's concentration, especially in markets with a few buyers. In a market where there is a higher buyer concentration, firms earn lower level of profits than that of markets with lower buyer concentration. (Wikepedia).

There are two types of buyer power. The first is negotiating power and the other is related with customers price sensitivity. Negotiating power of buyers arises in relation with the number and size of firms. When there are many small buyers of a product, all other things remaining equal, the seller will charge higher prices and higher margins. Conversly, if a firm sells to a few large buyers, those buyers will have significant leverge to negotiate better pricing. A buyer power which is related with customer's price sensitivity arises when a given product (brand) is similar with all other products in a given market. In this case buyers will base their purchase decisions on price which will increase competitive rivalary, resulting in lower prices and lower profitability. (porter, 1980)

2.2.1.3 Barriers to entry or exit

Broadly defined, barriers to entry or exit can be a set of economic forces or obstacles that create a disadvantage to new competitors that are attempting to enter the market orthatinfluencefirms'decisionofexitingthemarket.(Wikepedia)

In general, barriers to entry can be classified into three major types. These are structural, strategic, and statutory (legal) barriers to entry. Structural barriers to entry are barriers that are given by a firm's inherent situiation. These includes vertical integration, control of essential resources, expertise and reputation of the incumbent

firm, economies of scale, technological advantages and brand loyality. Strategic barriers on the other hand are barriers that are created by firm's own choice. These includes excessive investments in capacity, predatory pricing, R&D expenditures, product differentiation and investments in advertising. A statutory or legal barriers are barriers that are given a force of law. These includes licences, patents, copyrights, public franchises, tarrifs, quotas and other trade restrictions. (Maurice et al., 1992)

Barriers to exit are obstacles in the path of a firm who wants to leave a given market. The major exit barriers are high investments in fixed assets and asset specificity. A firm with higher investments in fixed assets and on specialized technology that can not be sold or converted into other uses will incur high exit costs. (porter, 1980)

2.2.1.4 Product Differentiation

Product differentiation is an act of distinguishing or differentiating a product from the product of other competing firms. It is a strategy followed by firms to defend their price from leveling down to marginal cost. Product differentiation can be of two types. These are: horizontal and vertical differentiation. Horizontal differentiation is when products are different according to features that can't be ordered in an objective way. It is differentiation based on colors, tastes or styles. Vertical differentiation, on the other hand occurs in a market where the several goods that are present can be ordered according to their objectives quality from the highest to the lowest. (Wekipedia)

Product differentiation protects sellers from price competition by either shifting the sellers demand curve outwards, enabling it to sell a larger quantity at a given price or tilt its demand curve to a steeper slope and therefore lowers the price elasticity of

demand, enabling it to raise price without losing many customers. (Ferguson & Ferguson, 1994)

2.3 Strategic behavior of firms (Market Conduct)

Market conduct is defined as the pattern of behavior that firms follow in adopting or adjusting to the market in which they operate to achieve a well defined goal or goals. Given the market condition and the goals to be perused, a firm will be acting alone or jointly to decide about the price levels for the products, the types of the products, and their quantities, product design and quality standards, advertisement, research and development investments etc. (Lee, 2007)

Market conduct mainly focuses on firms' policies towards its market and towards the moves made by its rivals in that market. Under market conduct the main areas of interest are on setting quality, prices, discouraging new entrants or coercing rivals using predatory pricing, mergers and acquisitions, collusion (both explicit or tacit), legal tactics and pricing strategies or other means of entry deterrence. (Ferguson & Ferguson, 1994)

2.3.1 Pricing starategies.

In the SCP paradigm the behavour of firms in setting their prices play a critical role. Pricing starategies like that of price discrimination, predatory pricing and price fixing are only a few examples.

Price discrimination refers to a situation where firms are selling the same product at different prices to different consumers. Price fixing on the other hand refers to a situation where market structure does not allow sellers to sell products at prices below the listed prices of manufacturers. The predatory pricing on the other hand allow

products to be sold at prices below production costs (marginal cost or average cost). The main purpose of these strategies is to acquire market share, and thus monopolistic profits. (Ferguson & Ferguson, 1994)

2.3.2 Mergers

Market conduct can also be viewed as a way in which firms behave in order to increase market share. Three different types of mergers can be identified namely, horizontal mergers, vertical mergers and conglomerate mergers. Horizontal mergers occur when firms in the same industry combine. Vertical mergers occur when firms combine at different stages of the production process. Conglomerate mergers on the other hand combine unrelated firms. Mergers could be harmful or beneficial to consumers depending on their results. Mergers that enable firms to acquire market power may raise consumer prices, while mergers that enable firms to realize operational and managerial efficiency can reduce costs and thereby lower prices. (Crandall & Winston, 2004)

2.3.3 Collusive behaviour

In a market, an imperfect competition arises mainly due to the number and size distribution of firms and their behavior. When there are few competitors in a market firms will get the opportunity of choosing whether to cooperate or not. In some cases firms engage in collusion in order to minimize competition amongest them by creating a situation where firms jointly set prices and outputs as well as share the market amongest them. Explicit agreements to fix prices and a wide variety of other restrictive practices are potentially collusive including exclusive contracts, exclusive territories and are often treated as per se violations by antitrust autorities. (Crandall & Winston, 2004)

2.4 Market Performance

Market performance is the end result of the activities undertaken by firms in pursuit of their goals. High rate of growth of the firm, increase in the sales, increase in the capital turnover,efficiency and an increase in the employment are some variables on the basis of which one can judge the market performance of the individual firms. (Barthwal, 2000)

However, in measuring market performance a few difficulties might arise due to the lack of uniformity in the use of concepts such as market, firm and profit. According to Perloff et al. (2007) three measures of market performance are identified. These are: the rate of return, price – cost margin and the Tobins *q*. The rate of return is a measure that shows the profit per unit of investment. Price cost margin on the other hand reflects the difference between price and marginal cost.The other measure, the Tobins *q*, measures the ratio of the market value of a firm to its value based on the replacement cost of its assets.

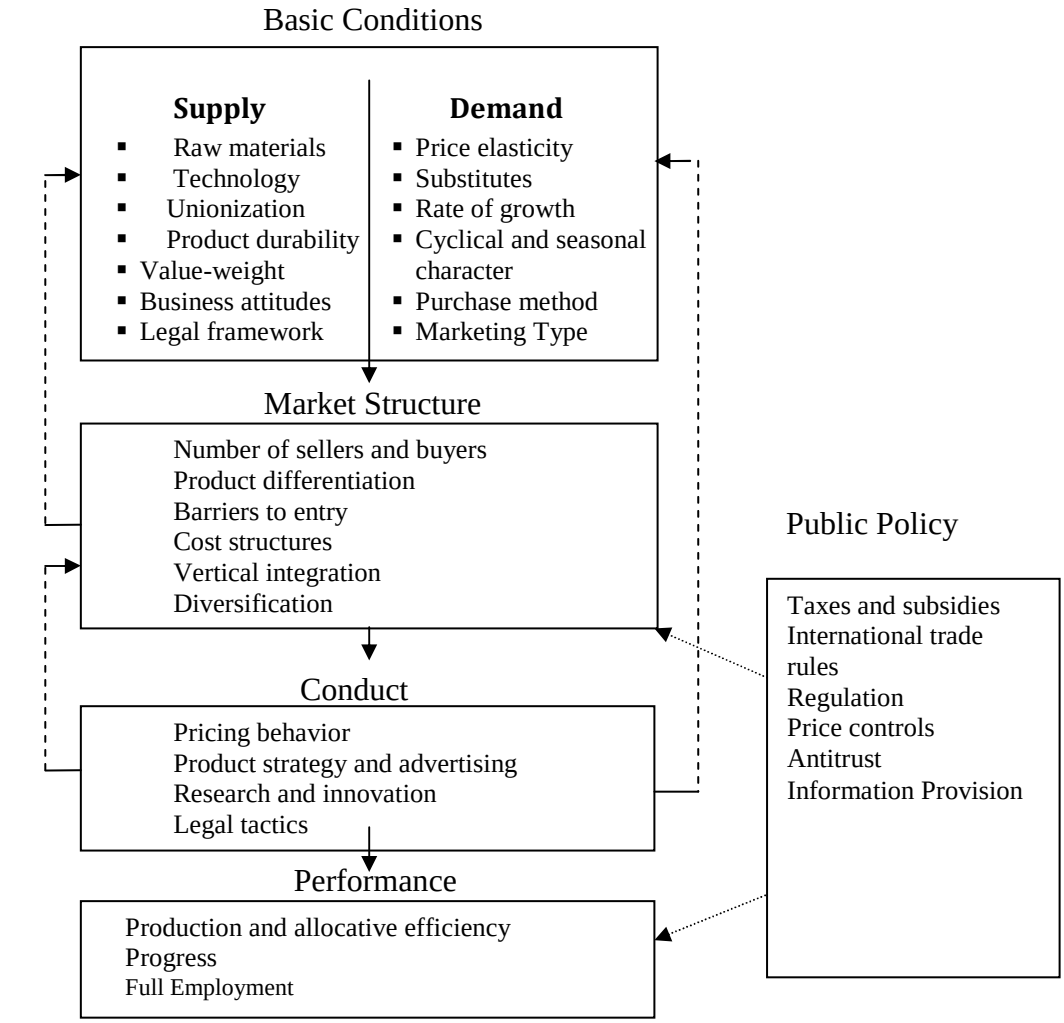
2.5 Relationships between market structure, conduct and performance

In the past, considerable effort has been made to identify the relationship between industry performance and market structure. However, most of these studies have produced different results leading to divergent conclusions and there is still a disagreement as to the nature of this structural relationship. In examining this S-C-P relationship much of the empirical works hypothesize that concentrated markets permit collusive behavior leading to restricted output and hgher prices. One of the founders of this hypothesis was J.S. Bain (1951) supported by Mann (1966) and Weiss (1974).

The traditional SCP paradigm posits a specific one way relationship from market structure to conduct and performance, where market structure is exogenously determined by either demand or supply factors. But according to Ferguson P.R. and Ferguson G.J (1994), the traditional premise that market structure is exogenously determined by demand and supply factors is unsound. Performance and more particulary conduct affects structure. For instance, mergers directly affect the number and size distribution of firms in a market, innovation and advertising may raise entry barriers, predatory pricing could force competitors out of the market. If market structure gives rise to conduct which raises prices and enhances profits, then this may attract entry, modifying the structure of the market.

However, critiques of the traditional SCP paradigm, have pointed out the existence of a feedback effect in which performance affects both conduct and structure, and conduct in turn affects structure. In addition recent studies on the SCP relationships added a lag structure to signify that structure conduct and performane do not affect one another contemporaneously. Therefore, due to the existence of a simultaneously determined causes and feedback effects among market structure conduct and performance, the traditional consideration of exogenous determination of market structure will be violated making it to be endogenously determined within the model. Figure 2.2 shows the traditional inter-relationships among market structure, conduct and performance.

Figure 2.1 The Traditional Structure-Conduct-Performance Paradigm



source: Scherer and Ross (1990)

2.5.1 Relationship Between Market structure and performance

Currently, there are many studies that attempt to relate market structure to each of the measures of market performance. But, for the purpose of this paper, only selected findings that are aimed at providing a clear understanding about the relationship will be reviewed.

Previous studies by industrial economists regarding the relationship between market structure and performance supported a positive relationship between industry concentrations, barriers to entry and profits. Studies conducted by Bain (1951), Mann(1966) and Weiss(1974) supported this hypothesis

One of the earliest designers of the SCP paradigm Joe Bain, hypothesized that profits would be higher in industries with high concentration and high barriers to entry than in other industries and presented evidence in support of the hypothesis. Mann(1966) has also confirmed Bain's prediction and earlier findings that concentrated industries with very high barriers to entry have higher average profit rates than concentrated industries that do not have very high barrier to entry, by using ten years industrial data.

Another study by Weiss(1974) concluded the existence of a significant relationship among profits, concentration, and barriers to entry by conducting a regression analysis.

Similarly, a study conducted by Oustapassidis et al.(2000), on Greeks' food manufacturing industry estimated a simultaneous equations model to examine the market power versus efficiency hypothesis. The results from the estimation has showed the existence of a positive and significant relationship between market structure as measured by market shares and performance as measured by profitability.

Another research finding regarding the relationship between market structure and performance was provided by a research conducted by Tung et al. (2010) that employed a structure conduct performance model of industrial economics to estimate the causes and effects among the international tourist hotel industry in Taiwan from 1995-2006. The three stage least squares estimation results on the system of simultaneous equations indicated a positive and significant impact of market share on a firms' profitability.

Wang et al (2006) have also provided a positive and significnat and one way effect of market structure on current performance. The study has further showed that market structure is not dependent on both current and past performances by employing a simultaneous equations framework using data on U.S. food and tobacco processing industries.

However, there are also research results indicating a weak relationship or no relationship between the structural variables and performance. Contrary to the traditional relationship between market structure and performance, a study by Sarkaria(1967) using data on Indian industries has revealed a significantly negative relationship between market structure as measured by concentration and profitability as measured by return on equity & return on assets. Goldberg and Rai (1996) has also found a negative and insignificant relationship during their investigation of the relationships between market structure and performance using data from eleven European banks.

Another study by Cabral (2000) tested the relationships by using data gathered on concentration and profit rates for a number of industries and have estimated the econometric relationship expecting a positive coefficient on the regression of profit rates on concentration. But the result was not as expected showing a weak statistical link between market structure and performance. One of his suggestions for this weak linkage is the methodology that he followed which ignores the possibility of reverse causal links in the relation between structure, conduct and performance.

Delorme et al.(2002) has also used a simultaneous equations framework to study the relationship between structure conduct and performance in the U.S. manufacturing industry in the 1980's and 1990's. This paper expands on earlier structure – conduct -

performance studies by using a lag structure to signify that structure conduct and performance do not affect one another contemporaneously. The findings from the estimation showed that industry structure as measured by concentration does not depend on current industry performance as measured by profits.

2.5.2 Relationship between market structure and conduct

Conduct is influenced by market structure since firm strategies differ with the level of competition in different market structures. For example a firm who is a monopolist may not be engaged in advertising its products since it contributes less for profits. Inversely, conduct can influence market structure because firms can make entry cost endogenous by choosing different levels of quality, advertising, R&D and so on, thus affecting the potential number of entrants. (Ferguson & Ferguson, 1994)

A study conducted by Zellner (1989) on the food industry, concluded the existence of a positive relationship between concentration and advertising intensity where advertising is a barrier to entry rather than a form of information which facilitates entry. This positive relationship between conduct and market structure is also supported by the findings of Oustapassidis et al.(2000), where advertising intensity was used as a measure of market conduct. Delrome et al.(2002) has also confirmed this positive relationship between market structure as measured by Herfindhal-Herishman Index and conduct as measured by advertising intensity. In addition, a study by Misra (2010), which aims at analyzing the relationship between industry advertising intensity and market structure of the indian consumer goods and services sector has further strengthened this positive relationship.

Similarly, the findings from Tung et al.(2010) on the intenational hotel industry has indicated a two way causes and effects relationship between market structure and strategic behavior or conduct. Bhatti et al.(2011) has also indicated the same result by using a simultaneous equations framework when analyzing the efficiency and market power hypothesis in the pakistani diary processing industry.

2.5.3 Relationship between conduct and market performance

Previous empirical studies of the relationship between profitability, market structure and advertising intensity have consistently found a strong positive relationship between profit rates and advertising intensity. This is mainly due to the ability of a profitable firm who affords higher advertising costs in order to keep its profits and prevent new entrants into the profitable market.

Result from an empirical study by Oustapassidis et al. (2000) showed that there is a positive and two- way causes and effects relationship between industry advertising intensity and profitability by using data on Greek's food manufacturing industry. Similarly, an empirical analysis of the role of advertising in the Canadian consumer goods industries by Comanor & Wilson (1967) has found that advertising intensity has a positive, statistically significant and quantitatively important impact upon profit rates which provide a measure of market performance.

In contrast, research findings by Delrome et al.(2002) when studying the relationship between structure, conduct and performance in the U.S. manufacturing industry found out no systematic relationship between advertising and profitability. Empirical results from Misra (2010) further showed that for a given level of concentration, industries which earn lower price-cost margins engage themselves more rigorously in

advertising activity than industries which earn higher price-cost margins implying the possibility of a negative relationship.

In general, Regarding the relationship between market structure and performance, the reviewed litratures provided mixed results which needs further investigation.Though Studies by Bain (1951), Mann (1966),Weiss(1974), Tung et al. (2010) and Oustapassidis et al (2000) confirmed a strongly positive relationship among the variables, findings by Delrome et al. (2002) have found no relationship and Cabral (2000) a weak relationship.

Concerning the relationship between market structure and conduct, results from different studies have proved a significantly positive relationship and in some cases a two way positive and simultaneous relationship was reported. Findings in favour of these results include Zellner (1989), Oustapassidis et al. (2000), Delrome et al. (2002), Misra (2010), Tung et al. (2010) and Bhatti et al. (2011) and the Results from Tung et al. (2010) and Bhatti et al. (2011) have further identified a two way positive and simultaneous relationship between the variables.

On the other hand, findings regarding the relationship between conduct and performance remained inconclusive. Study results by Comanor & Wilson (1967) and Oustapassidis et al. (2000) concluded on a positive relationship while Misra (2010) reported a negative one. In addition, results from Delrome et al. (2002) have found no significant relationship among the variables.

Interms of the methods followed, most of the empirical works reviewed have used a simultaneous equations modelling of equations and estimated the model using a Two Stage Least Squares or Three stage Least Squares estimation methods. Zellner(1989), Oustapassidis et al.(2000), Delrome et al.(2002), Wang et al. (2006), Tung et al.

(2010), are among those who tested the relationships using a simultaneous equations framework.

In Ethiopia, a number of S-C-P studies are conducted but most of the studies concentrate on descriptive analysis of variables. One of a recent study by Yifru (2007) has used a descriptive analysis of market structure, conduct and performance of selected large and medium scale food manufacturing companies. The study uses a method of descriptive analysis which is based on an industrial organizational approach of market analysis.

Therefore, taking into consideration previous relationships between market structure, conduct and performance, this paper investigates whether the proposed relationships between the variables holds true for the Ethiopian cement industry. Furthermore, as most of the reviewed literatures indicated, the use of a simultaneous equations model is the most preferred method that can accommodate endogeneity (simultaneous determination of variables) and feedback effects among variables. Therefore this paper adopts the same method of a simultaneous equations framework and investigates the relationship between market structure, conduct, and performance within the context of the Ethiopian cement industry.

3. Overview of The Ethiopian Cement Industry

The construction industry plays a major role in the less industrialized countries since it contributes significantly both for national product and of employment. Indeed the creation of physical facilities constitutes more than one half of the gross domestic investment of both developed and developing nations. The sector also plays a critical role in satisfying a wide range of physical economic and social needs and contributes significantly to the fulfiliment of various national goals. (Moavenzedah & Rossow, 1975)

The construction industry is given a special focus in the policies of the many developing countries. In Ethiopia, due to its critical role in the overall economic development, the cement industry is identified as one of the areas of the 2010/11-2014/15 Industrial Growth and Transformation Plan (IGTP) as a sector of special consideration. (MoI,2010)

Cement, being one of the most essential raw materials in any kind of construction activity plays a crucial role in the infrastructural development of a country. In Ethiopia, Given the vast geographical size and massive population, various construction activities are being undertaken by the Central Government, State Governments, Public Sector Undertakings and other organizations, including the private sector which generates a huge demand for cement. The major factors that are causing a huge demad for cement are heavy investments on housing projects, universities, infrastructures, power generation plants and irrigation and road construction projects. (MoI,2011)

The increase in cement consumption, that was triggered by a highly expanding construction sector, has resulted in years of severe shortage of construction materials,

most notably cement. In addition, a period of acute power shortages during the year 2008/09 has led to the closure of the two major cement manufacturers Mugher and Messobo cement factories making the conditions much worse.

In an effort to alleviate these problems, the government has undertaken measures to import huge amount of cement from countries like Pakistan, Saudi Arabia, and Egypt. In addition, The start of operation of additional power generating plants, had also lifted the power rationing by the Ethiopian Electric Power Corporation (EEPCo) and enabled major cement factories to operate at their maximum capacity. (MoI, 2010)

On the other hand, the increasing demand for cement has also provided the desired boost to the cement industry leading to a quite visible growth of additional production capacity in over a period of four years. Due to the rapid economic growth in general, and construction activities in particular, cement consumption (including imports) has risen by an average growth rate of 30% for each of the last four years, well above the growth rates seen during this period for both overall GDP growth (11%) and the construction sector (10%), and is expected to rise by the same rate for the coming five years. This increase in cement consumption which is triggered by huge projects in the construction sector has led to extensive private sector domestic and foreign investments to establish cement manufacturing industries. Which increased the annual production capacity of the country from its 1.8 million tons during the year 1998 to 12.22 by the year 2004 EFY.

3.1 Cement production and consumption

Currently, in Ethiopia, cement is mainly produced in two forms: Ordinary Portland Cement (OPC) and Portland Pozzolana Cement (PPC). OPC is the most common type of cement in general use around the world because it is a basic ingredient of concrete.

PPC is ordinary Portland cement blended with pozzolanic materials like fly ash, burnt clays, ash from burnt plant material or silicious earths, either together or separately. In Ethiopia, approximately 18 percent of the total production was historically OPC, while 82 percent was PPC. (Access Capital S.c, 2009)

In terms of cement production, the years before 2000 EFY have witnessed a very unsettled period were there was an increasing supply (at a slower rate) but a rising demand period in which prices have been on a steady upward trend and production was dominated by the two largest players Mugher and Messobo cement. Before the 2000EFY period only six companies had been producing cement and no new investment into the sector were achieved.

After the year 2000EFY, the huge demand for cement accompanied by limited capacity of existing firms to supply the market has created shortages attracting new private investment projects into the sector.

Based on the data from the Ministry of Industry, upto March, 2004EFY the number of cement manufacturers in the country has reached eighteen manufacturing industries (including five newly opened establishments) with a combined output of nearly 12.22 million tons and are expected to produce 50% of their annual capacity during their first year of operation. The sector has shown a radical increase in the number of establishments over the past six months (October 2011 to march 2012) alone when five new and expansion projects joined the sector with a capacity of 5.2 million tons per annum. (MoI, 2012). The following table summarizes the total cement production during 1999 - 2003 EFY.

Table 3.1 : Cement production during 1999-2003 EFY.

Factories	Production in 000' tons				
	1999	2000	2001	2002	2003
Mugher Cement	809,493	737,266	640,246	608,378	589,331
Messobo Cement	1,028,637	900,577	770,535	687,845	896,614
National Cement	75,567	69,543	96,365	105,857	112,500
Jemma Cement	9,750	9,180	9,153	9,768	11,250
Abyssinya Cement	40,261	46,520	54,600	58,417	67,500
Redfox Cement	-	25,125	52,000	51,450	75,000
Derba Midroc Dejen Cement	-	-	-	62,500	67,500
Debressina Bussiness Industries	-	-	39,600	54,000	67,500
Huan Shang Cement	-	-	50,400	59,400	67,500
Zhong shan Cement	-	-	65,250	291,450	326,250
Pioneer Cement	-	-	-	234,450	292,500
Huan Yu Cement	-	-	-	8,593	84,375
Total	**1,963,708**	**1,788,211**	**1,778,149**	**2,232,108**	**2,657,820**

Source: Ministry of Industry.

As shown on the above table the major players Mugher and Messobo on average produced around 75 percent of the total annual production indicating a monopolistic market structure. Though the number of establishments has increased during the last two years, the price of cement remained increasing until the new giant firm Derba Midroc joined the sector who brings down the ex-factory price for a bag (50kgs) of cement to Birr 153. (Acess Capital S.c, 2009)

Apart from domestic production, cement imports has also supplemented domestic production. The amount of imported cement has grown contineously since 1998 EFY when the Ministry of Trade and Industry allowed contractors and investors to import cement on a franco valuta basis (by using foreign currency from external sources)

which enabled private sector contractors import cement from countries like Egypt, Pakistan and Saudi Arabia. (MoI,2012)

According to the data from MOI, Starting from 1999 - 2000 EFY a total of 3.27 million tons of cement is imported both by the government and the private sector importers. The amount accounted for around one third of the total domestic production over the period. However, due to illegal financial practices by private importers, by the year 2000EFY importation of cement by the private sectors was banned and only the government was entitled to import and distribute through its own marketing outlets. But, after two years banning of private sector imports, a severe shortage in power supply and the closure of the two major cement factories (Mugher and Messobo) had led the government to allow private sector imports on a franco valuta basis. (MoI,2010)

In addition, following the closure of the two cement factories, the price of cement has shown an immediate jump which has led to a wide spread government initiated importation and distribution in order to stabilize the domestic price level.

Recently, the introduction of Derba Midroc cement whose production has started to flood the country, created a huge capacity of production that can supply the market at a minimal price when compared with the already existing firms. After its introduction the cement market has experienced a significant stability in both the amount of cement supplied to the market and the price level which has made the already existing firms to look for new foreign markets.

Currently, there is a huge fall in domestic demand for cement which is mainly due to a slow down of construction activities combined with increment in cement production. This mis-match between demand and supply in the sector has led to a fall

in domestic prices for cement and forced the major cement manufacturers to look for foreign markets like South Sudan, Djibouti, and Kenya. (MoI,2011)

During the current year Messobo Cement has exported around 2000 quintals of cement to South Sudan at a lower selling price and with an additional cost of transportation to compensate the domestic market loses which proves the case that the international market is not a choice for cement producers.(MoI,2012)

In general, over the last five years the cement industry has experienced a very turbulent condition where cement prices rose by around 32% (from levels of Birr 275 to over Birr 360 per quintal) followed by severe shortages in power supply and a ban on private sector imports of cement which follows a period of about two years when private sector imports had been permitted on a franco valuta basis in 2009. (Access Capital S.c,2009)

3.2 Major Players of the Cement Sector

The leading manufacturer in the Ethiopian cement sector is Derba Midroc cement Plc, which started operation on February, 2012 earlier this year. The company has the capacity of supplying 2.3 million tons of cement per year which accounted for approximately 20% of the national production capacity in 2012. (MoI,2011)

The second largest cement producer is the government owned Mugher Cement Enterprise which was established in 1984. The company has served as the only cement supplier starting from the independence of Eritrea in 1991 until 1996 when another cement factory, Messobo cement is established. In recent years the company implemented an expansion project with a capacity of 1.4 million tons per year and

commenced operation since June, 2011. The company has now a combined capacity of producing 2.27 million tons of cement per year. (MoI,2010)

Messobo Cement, the third largest cement producer, is established in 1996 by an endowment fund called EFFORT (endowment fund for the rehabilitation of Tigray). Like that of Mugher Cement it has implemented an expansion project that raised its capacity to 2.24 million tons per year. (MoI,2010)

The fourth largest operational cement factory is National Cement Share Company which was previously known as Dire Dawa cement factory. The factory is a share company of East African Holdings Share Company and the government of Ethiopia. Currently, the factory has the capacity of producing 300 thousand tons per year and is in the final stages of upgrading its capacity to 1.2 million tons which is expected to finalize its expansion project at the end of 2012. (MoI,2010)

Other investment projects in the sector that are currently operational include Abyssinia, Red fox, Jemma, Pioneer, Huan Shang, Enchini, Zhong Shang, Huan Yu, Debressina, Derba Midroc (Dejen Project) and East cement factories. (MoI,2011)

3.3 Entry barriers to the cement sector

As it is the case for most of cement manufacturing industries in many countries, the most important barriers to entry within the Ethiopian cement sector are investment capital constraints and economies of scale. Lack of access to external or domestic capital sources at reasonable prices to fund investment projects in the sector has made entry difficult. Economies of scale – economic efficiency that resulted from carrying out production or sales on a larger scale – allowed established firms to take advantage and created difficulty for other manufacturers to enter the industry.

In addition, access to inputs for cement production (Limestone, Sandstone, Clay, Gypsum and Pumice) which is restricted through government licenses, natural distribution of resources that require specific exploration knowledge and big investments in machinery are required to enter the sector.

3.4 Product Differentiation, R&D and Advertising Intensity of Cement Factories

In a market where there are few sellers, the behavior of firms will tend to an act of collusion in order to jointly determine market prices and gain greater profits. Within the Ethiopian cement industry, following the introduction of the new giant Derba Midroc with a huge production capacity, the price of a quintal of cement reached a minimum of birr 153 and a maximum of birr 170. Before the entry of the company the price charged by the existing firms was a maximum of birr 500 and minimum of birr 225 which shows the existence of a collusive price limiting activity by the major players. (Access Capital S.c, 2009)

Though product differentiation in the cement sector is very low due to the existence of a mature technology and use of similar inputs, pricing decisions among firms along with cost advantages play a critical role in the sector. Due to differences in cost structures among cement manufacturers the price charged by each are not the same implying the existence of price discrimination.

Although firms in a monopolistic market structure have less competition, they still can increase profits by developing new products and lowering their costs. In Ethiopia, due to a weak price elasticity of demand for cement, companies engaged in cement production spend less on research and development indicating a lower level of competitive pressure within the cement market.

Though brand names in the Ethiopian cement industry plays no significant role due to the homogeneous nature of the product, the major firms use advertising as a means of providing information about cement prices than a means of persuading consumers of their specific brands.

3.5 Challenges within the Cement Sector

According to the Ministry of Industry the main reasons for the low supply of cement are mainly; power shortages, lack of adequate and sustainable availability of coal and a rising cost of production. Since Cement industry is an energy-intensive sector, all major operations of cement manufacturing critically hinge on the availability of power. Though not adequate, all operational cement manufacturing plants are currently provided with a power supply from the Ethiopian Electric Power Corporation (EEPCo). During the year 2009, the corporation has instructed the nation's two largest cement plants Mugher and Messobo to close for a month due to a severe shortage in power supply. By the coming year, the government has planned to fully shift the energy source of cement factories from being dependent on the use of electric power and High Fuel Oil (HFO) that involve foreign currency spending, to that of coal and bio mass energy sources as alternative sources. In addition the government is looking at possible imports of coal from countries like South Africa and Pakistan with the aim of securing a sustainable supply of coal. (MoI, 2011)

As is the case for all manufacturing industries the cost of production of cement is a major factor that determine the price of cement. In Ethiopia, cement production comprises of the following major expenses like Power & fuel costs, stores & spare parts, cement transportation charges, repair and maintenance costs, packing expenses and overhead costs. Out of these costs fuel oil alone costs around 60% of the total cost

of production. Though one of the reasons for price rise of cement is profit motive of the cement companies, a rise in the cost of production specially the cost of fuel oil is a major factor that determine cement prices. (MoI, 2011)

Recently, in response to the fall in the prices of cement, following the introduction of the new giant Derba Midroc cement factory and due to the decline of domestic demand due to the seasonal nature of construction activities, five cement manufacturers including Mugher and Messobo cement started looking for foreign markets. Currently five companies are given export permits by the government and are on the verge of starting exports to neighboring countries like South Sudan though not a feasible option. (MoI, 2011)

4. Research Methodology

4.1 Model Specification

One of the most important approaches adopted within the SCP paradigm is the use of simultaneous equations modeling. This approach helps to take into account the multiplicity of causality between structure, conduct and performance within the framework. This study employed the structural form of a simultaneous equations regression model which involves estimating two or more equations within the model jointly.

Analysis of the SCP model using a simultaneous equations framework has been followed by previous studies by Zellner (1989), kambhampati (1996), Oustapassidis et al. (2000), Tung et al. (2010) and Delrome et al. (2002) in their attempt to empirically evaluate the SCP paradigm.

Therefore, proceeding from prior studies, a simultaneous equations framework is used to study the relationship between structure, conduct, and performance in the Ethiopian cement manufacturing sector. The model developed is composed of three equations, one each for market structure as measured by market share, conduct measured by advertising intensity, and performance measured using profitability. In this model the dependent variables are expected to be determined within the model which is due to the endogeneity problem arising from the expected joint determination of market structure, conduct and performance. Therefore to account for this endogeneity bias the three endogenous left hand side variables are used as explanatory variables in each of the equations.

The model to be estimated takes the general form provided below and the variablesincluded in each are discussed in detail in the following sections.

$$MS = f(ADV, PR, OWNDUM, KSR) \quad (1)$$

$$ADV = f(PR, MS, CR_4, CR4^2) \quad (2)$$

$$PR = f(MS, ADV, CAP, TOC) \quad (3)$$

Where *PR* is firm profitability, *MS* is market share, *ADV* is firms advertising intensity, *OWNDUM* is a dummy variable for domestically owned firms, *KSR* is capital to sales ratio, CR_4 is four-firm conentration ratio, $CR4^2$ is squared Four-firm Concentration ratio, *TOC* is total operating cost, *CAP* is total capital investment.

4.1.1 Market Share Equation

In this market share equation, advertising intensity, profitability, ownership dummy variable and capital to sales ratio are included as explanatory variables for market share. Advertising intensity and profitability are treated as endogenous variables and the other two are instruments for market share.

The inclusion of advertising intensity in the market share equation is mainly due to its effect of creating a barrier to entry in the form of brand name. A successful advertising expenditure is associated with a successful product differentiation and erects a barrier to entry which is conducive to greater market share. Firms that are successful in differentiating their products are also capable of attaining larger market shares. The incentive to advertise also depends on the type of market structures. In a situation of perfect competition where there are many sellers and buyers with a homogeneous product, there is no any extra benefit from advertising a product. This is due to the spillover effect of advertising expenditure by any one firm which will

finally increase the demand for all firms equally. By contrast, in a perfectly monopolistic market all the benefits from advertising expenditures are captured by the monopolist. But in the real world, between the two extremes, the firm incurring the cost of advertising can receive greater benefits from advertising when the number of players in the market is fewer and it is easier to differentiate the products.

In addition to advertising intensity, profitability could also be a factor influencing market structure (market share). In cases, where profits are very high, new firms are attracted in that industry and as the competition in that industry increases, the degree of concentration and market share will decrease. On the other hand, when a market becomes mature and the profits start to decline, firms might engage in a process of mergers and acquisitions in order to improve economies of scale and synergies among firms which will further increase concentration and market share implying a two sided relationship between market share and profitability.

Capital to sales ratio is a barrier to entry which is assumed to be positively associated with market share. The higher the capital to sales ratio, the higher the perceived ability of the firm to efficiently utilize its fixed assets in generating profits and market share. A larger capital to sales ratio is a barrier to market entrance as more fixed assets as compared to sales revenue are required to enter and remain in that market. Ownership dummy variable is included in this equation to investigate whether a significant difference existed in market shares among domestically owned and foreign owned firms.

Both capital to sales ratio and ownership dummy variables are only included in this equation. Capital to sales ratio is not included in the advertising equation because advertising is a function of the number and size distribution of firms. Based on the

specification of other similar studies advertising equation is only a function of the number and size distribution of firms. Since advertising is a non-price competition mechanism it is applicable and effective in concentrated markets which entails the inclusion of Four-firm concentration ratio which is used to measure the level of market concentration.

4.1.2 Advertising Equation

In the advertising equation, market share, profitability, four-firm concentration ratio, and its squared value are included as explanatory variables. Market share and profitability are treated to be endogenously determined while four-firm concentration ratio and its squared value are instruments for advertising intensity.

In this equation, the variable market share is included assuming its positive relationship with advertising intensity. As previously discussed, the incentive to advertise is dependent on the type of market structure. Advertising in a perfectly competitive market structure does not enable a firm to either increase their price or to get a larger market share. In monopolies, advertising may be used to generate greater awareness of the product and its value to the customer which results in increasing the overall market demand. However, the monopolist has no need of using advertising to increase market share since maximum profits can be achieved by fixing prices at such level that the combined effect of revenues and costs results in maximum profits.

In contrast, a firm operating in an oligopolistic market structure can gain maximum profits from advertising through the effect of advertising at increasing market share as well as total market demand. To achieve this maximum profits the firm needs to differentiate its products and establish product superiority over competitors.

In an oligopolistic market structures, an increase in the market share of a firm will improve its ability of earning profits and therefore the few remaining players will have the incentive to compete on a non-price basis such as advertising expenditures.

Although there have been a large number of studies regarding the relationship between four-firm concentration ratio and advertising intensity, the results have been inconclusive of the sign of the relationship and it is still difficult to identify the actual direction of causation between the variables.

From previous research results two principal hypothetical models regarding the relationship between advertising intensity and industry concentration have been advanced. These are; (1) advertising intensity and industry concentration are positively and linearly related; (2) advertising intensity and industry concentration are non linearly related, suggesting an inverted-U relationship where advertising intensity will be highest at intermediate levels of industry concentration. (Hoveland & Lancaster, 1985)

The positive and linear relationship hypothesis is more likely to happen in oligopolistic markets than in low concentration markets because non price competition like that of advertising is perceived as more profitable and more desirable in oligopolistic markets since changes in non-price competition are not as easily copied by competitors as are changes in price. On the other hand the non-linear (inverted –U relationship) model implies that advertising is likely to be highest in moderately concentrated industries. In other words, the relationship between advertising intensity and industry concentration will be positive up to a point where concentration is moderate and becomes negative at high levels of concentration. (Hoveland & Lancaster, 1985)

Therefore this equation includes both the four-firm concentration ratio and its squared value to provide evidence as to the linear or non- linear nature of the relationship between advertising intensity and industry concentration.

In addition, profitability is included in this equation because; profitability allows a company to spend more resources on advertising. The higher the profit earned by a company, the larger the budget available for investments in advertising. The incentive to advertise is higher when profits are increasing, since there will be more resources available for advertising expenditures. Therefore, profitability is considered as one of the critical factors in the determination of the level of advertising expenditure.

4.1.3 Profitability Equation

In the profitability equation, market share, advertising intensity, total capital investment, and total operating costs are included as explanatory variables. Market share and advertising intensity are treated to be endogenously determined while total capital investment, and total operating costs are instruments for advertising intensity.

The inclusion of market share in this equation is due to its assumed positive effect on a firm's profitability. A higher level of market share enables a firm to utilize economies of scale to reduce costs and gives the firm market power. On the other hand, the higher the market shares of firms competing in a market, the higher the possibility of collusion among them which aimed at maximizing their profits. In addition, customers may also use market share as a signal of product quality and therefore products can be able to command higher prices and receive higher profits.

Advertising can directly influence profitability by shifting the demand curve for the commodity upwards to the right. This shift in the demand curve will then increase the price that consumers are willing to pay for a given quantity enabling producers to earn

a higher profit margin. In addition, advertising can also influence profitability by creating barriers to entry which limit the level of competition in a market. If advertising expenditure makes a consumer less willing to change the consumption of a certain product, the effect of the advertising expenditure is not only to increase the price that the consumer will pay for the same product, but also to reduce the incentive for potential entrants to join the market which will create a barrier to entry. Therefore a new company will have to incur high advertising expenditures to become a threat for the incumbent firms.

It is obviously understood that total operating costs incurred by a firm can directly influence profitability. Although a firms primary objective is to maximize profits, it involves certain costs which are critical in determining how much of a firms output must be produced. A firm with a higher cost of production will be less profitable than that of a firm with lower cost of production. Since total operating costs can serve as an indicator of the efficient utilization of resources and economies of scale, the inclusion of capital to sales ratio in this equation will only be a loss of degrees of freedom and therefore ommitted from this equation.

With regard to the inclusion of ownership dummy variable in the profitability equation, the data collected from cement factories indicated that domestic firms are more profitable than that of foreign owned firms. Therefore, since the effect of ownership dummy variable on profitability is already known I found no need of including the variable in this equation.

On the other hand, total capital investment is included as an explanatory variable assuming its negative association with current profitability. Though the long term effect of capital investments on profitability is positive it appears relatively less

profitable in earlier years and more profitable in later years which is due to the time lag between capital investments and the expected benefits.

4.2 Method of estimation

This study uses unbalanced panel data of twelve cement manufacturing firms over a period of five years (1999 – 2003 EFY) to investigate the interrelationships between market share, profitability and advertising intensity within the context of the Ethiopian cement manufacturing industry by employing a simultaneous equations regression model.

Simultaneous equations regression model is a model that describes a situation where atleast one of the right hand variable is endogenous and therefore the error term is coorelated with atleast one of the right hand side variables.

A variable is said to be endogenous if it is coorelated with the error term and exogenous if it is not correlated. The three most important sources that can produce a coorelation between the error term and the explanatory variable are : Ommission of an important explanatory variable, measurement error in an explanatory variable or revese causation -which is assumed to be the case in this study.

There are two alternative approaches of estimating a simultaneous equations model. One is the single equation estimation and the other is a system estimation. A single equation estimation involves estimating either one equation on the model or two or more equations in the model separetely. System estimation on the other hand, involves estimating two or more equations in the model jointly.

A single equation estimator comprises of, Ordinary Least Squares (OLS) estimator, Instrumental Variables (IV) estimator and Two Stage Least Squares (2SLS) estimator.

A system estimator on the othe hand, comprises of Three Stage Least Squares (3SLS), Full Information Maximum Likelihood (FIML) and Generalized Method of Moments (GMM).

Every simultaneous equations model can be placed in one of the following three categories: unidentified, identified or an over identified equation. When an equation is unidentified the equation will not have enough information to obtain any meaningful estimates. When an equation is exactly identified the equation just have enough information to obtain meaningful estimates. An overidentified equation have more than enough information to obtain meaningful estimates.

There are two methods of obtaining identification in a simultaneous equations model. One method is to use prior information provided by economic theory to exclude certain variables from an equation that appear in a model. This is called obtaining identification through exclusion restrictions. The other method is by using the rank and order conditions. The order condition is a necessary but not sufficient condition for identification. The rank condition is both a necessary and sufficient condition for identification. Because the rank condition is more difficult to apply, many studies only check the order condition. The order condition is a simple rule of counting used to determine if the system of equations is identified. The rank condition, on the other hand, tells whether the equation that is being checked for identification can be distinguished from a linear combination of all structural equations in the system. Green (2002)

When estimating a system of simultaneous equations the first step is to conduct a Durbin-Wu-Hausman endogeneity test and check whether the system has a problem

of endogeneity and need to be estimated using the method of instrumental variables than that of the OLS.

In this paper, the system of simultaneous equations comprising of market share, advertising and profitability equations is estimated using the Three Stage Least Squares (3SLS) estimator. A 3SLS estimator is a system estimator that is used to estimate two or more identified equations in a simultaneous equations model together. Unlike the 2SLS estimator the 3SLS estimator takes into account the coorelation between the error terms in different equations. The 3SLS estimator uses more information than a single equation estimator and therefore produce generally consistent and more efficient estimates than that of 2SLS. Green, (2002)

Estimating the previously specified system of simultaneous equations using a 3SLS estimation method involves three stages. The first stage is to make a regression of market share, advertising intensity and profitability equations on all the exogenous variables in the system, which is the same as OLS regression. In the second stage, the predicted values from the first stage regression are used as instruments for each of the equations, which is called a 2SLS regression. The third stage is to use the predicted values from the 2SLS regression as instruments for market share, advertising intensity and profitability to estimate the three structural equations which gives the 3SLS estimation results.

4.3 Definition and measurement of variables

In this study, the following variables were considered to estimate the above system of simultaneous equations regression model.

1. **Market share (MS)**:- Is the percentage of the total sales volume in a market that is captured by each firm. It is calculated by taking the firms sales over the same period and dividing it by the total sales of the industry over the same period.
2. **Advertising intensity (ADV)**:- The amount of advertising expenses by each firm divided by its total assets.
3. **Profitability (PF)**:- Refers to the efficiency of a firm on generating profits. It is an aggregated before tax ratio of accounting profits to total Revenue expressed as percentage.
4. **Four-firm concentration ratio (CR_4)**:- The sum of the market shares of firms ranked within the top four firms.
5. **Capital to sales ratio (KSR)**:- It measures the efficient use of fixed capital of a firm. It is calculated as a ratio of fixed assets to sales revenue.
6. **Total operating cost (TOC)**:- Is the same as total cost which is the sum of fixed and variable costs of each firm.
7. **Capital Investment (CAP)**:- Is a measure of a firm's efficiency in deployment of its assets, computed as a ratio of the total value of assets to sales revenue generated over a given period. Capital intensity indicates how much money is invested to produce one unit of sales revenue.
8. **Ownership Dummy (OWNDUM)**:- is a dummy variable which takes the value 1 for domestically owned firms and 0 for foreign owned firms.

5. Results and Discussion

5.1 Descriptive results

As shown in Table 5.1 below, the 1999-2003EFY total production of cement at the industry level was 10.41 million tons with a total sales value of 15.73 billion birr. The highest and the lowest amount of annual production were 2.6 million tons in 2003 and 1.77 million tons in 2001. On average, during the period considered, 2.08 million tons of cement was produced each year. The average industrial cost, fixed capital and employed labour were birr 8.84 billion, birr 25.4 billion and 20,229 persons respectively. (Table 5.1)

Table 5.1: Descriptive Statistics of the Cement Industry during 1999 - 2003 EFY

(Value in Million Birr except for persons employed)

Year	Production in '000 tons	Total sales Revenue	Total cost	Fixed capital	Employed Persons
Total	**10,419**	**15,732**	**8,843**	**25,445**	**20,229**
Average	2,083	3,146	1,769	5,089	4,045
Max.	2,658	5,295	3,133	7,330	5,273
Min.	1,778	2,032	1,038	2,719	2,316
St. Dev.	369	1,312	835	1,753	1,193

Source: Ministry of Industry. Number of observations = 37

Among the twelve cement factories considered during the period, Messobo Cement factory had the maximum amount of total production of 4.28 million tons of cement. This cement factory employed the highest amount of capital and also had the highest total sales revenue of 6.22 billion birr which is about 39 percent of the total industrial sales value over the considered period. The minimum amount of production within the stated period was produced by Jemma Cement factory. The factory has produced 49,101 tons of cement which is 0.47 percent of the total industrial production during the period. The factory has employed the lowest capital

and labour inputs earning the minimum level of sales revenue when compared with the remaining firms (Table 5.2).

Table 5.2: Descriptive Statistics on Cement Factories During the Year 1999-2003 EFY.

(in million birr except for production and person employed)

Factories	Production in '000 tons	Sales Revenue	Total Operating Cost	Persons Employed (2003)
Mugher Cement	3,385	4,981	2,982	1517
Messobo Cement	4,284	6,220	3,356	1251
National Cement	460	488	288	362
Jemma Cement	49	64	29	176
Abyssinya Cement	267	367	213	221
Redfox Cement	204	102	54	192
Derba Midroc Dejen Cement	130	227	125	217
Debressina Bussiness Industries	161	260	145	191
Huan Shang Cement	177	296	166	211
Zhong shan Cement	683	1,192	645	322
Pioneer Cement	527	951	516	294
Huan Yu Cement	93	584	324	319
Total	**10,420**	**15,732**	**8,843**	**5273**
Average	868	1,311	737	439
Max	4,284	6,220	3,356	1517
Min	49	64	29	176
St. Dev.	1,412	2,048	1,153	448

Source: Ministry of Industry. Number of observations = 37

By the year 2003, the average annual employment at the industry level was 439 persons. The highest and the minimum employment was 1517 by Mugher Cement and 176 by Jemma Cement factory which shows a significant disparity between industries.

Of the twelve cement factories the two major factories – Messobo and Mugher – produced more of the total industrial production. They had much better scale of production and input resources as compared to the remaining cement factories. These

two factories had a total production amount of 7.66 million tons of cement with a total sales revenue of 11.2 billion birr. The total production by these two firms is around 74 percent of the total industrial production and 71 percent of the total industrial sales revenue within the period.

In general, Over the considered period, the cement industry has registered an average annual growth rate of 11.35 percent in the output produced and a 12.1 percent growth in the annual sales revenue of cement factories. The sector had employed an average of 4045 persons with a maximum of 5273 in 2003 and a minimum of 2316 persons by the year 1999 EFY.

On the other hand, the descriptive results from Table 5.3 showed that the average Four-firm concentration Ratio (CR4) for the period 1999-2000EFY is around 73 percent indicating an oligopolistic market structure of the cement industry.

Table 5.3: descriptive statistics of variables on the cement industry.

Variables	AD	MS	PF	CR4	ISAGR	TOC	KI
Mean	0.003073	12.31	47.17	73.63	16.18	208.62	4.23
Max	0.007130	52.38	59.00	99.50	25.05	630.00	29.32
Min	0.000180	0.42	26.12	79.19	(8.94)	3.00	0.37
St. Dev.	0.002044	15.77	8.09	11.25	8.30	280.05	6.23

Source: Ministry of Industry. Number of observations = 37, a= In million birr

In addition, the average market share which is the percentage of an industry's total sales that is earned by a particular company over the specified period is around 12 percent. The maximum value of the market share that is held by a single firm is around 52 percent which is registered by Mesobo Cement Factory by the year 2000EFY and the minimum is 0.4 percent held by Jemma cement factory by the same year.

In terms of profitability the average annual profitability of a firm within the cement industry is about 47 percent and to achieve this average level of profitability the firm will incur an average cost of production amounting to 208 million birr.

5.2 Estimation results

By adding error terms, the proposed simultaneous equations model is given as :-

$$MS = a_0 + a_1 ADV + a_2 PF + a_3 OWNDUM + a_4 KSR + \varepsilon$$

$$ADV = b_0 + b_1 MS + b_2 PF + b_3 CR_4 + b_4 CR_4^2 + \gamma$$

$$PF = c_0 + c_1 MS + c_2 ADV + c_3 CAP + c_4 TOC + \eta$$

Before estimating the system of equations using instrumental variables method, a test of the appropriateness of OLS and the necessity to resort to instrumental variables estimation method must be conducted. One of such tests is the Durbin –Wu-Hausman (DWH) test which involves fitting the model by both OLS and IV approaches and comparing the results against the null hypothesis that the OLS estimator is consistent and fully efficient. From the results on Table 5.4 in the market share equation the test statistic has indicated a DWH P- value that rejected the null hypothesis that OLS is consistent and fully efficient and implies the need to resort to IV estimation methods.

In order to use an IV method of estimation, there is a need to check for the validity of instruments. A variable is said to be a valid instrument if it is uncoorelated with the error term but coorelated with the endogenous explanatory variable. For an instrumental variable to be valid it must satisfy two conditions; instrument relevance and instrument exogeneity. Instrument relevance implies the need for an instrument to be coorelated with the endogenous explanatory variable and instrument exogeneity implies no coorelation between the instrumental variable and the error term. The first

stage regression results are often used as a means of checking the validity of an instrumental variable but may not be sufficiently informative for models with more than one instrumental variable.

In order to check the validity and relevance of instruments the Hansen J test for overidentification of all instruments and the Anderson Canonical Correlation test of identification or IV relevance are used. The Hansen J test is a test with the null hypothesis that all instruments are valid and uncorrelated with the error term while the Anderson Canonical Correlation test considers the canonical correlations of the endogenous variable and the instruments matrix. If an equation is to be identified and instruments to remain relevant all the coefficients of the canonical correlation will be significantly different from zero. The Anderson Canonical Correlation test considers the null hypothesis that the minimum canonical correlation is zero (the equation is unidentified and the instruments are not relevant).

Another statistic which is used to measure instrument relevance is the Shea partial R^2 measure. As a rule of thumb, if an estimated equation yields a large value of the standard partial R^2 and a small value of the Shea R^2 measure, it is concluded that the instruments lack sufficient relevance to explain all the endogenous regressors.

From the results on Table 5.4, the Anderson Canonical Correlation test has provided a higher p value of 0.0880 and 0.4226 on the market share and profitability equations failing to reject the null hypothesis. On the other hand, the Hansen J test has provided a p value of 0.6701, 0.7889 and 0.7620 on the market share, advertising and profitability equations respectively failing to reject the null hypothesis that instruments are uncorrelated with the error term that lends support to the validity of instruments.

In addition, the Shea partial R^2 measure is found out to be lower than the standard partial R^2 in all the three equations which proves the fact that the instruments lack sufficient relevance to explain all the endogenous regressors.

During the estimation of the above system of equations, lack of data on additional instrumental variables has led to the problem of weak instruments. Instruments that are used in the system are not sufficiently coorelated with the endogenous regressors that forced the use of instrumental variables which have little power of explaining the endogenous vaiable. In addition to this, due to the existence of a small number of cement factories over the considered five years period, the number of observations are also limited which makes estimation results to be less useful for generalizations regarding the inter-relationships between variables.

After the 3SLS regression of the system using the statistical software package STATA-12.0 all the coefficients for each of the variables are estimated and the *t*- statistics for the coefficients are also provided. Table 5.4 to 5.6 report the estimation results.

Table 5.4 3SLS estimation results.

Dependent Variables	3SLS		
	Market Share Equation	**Advertising Intensity Equation**	**Profitability Equation**
Constant	0.331	-0.003	29.44***
	(1.12)	(0.50)	(3.41)
MS		0.008***	-64.40
		(4.27)	(1.30)
ADV	121.38***		8614***
	(4.08)		(2.81)
PF	-0.012**	0.0001168***	
	(2.25)	(2.83)	
OWNDUM	0.01300		
	(0.25)		
KSR	-0.004		
	(0.28)		
CR4		0.000004	
		(0.03)	
CR42		0.000024	
		(0.05)	
CAP			-0.001
			(0.09)
TOC			-0.002
			(0.26)
Observations	37	37	37
Durbin-Wu-Hausman Endogeneity test (P - Value)	0.0000	0.4332	0.1060
Hansen J test for overidentification of all instruments (P – Value)	0.6701	0.7889	0.7620
Anderson Canonical Correlation test of identification / IV relevance (P- Value)	0.0880	0.0002	0.4226

Note: a. *, ** , *** denote significance at 10%, 5% and 1%

b. *t* -statistics in parenthesis

Table 5.5 2SLS estimation results.

Dependent Variables	2SLS		
	Market Share Equation	**Advertising Intensity Equation**	**Profitability Equation**
Constant	0.01	-0.016	29.303*
	(0.01)	(0.80)	(2.15)
MS		0.007**	-78.411
		(2.31)	(0.80)
ADV	112.99**		7830
	(2.62)		(1.56)
PF	-0.005	0.0000961**	
	(0.31)	(1.35)	
OWNDUM	0.063		
	(0.44)		
KSR	0.02200		
	(0.59)		
CR4		0.0003423	
		-0.69	
CR42		-0.000002	
		(0.66)	
CAP			0.018
			(0.55)
TOC			-0.014
			(0.50)
Observations	37	37	37

Note: a. *, ** , *** denote significance at 10%, 5% and 1%

b. *t* -statistics in parenthesis

Table 5.6 OLS estimation results.

Dependent Variables	OLS		
	Market Share Equation	**Advertising Intensity Equation**	**Profitability Equation**
Constant	-0.114	-0.008	47.15***
	(0.72)	(0.42)	(19.63)
MS		0.004	24.90
		(1.43)	(1.28)
ADV	18.14*		966.92
	(1.79)		(1.50)
PF	0.003	0.00003	
	(0.88)	(0.62)	
OWNDUM	0.198 ***		
	(4.21)		
KSR	-0.028**		
	(2.25)		
CR4		0.000199	
		(0.34)	
CR42		-0.000001	
		(0.34)	
CAP			-0.013
			(0.25)
TOC			-0.024**
			(2.32)
Observations	37	37	37
Within R^2	0.2799	0.0091	0.2942
Between R^2	0.2267	0.5997	0.2889
Overall R^2	0.3905	0.1799	0.2659

Note: a. *, ** , *** denote significance at 10%, 5% and 1%

b. *t* -statistics in parenthesis

5.3 Discussion of results

In the structure or market share equation the coefficient on advertising is significant and as expected positive on both the 3SLS and 2SLS estimation results. This indicates that advertising expenditure is capable of creating a differentiated product which further erects a barrier to entry creating a conducive environment for the attainment of larger maket share. On the other hand, the 3SLS result has indicated a negative and significant effect of profitability on market share. This negative effect implies that higher level of profitability will attract new entrants to the sector and intensify the level of competition resulting in a reduced degree of concentration and market share. Eventhough insignificant, the coefficient for ownership dummy variable has also indicated an increase in market share when a firm is domestically owned which might be due to the existence of economies of scale in production arising from a long period domination of the sector by government owned domestic firms.

In contrast, the coefficient for capital to sales ratio is found negatively and insignificantly affecting market share. Although capital to slaes ratio is expected to serve as a barrier to entry the results does not support the theoretical expectation.

In the conduct or advertising equation, both the effects of market share and profitability are significant and with their expected positive signs. This indicates that cement factories with higher market shares tend to have a higher amount of advertising expenditures and an increase in the profitability of a firm leads to an increase in a firms' advertising expenditures.

In addition, unlike what previous studies found out regarding the relationship between advertising and four-firm concentration ratio the 3SLS results does not

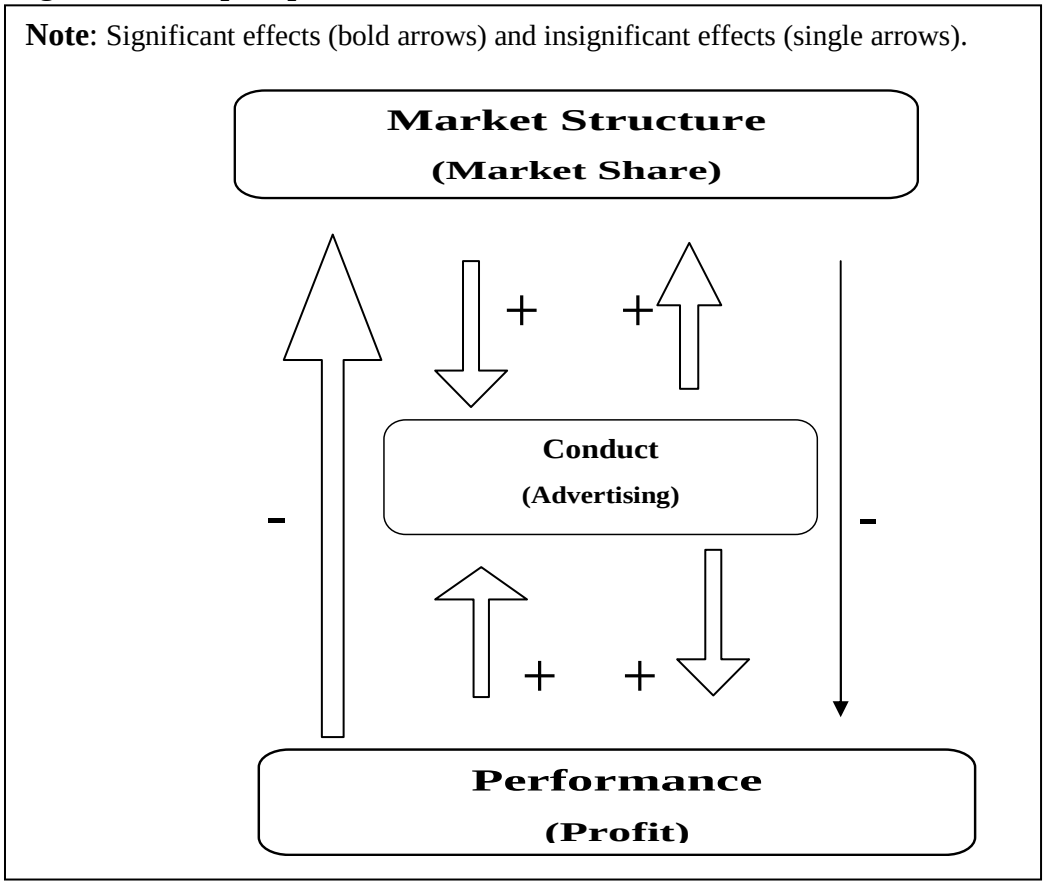
provide any evidence about an inverted-U relationship rather the relationship is found out to be linearly positive but insignificant.

In the performance or profitability equation, with the exception of the coefficient for advertising intensity and the constant term, all the estimated coefficients remain insignificant. The coefficient for market share is found negatively and insignificantly affecting profitability of a firm which supports the efficiency hypothesis that large firms make more profits through their efficient operations than through owning larger market shares.

In addition, both capital investments and total operating costs are found to affect profitability insignificantly but as expected negatively. As can be obviously understood, capital investments are more likely to be less profitable in earlier years than in later years. Similarly, as indicated on the 3SLS results, a high cost firm is less profitable than that of a low cost firm. Figure 5.1 below presents a graphical representation of the 3SLS estimation results.

Figure 5.1. Graphic presentation of 3SLS estimation results

Note: Significant effects (bold arrows) and insignificant effects (single arrows).



Inspired by Tung et al (2010)

In general, the 3SLS estimation results have shown that, a simultaneous relationship exists between market share and advertising intensity on one hand, and between profitability and advertising intensity on the other. The two way and positive causes and effects relationship between advertising intensity and market share indicates that, cement firms with higher market shares tend to have higher advertising expenditures and advertising intensity does have a significant influence on the market shares of firms. This two way causes and effects relationship between advertising intensity and market share is also confirmed on the 2SLS estimation results.

6. Conclusions and Implications

The aim of this paper is to reapply the SCP model of industrial economics to the Ethiopian cement industry by focusing on the simultaneous causes and effects relationship among the cement market structure, firms' strategic behavior (conduct) and performance.

Through out the estimation of the system of equations, lack of data on additional instrumental variables and the use of a small number of observations has created a problem of weak instrumental variable making generalizations based on this estimation results to be difficult.

From the 3SLS estimation results, a positive, simultaneous and two way causes and effects relationship was found out between market structure (market share) and conduct (advertising intensity) on one hand and between profitability and advertising intensity on the other.

These positive causes and effects relationship imply that, a higher market share in the cement industry does lead to an increase in advertising expenditure and also advertising expenditure is directly related to market share which indicated the role of advertising as a means of entry deterrance. Similarly, an increase in the amount of advertising expenditure by a firm leads to an increase in its profitability and vise versa, which further strengthened the role of advertising as a means of increasing profitability.

In addition, both the 3SLS and 2SLS estimation results have indicated that, profitability is not affected by market share though the latter affects market share negatively and significantly. This result is in support of the efficiency hypothesis

which assume that large firms gain more profits through their efficient operations than through owning larger market shares. On the other hand, the negative effect of profitability on market share might be due to the effect of higher profits on attracting entry of new firms which will finally lead to the reduction of market share.

Eventhough proper estimation of the system of simultaneous equations requires an additional number of observations and relevant instrumental variables, the application of the SCP paradigm in the context of the Ethiopian cement industry can serve as a stand point to inform market players, researchers and policy makers about the existing interelationships between market structure, firms strategic behavior and performance and assists their interventions towards improving the sector.

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Declaration

This thesis is my original work and has not been presented for any degree in any other university, and that all sources of materials used for the thesis has been dully acknowledged.

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