

**Analysis of the Growth of Exports in the Manufacturing Firms of
the Cement Industry and the Growth of the Welfare Index
Counting the Costs of Market Penetration (the Monopolistic
Competition Approach)**

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ABSTRACT

The study aimed to analyze the growth of exports the manufacturing firms within Iran's cement industry and the growth of the welfare index in the export markets of the industry. Thus, variations in the exports of the firms and the welfare indices of the target countries relative to the costs of trade has been analyzed by implementing various models of international marketing and the activity of heterogeneous firms in monopolistic competition circumstances using panel data and the non-linear least squares method during 2003-20. Effects of market penetration costs on the entry of firms were considered in two modes. In the first mode, the costs were considered fixed and uniform, while the second mode considered them endogenous according to the productivity of the firms. The results showed that when the costs were endogenous, increasing the firms' productivity facilitated their entry and increased rate of exports. Moreover, analyzing the growth of the firms' export rates showed that the rate of their entry had most significant impact on the growth of exports Iran's cement industry. The same factor had the most remarkable role in changing the welfare index in target countries.

ملخص

تهدف الدراسة إلى تحليل نمو صادرات شركات التصنيع الإيرانية في مجال الإسمنت، ونمو مؤشر الرفاهية في أسواق التصدير لهذه الصناعة. وقد تم تحليل الاختلافات في صادرات الشركات ومؤشرات الرفاهية في البلدان المستهدفة مقارنة بتكاليف التجارة، وذلك من خلال تنفيذ نماذج

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مختلفة للتسويق الدولي ونشاط الشركات غير المتجانسة في ظروف المنافسة الاحتكارية باستخدام بيانات جدولية وطريقة انحدار المربعات الدنيا غير الخطية لفترة 2003-2020. كما تمت دراسة تأثيرات تكاليف النفاذ إلى الأسواق على دخول الشركات من خلال أسلوبيين. في الطريقة الأولى، اعتبرت التكاليف ثابتة وموحدة، في حين اعتبرت الطريقة الثانية داخلية وفقا لإنتاجية الشركات. وأظهرت النتائج أنه عندما كانت التكاليف داخلية، فإن زيادة إنتاجية الشركات سهلت دخولها وزادت من معدل الصادرات. كما أن من خلال تحليل نمو معدلات تصدير الشركات تبين أن معدل دخولها كان له الأثر الأكبر على نمو صادرات صناعة الإسمنت في إيران. وكان للعامل ذاته الدور الأبرز في تغيير مؤشر الرفاهية في الدول المستهدفة.

ABSTRAITE

L'étude visait à analyser la croissance des exportations des entreprises manufacturières de l'industrie du ciment en Iran et la croissance de l'indice de bien-être sur les marchés d'exportation de l'industrie. Ainsi, les variations des exportations des entreprises et les indices de bien-être des pays cibles par rapport aux coûts du commerce ont été analysés en mettant en œuvre divers modèles de marketing international et l'activité des entreprises hétérogènes dans des circonstances de concurrence monopolistique en utilisant des données de panel et la méthode des moindres carrés non linéaires au cours de la période 2003-20. Les effets des coûts de pénétration du marché sur l'entrée des entreprises ont été examinés selon deux modes. Dans le premier mode, les coûts ont été considérés comme fixes et uniformes, tandis que dans le second mode, ils ont été considérés comme endogènes en fonction de la productivité des entreprises. Les résultats ont montré que lorsque les coûts étaient endogènes, l'augmentation de la productivité des entreprises facilitait leur entrée et augmentait le taux d'exportation. De plus, l'analyse de la croissance des taux d'exportation des entreprises a montré que le taux d'entrée avait l'impact le plus significatif sur la croissance des exportations de l'industrie cimentière iranienne. Ce même facteur a joué le rôle le plus remarquable dans l'évolution de l'indice de bien-être dans les pays cibles.

Keywords: cement export, Economic Welfare, Monopolistic Competition, productivity, Costs of Market Penetration

JEL Classification: F1, I31, D43, D24, M30

1. Introduction

Exports influence the GDP and result in strengthening production capacities and creating new capacities in that regard. Firms enter international markets and encounter their competitors, they have to adopt policies and programs to penetrate their target markets by considering the political circumstances of their countries. In countries like Iran that have been under economic sanctions for several terms, such policies and solutions can help firms to survive the competition and maintain a share for Iran in those markets. The market share is discussed in terms of monopolistic markets or oligopolies. In such circumstances, the rate of exports depends on the number of firms and their competitiveness in foreign markets. Thus, countries that have companies with higher competitiveness, can document higher rates of exports. In such markets, advertising is a significant behavioral market variable that can influence market performance in terms of sales and exports (Dehghani, 2015). Thus, advertising can consolidate firms' shares in their target markets based on the significance of their penetration in such markets, particularly in countries like Iran that have experienced the significant influence of economic sanctions on their export rates. In this regard, the cement industry is one of the strategic industries that play an indispensable role in the economic development of the country and its nationwide construction. The global production of cement in 2019 was 4120.46 million tons, which showed a 1.2% increase compared to the statistics of 2018 (3992.21 million tons). Moreover, the global consumption rate between 2018 and 2019 increased by around 3% and reached 4081.19 million tons. Iran's cement industry makes up 2% of the country's GDP, and the production of 89 million tons of cement in the country in 2019 made it the 10th major producer of cement in the world and the top producer in the Middle East (Iran Cement Association, 2021).

Calculations made by the researcher (using Herfindahl's index) on the market structure of the industry showed that the structure of the product had a monopolistic competition structure with an inverse Herfindahl Index of 29.41. Moreover, the market structure of Iran's cement industry in 2020, without taking into account the impact of ownership, was shown to be monopolistic with an inverse Herfindahl Index of 0.01. It should be noted that the market structure of the product in Iran, alongside other influential factors, has created obstacles to the industry's exports. In other words, the existence of negative competition between producers and

exports in the target countries has led to the export of cement to some countries at very low prices. As a result, this has influenced the import price index of the product in the target countries, and some countries have banned the import of Iranian cement or have placed heavy tariffs on it to prevent the cheap sales of cement (The Research Center of Islamic Legislative Assembly, 2021).

The present study aimed to find out answers to the following questions: “Can firms document high export rates if they face costs like market penetration costs?”, “If the penetration costs arise in monopolistic competition circumstances, how much is the share of such costs alongside other factors that influence the growth of the cement industry?” and “Based on the threats made by some target countries to ban the import of Iranian cement, what are the factors that influence such countries’ welfare index, and what is the share of the cost in the index?” Various models relevant to the activity of heterogeneous firms in monopolistic competition circumstances like the models of Dixit – Stiglitz (1977), Krugman (1980), Helpman (1990), Melitz (2003), Chaney (2008), and Dorfman and Steiner (1954), Grossman, and Shapiro (1984) were implemented to investigate the above questions. The second section of the study introduces the theoretical foundations of market penetration costs in monopolistic competition circumstances, the models relevant to the activity of heterogeneous firms in monopolistic competition circumstances, and the literature on the field. The third section presents the model and variables of the study. Then, the fourth section offers the analysis of the results, and the conclusion and suggestions for future studies are provided in section five.

2. Literature Review

Several theories have been proposed for market penetration costs and the activity of heterogeneous firms in monopolistic competition circumstances. The theories are briefly introduced below.

2.2. The theories of market penetration costs in monopolistic competition circumstances

The present study considered market penetration costs as the ultimate costs of access to a certain number of consumers in a market. Corporations need to spend money on marketing to access consumers in

any country, and the costs arise from the need to be stationed and establish distribution channels. Thus, market penetration costs are calculated as marketing costs according to the market size or population of a target country. As a result, the present section introduces theories that consider the costs of advertising activities in monopolistic competition circumstances according to the market size.

a. The Dorfman-Steiner theorem: It was one of the earliest official theories of desirable monopolistic advertising, which was proposed in 1954. According to the theory, any firm that could influence demands for its products via advertising set its advertising budget and expenditures in a way that any increase in the unearned income resulting from a one-dollar increase in advertising expenditures would be equal to the customary elasticity of demand for its product (Dorman & Steiner, 1954). The theory identified the main characteristics of the structure on which monopolistic advertising depended and offered a general framework in which theories of monopolistic advertising could be developed (Bagwell, 2007).

b. Grossman and Shapiro's model: The two researchers investigated the role of advertising in markets with advantage differentiation. According to the theory, every firm implements advertising as a competitive instrument to attract the customers of other corporations (Grossman & Shapiro, 1984).

Investigating theories offered on market penetration highlights international marketing costs in foreign trade, particularly when domestic markets have monopolistic competition or oligopoly structures. The providers of a particular class of commodities in a monopolistic competition structure offer product that vary in terms of quality and price. The products are not exact replacements for one another, and firms attract more customers by offering products that are cheaper and have better quality compared to the products offered by their competitors. As a result, consumers in international markets can have access to a wider variety of commodities in a particular class. The issue has been investigated by various theorists using monopolistic competition models, some of which are introduced below.

2.3. The models of monopolistic competition with heterogeneous goods

a. Dixit-Stiglitz's model: In monopolistic competition circumstances, commodities in a particular class, sector, or industry are suitable replacements for other commodities in the same unit, but they are considered poor replacements for commodities in other units of an economy. To investigate market solutions concerning the selection of an optimal choice, it is expected that demand for products depends on the substitution and cross elasticity of demand. To investigate this, the set of commodities preferred over others is indicated by subscript 0, and other potential commodities that can be selected are indicated by subscripts 1, 2, 3, and 000. For this purpose, in an imaginary utility function distinguishable by the levels of the indifference curve, the amounts of various products are specified as x_0, x_1, x_2, \dots (Dixit & Stiglitz, 1977):

$$\mathbf{u} = \mathbf{U}(\mathbf{x}_0, \mathbf{V}(\mathbf{x}_1, \mathbf{x}_2, \mathbf{x}_3, \dots)) \quad (1)$$

In the above model, it is assumed that function \mathbf{V} is symmetric, and all commodities have fixed and variable costs. Moreover, all commodities have a uniform income elasticity, and the utility function is linear. The utility function with the Constant Elasticity of Substitution (CES) is a utility function that makes it possible to investigate the relations leading to the selection of the commodities of a class. Thus, the CES was selected for the \mathbf{V} , and the function \mathbf{U} could be selected in any way desirable. In this regard, Krugman employed Dixit-Stiglitz's model to propose saving in the scale of production, which was known as the New Trade Theory.

b. Krugman's model: The model assumes the technologies, tastes, and factors of the trading partners are constant and proves that corporations in monopolistic competition circumstances can make their goods heterogeneous without spending any money. Each corporation has a certain level of monopolistic power in a state of equilibrium, and the entry of firms reduces the monopolistic profit to zero. Thus, it is assumed that when there are two countries having the trade costs of τ , an individual can select out of n products made inside the country and n^* products made outside of it. The price of the domestic product is the same money that the producer receives. However, foreign products are more expensive than the price determined by their producers. If foreign firms determine the

price at p^* , consumers in the country need to pay $\hat{p}^* = p^*/\tau$ for the product. Similarly, the foreign purchasers of a domestic product have to pay $\hat{p} = p/\tau$. As prices generally vary for the consumers of the products made in different countries, the consumption of any imported product differs from consuming its domestic counterpart (Krugman 1980).

Krugman's model, which proves the theories of globalization and free trade, includes all factors that influence trade interactions.

c. Helpman's model: Helpman investigated the rate of intra-industry trade by employing Krugman's model. In the model, the trade between countries depends on the size of the trading partners. Thus, assume a world where all sectors produce heterogeneous goods with similar priorities. Then, the import of product i from country j is equal to a ratio of the GDP of j (G^j). Assuming that expenditures are a ratio of the GDP, the volume of the bilateral trade can be obtained using the following formula (Helpman, 1990):

$$\mathbf{T}^{ij} = \mathbf{s}^i \mathbf{G}^j + \mathbf{s}^j \mathbf{G}^i = 2 \mathbf{G}^i \mathbf{G}^j / \mathbf{G} \quad (2)$$

In the above equation, G is the global GDP, and s is the ratio of the imports of the importing country to the exporting one. Thus, the volume of bilateral trade should be positively related to the income level. Moreover, using Equation 2, Equation 3 for the volume of the global trade can be obtained:

$$\mathbf{T} = \left[\mathbf{1} - \sum_i (\mathbf{s}^i)^2 \right] \mathbf{G} \quad (3)$$

In the above equation, the parenthesized term measures the dispersion of the relative size of the country. Consequently, in bigger countries, the share of trade in the GDP is higher.

When corporations decide to enter a particular target market according to its characteristics, factors like firms' productivity (Q) play significant roles in their competitive power. This factor, along with other costs of entry, can influence the survival of firms in their target markets.

Melitz (2003) proposed a model where he showed that the dynamic decisions of firms to enter and exit markets are influenced by hidden costs and the costs of trade. He investigated the effect of firms' productivity on entry to target markets in the face of trade costs. Moreover, Chaney (2008)

proposed a model where he showed that the threshold of productivity (Q_j^*) in each country (j) and the import price index (P_j) in target countries were two significant factors alongside firms' productivity that influenced entry to a target market, the strategic choices of firms whether to export, and the selection of target countries. In this way, comparing firms' productivity to the threshold of productivity in target countries indicates which firms are in optimal conditions ($Q \geq Q_j^*$) to enter target markets. It can be concluded that firms with lower productivity cannot make sufficient profits outside their countries to afford the fixed costs of entry to international markets. Thus, Chaney's model considers the rate of exports a function of the size of importing and exporting countries, firms' productivity, fixed and variable trade costs, and the elasticity of import substitution.

In general, investigating various theories proposed in the field of international marketing and the activity of heterogeneous firms in monopolistic competition circumstances showed that the advertising costs of heterogeneous firms in target markets were justifiable. Moreover, the elasticity of consumer demand in target markets was found to have a significant impact on advertising costs. Besides, it was found that in monopolistic competition circumstances, the productivity of firms was the most significant factor as it determined the activity of firms in the field of exports and influenced their entry to or exit from such markets.

2.4. A review of the related literature

Brakman et al. (2019) used Melitz's (2003) model to investigate and calculate the productivity of several small and large service and manufacturing companies in the Netherlands during 2010-16. They considered a productivity threshold to evaluate the investigated firms' exports and determine companies that had potential for exports. Then, they investigated the factors that influenced their exports. The findings of the study showed that productivity growth should be controlled in exporting companies, and the factors that influence this need to be identified. Variables like company size, the status of imports, and foreign ownership are significant factors that influence the future export activity of a company. Moreover, placement in more marginal areas does not increase the probability of exports, but being near borders can increase it. Costa et al. (2017) implemented the data concerning the productivity and size of manufacturing firms in Italy to calculate an export threshold using

the Receiver Operating Characteristics (RCO) curve. The researchers classified the firms' distribution proportionate to their productivity and export threshold using the threshold value. The results of the study showed that the entry of any firm into international markets significantly depends on its size and productivity. Moreover, even if firms have convenient size and productivity for exports, their survival will depend on domestic demand to a great extent. Mao and Zhang (2015) investigated the factors that influenced market penetration costs in China's export targets. First, the researchers calculated the market penetration index in China's export targets during 2002-14. Then, they investigated the factors that influenced the penetration rate of the Chinese market by implementing the gravity theory. They found that increasing the labor force costs had a significant negative impact on the MPR and was somehow compensated with the reduction in the costs of the country's trade with most of its trade partners. Moreover, the effects of an increase in productivity and the actual currency rate were negligible or very low from an economic perspective. Tavassoli and Azad (2021) investigated the effect of international marketing on improving the export performance of the companies exporting auto parts in Tehran. The results of the study, which were obtained using the Path Analysis, showed that customers' orientation had a significant effect on relationships and behavioral commitment. Moreover, it was shown that relationships had a significant effect on behavioral commitment and export performance. Shah Hosseini et al (2019) implemented the generalized method of moments to investigate the effect of the characteristics of firms and industries on the export intensity of industrial firms with ten or more employees. The findings showed that the intensity of R&D, the intensity of capital, and workforce productivity in the firm had a positive impact on the export intensity of the firms, while firm size, the focus of the industry, and workforce productivity in the industry had negative impacts. In Darvishi's (2011) thesis, the factors influencing firms' entry to and exit from export markets were investigated by highlighting the role of firm productivity. In the study, the factors that influenced firms' entry to and exit from export markets were investigated using Melitz's (2003) model. First, the researcher implemented the data obtained from 29 industries with three-digit ISIC codes during 2001-07 to calculate the productivity of exporting and non-exporting firms. Then, a Panel Tobit Model was implemented to investigate the effects of factors like real capital, human capital, the concentration index, and productivity on firms' entry to and exit from export markets. The results of the study showed that real capital and

human capital had negative and positive effects on the entry rates, respectively. Nevertheless, the effect was significant in some of the industries that exported their products to high-tech companies. Moreover, the depreciation of currency had a positive impact on firms' exit from the markets, which was due to the firms' reliance on imported raw materials.

Domestic and foreign studies showed that researchers tended to focus on productivity as a factor that influenced various firms' export rates and their survival in their target markets. In general, looking at domestic studies showed that the researchers investigated productivity in addition to the effects of marketing, advertising, and trade costs on the firms' export performance. However, no study was found to investigate the effects of the productivity of industries and productivity threshold for each destination country counting the hidden costs of the trade (e.g., the costs of accessing consumers). On the other hand, the threshold of productivity was analyzed in foreign studies.

3. Data and Methodology

In the present study, the model to investigate market penetration costs in monopolistic competition circumstances was based on the model proposed by Arkolakis (2010), which implemented the theories of Krugman (1980), Helpman (1990), Melitz (2003), Chaney (2008), Grossman and Shapiro's marketing theory (1984), Dorfman and Seiner (1954), and Bagwell (2007). The model assumed that commodities differed, and each firm might produce heterogeneous goods.

3.1. Introducing the model

To extract the implemented models, first, the distribution of the firms' productivity, an indication of the concentration of the industry (Axtell, 2001), was determined. When the productivity distribution is in the Pareto mode, random shocks do not change the predictions of the monopolistic competition model. In addition, if there is no significant heterogeneity in the investigated sample, the Pareto distribution can offer a convenient estimation for a balanced distribution (Luttmer, 2006).

Similar Simon & Bonini, 1958; Kortum, 1997; Luttmer, 2006; Arkolakis, 2009; and Eaton et al., 2010 it is assumed that the productivity of firms in country i is in the Pareto distribution in the form of $pdf g_i(Q) =$

$\theta b_i^\theta / Q^{\theta+1}$ and $\theta > \sigma - 1$. b_i shows the firm's technology level. Thus, the probability of the activity of a firm in the market j is related to the productivity of Q . if $Q \geq Q_{ij}^*$ is nominally $1 - G_i(Q_{ij}^*)$. Thus, the input values from country i to country j are obtained as follows:

$$\begin{aligned} M_{ij} &= J_i [1 - G_i(Q_{ij}^*)] \\ &= J_i b_i^\theta / (Q_{ij}^*)^\theta \end{aligned} \quad (4)$$

Moreover, the distribution of the firms can be obtained using Equation 5:

$$\mu_{ij}(Q) = \begin{cases} \frac{\theta(Q_{ij}^*)^\theta}{Q^{\theta+1}} & \text{if } Q \geq Q_{ij}^* \\ 0 & \text{otherwise} \end{cases} \quad (5)$$

In this section, two modes were considered for investigating the firms' exports to their target countries on the condition that $Q \geq Q_{ij}^*$:

1. Circumstances in which the ultimate costs of accessing more consumers are fixed ($\beta=0$). In such circumstances, the probability of accessing more consumers will equal 1 ($n_{ij}(Q) = 1$).
2. Circumstances in which firms engage in more extensive marketing endeavors according to their productivity levels. In such circumstances, the ultimate costs of accessing customers will be endogenous ($\beta>0$). Thus, based on the productivity threshold of each target country, more productive firms will be more likely to access ultimate consumers ($Q_1 \geq Q_2 \geq Q_{ij}^*$, consequently, $n_{ij}(Q_1) \geq n_{ij}(Q_2) \geq 0$).

Assuming that the firms' productivity is in the Pareto mode, $\frac{Q}{Q_{ij}^*} = [1 - Pr_{ij}]^{-\frac{1}{\theta}}$, where Pr_{ij} indicates the sales percentile of a firm in its target market compared to other Iranian firms in that market. Thus, the

relationship between the number of firms and the average sales to the market under ($\beta=0$) circumstances can be illustrated as follows:

$$\frac{\overline{X_{uj}}}{\overline{X_u}} \quad (6)$$

$$= \left[\frac{(M_{ij}/M_{ii})^{-1/\tilde{\theta}}}{1 - 1/\tilde{\theta}} - \frac{(M_{ij}/M_{ii})^{-1/\beta\tilde{\theta}}}{1 - 1/\beta\tilde{\theta}} \right] / \left[\frac{1}{1 - 1/\tilde{\theta}} - \frac{1}{1 - 1/\beta\tilde{\theta}} \right]$$

In the above equation, $\frac{\overline{X_{uj}}}{\overline{X_u}}$ is the average sales of Iranian firms to the market j normalized by their average sales in Iran.

Now, in the $\beta > 0$ mode in which a firm has sales both in domestic and international markets, the intensity of firms' exports can be determined using Equation 7.

$$\frac{r_{ij}(Pr_{ij})}{\overline{X_{ij}}} / \frac{r_{ii}(Pr_{ii})}{\overline{X_{ii}}} \quad (7)$$

$$= \frac{1 - (1 - Pr_{ij})^{-1/\beta\tilde{\theta}}}{(M_{ij}/M_{ii})^{-1/\tilde{\theta}} - (1 - Pr_{ij})^{-1/\beta\tilde{\theta}}(M_{ij}/M_{ii})^{-1/\beta\tilde{\theta}}}$$

Thus, both modes implement parameters β and θ to analyze the models of export growth and welfare growth.

3.1.1. Firms' growth in export

The relative sales elasticity of a firm in market j according to variable trade costs can be obtained using Equation 8:

$$E_{ij} = \left| \frac{\partial \ln X_{ij}}{\partial \ln \tau_{ij}} \right| \quad (8)$$

According to Leibnitz's rule, changes in the overall export sales of country i to country j can be divided into three parts due to the small changes in the variable costs of trade:

$$\begin{aligned}
\frac{dX_{ij}}{d\tau_{ij}} = & J_i \int_{Q_{ij}^*}^{\infty} n_{ij}(Q) \frac{d(p_{ij}(Q) x_{ij}(Q))}{d\tau_{ij}} g_i(Q) dQ \\
& + J_i \int_{Q_{ij}^*}^{\infty} \frac{dn_{ij}(Q)}{d\tau_{ij}} p_{ij}(Q) x_{ij}(Q) g_i(Q) dQ \\
& + J_i n_{ij}(Q_{ij}^*) p_{ij}(Q_{ij}^*) x_{ij}(Q_{ij}^*) g_i(Q_{ij}^*) \frac{dQ_{ij}^*}{d\tau_{ij}}
\end{aligned} \tag{9}$$

Equation 9 indicates the share of the orders placed by new ultimate consumers in the trade. The three terms on the right side of the equation represent intensive margin growth, new consumers' margin growth, and new firms' margin growth, respectively.

3.1.2. The consequences of welfare

Equation 10 shows the consequences of welfare of changes in trade costs:

$$\begin{aligned}
\log P_j = & \frac{1}{1-\sigma} \log \left[\sum_v J_v \left(\frac{\sigma}{\sigma-1} w_v \tau_{vj} \right)^{1-\sigma} \int_{Q_{vj}^*}^{+\infty} Q^{\sigma-1} \left(1 \right. \right. \\
& \left. \left. - \left(\frac{Q_{vj}^*}{Q} \right)^{\frac{\sigma-1}{\beta}} \right) g_v(Q) dQ \right]
\end{aligned} \tag{10}$$

In this way, welfare variations that result from the changes in import costs in the target country because of changes in the trade costs can be calculated, and various effects of the intensive margin growth, new consumers' margin growth, and new firms' margin growth can be analyzed using $\frac{d \ln P_j}{d \tau_{ij}}$.

3.2. The variables and statistical resources of the study

Based on the above notes, the introduction of the implemented variables, the manner of measuring them, and the related resources are offered in Table 1.

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Table 1: An introduction of the research variables

Name	Description	The Source
\bar{X}_{ij}	The value of Iran's cement exports to each country divided by the number of exporting firms (Arkolakis, 2010)	Firms' financial records and Research calculations
X_{ij}	The export value of each manufacturing firm to its target country	Firms' financial records and Research calculations
Q	The productivity of the total components of production in which the quantitative indices of labor and capital are combined with each other based on their share in the production portfolio (The Central Bank of the Islamic Republic of Iran, 2018)	Research calculations
Q_{ij}^*	A firm enters export markets only when the net profit of exporting to a certain country is sufficient to cover the fixed costs of trade. The zero-profit condition determines the productivity threshold of firms' entry into domestic and international markets. Moreover, it determines the balanced distribution of exporting and non-exporting firms and their average productivity (Zhai, 2008).	Research calculations
P_j	Calculated the total share of the importing country's prices to the destination country in every destination country (Anderson & Wincoop, 2003)	Trade map and Research calculations
τ_{ij}	The Iceberg cost was calculated by Novy's (2013) method. On the World Bank website, this variable is estimated for most countries	The World Bank

Source: The related literature and the calculations of the present study

3.3. The Statistical Samples

The producing firms are chosen to analyze the results of the information gathered from the firms' financial statements. The research sample consists of 36 firms that were members of the Iran's stock exchange till the year 2020, according to several active firms' available statistics on the Codal Website. By examining the stats and information of these firms, it was found that most of the required statistics are available in the year 2003. Therefore, the research period is between (2003 - 2020). On the other hand, there is a need to study the countries that are the destination for Iran's cement, considering the evaluation of Iran's cement export market. With the evaluation of the export periods till the year 2020, samples have been chosen from the countries which allocate the most share of Iran's export. Therefore, 12 countries of Afghanistan, Pakistan, Iraq, Armenia, Uzbekistan, Azerbaijan, Russia, Kazakhstan, Oman, Kuwait, UAE, and Qatar have been chosen as the countries for Iran's exports.

4. Empirical Results

In this section, the models offered in the third section were implemented to calculate Iran's average cement exports (four-digit ISIC codes) to each target country based on the data obtained from Iran's Cement Association concerning the number of Iran's exporting firms to each country in 2018 and the investigation of the annual reports released by the firms in the specified period. Then, the firms' productivity and the threshold of productivity in each country are estimated using econometric methods to distinguish the forms whose productivity exceeded the productivity threshold of the target countries (Ahmadi et al, 2022). The variables were used in other models as input variables to analyze the growth of export and welfare index in the target countries. They are discussed in more detail below.

4.1. The firms' entry to target markets counting the market penetration costs

At this stage, the productivity threshold of the target countries and the firms' productivity were investigated, and the firms whose productivity exceeded the threshold levels were introduced to the model for analysis. Then, the relationship between the firms' intensity of exports and their productivity according to fixed and endogenous costs is examined using

equations 6 and 7 (introduced in the third section), respectively. Explaining the equations is according to the main model. Estimating the parameters β and $\tilde{\theta}$, which were among the main goals of the estimation of the two models, was carried out using the Nonlinear Least Squares Method in RStudio. The method did not require the investigation of the variables' stationarity, and the variables were introduced to the model in their original values (Mahmoudi et al, 2010). The results are provided in Table 2.

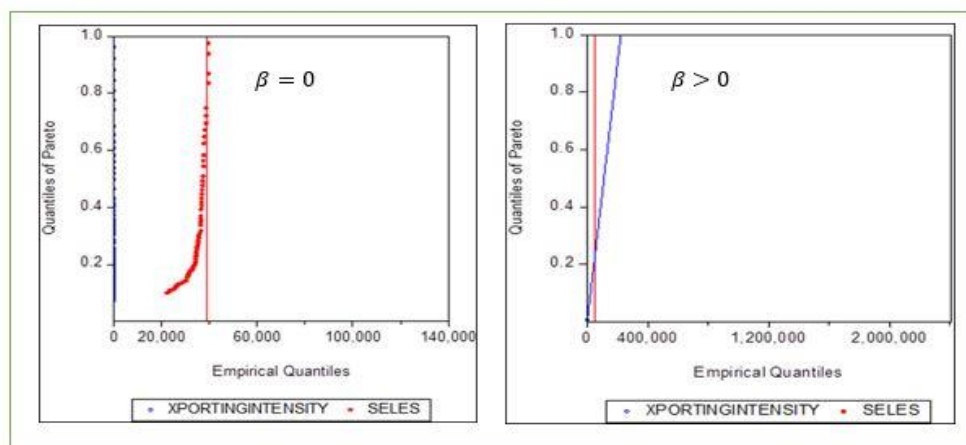
Table 2: The results of the estimation fixed and endogenous cost models

Cost/parameter	β	$\tilde{\theta}$	θ	Statistics (P-Value)
$\beta=0$	26	4	6	6.59 (0.000)
$\beta > 0$	0.37	1.33	2	3.49 (0.000)

Source: Research finding

Using the parameter $\tilde{\theta}$ extracted from the estimation of equations 6 and 7 in Table 4, the Pareto chart of each equation with a slope of $\frac{1}{\tilde{\theta}}$ was drawn (Figure 1).

Figure 1: The relationship between the firms' sales and exports in their target markets according to fixed and endogenous costs



Source: Research findings

As illustrated in Figure 1, when penetration costs are endogenous (i.e., firms carry out marketing endeavors according to the level of their productivity), the more significant entry of the firms to target markets increases the intensity of exports. However, when penetration costs are considered fixed for all firms, the intensity of exports is not proportionate to the firms' sales. This is an indication of the significance of international marketing endeavors in target markets according to the levels of productivity, which result in higher rates of exports. Thus, the relations required to answer the research questions are considered according to the endogenous costs of market penetration in the following sections.

4.2. The growth of the firms' exports in relation to the changes in the trade costs

The significant growth of international trade over the past few years has not been achieved without obstacles. On the one hand, tariff and non-tariff obstacles still exist and vary in strength in different regions. On the other hand, the trade costs as obstacles to trade have remarkable effects on the patterns of trade (Marti & Puertas, 2019). In the present study, the effect of trade costs on the rate of trade was investigated using Novy's (2011) trade cost measure. The advantage of the measure is that it covers a wide range of the components of the trade costs. The costs include items like transportation fares and tariffs. Moreover, it includes other components that are hard to observe and calculate (e.g., linguistic barriers, information costs, and administrative formalities as collecting their statistics over longer periods is very difficult due to the intense limitations of the data). The derived trade costs are a way to overcome this problem as it offers a measure of the costs of international trade. The measure can be used not only for studying the international trade, but it can be helpful for other applications that require the calculation of the time taken for mutual market integration. Thus, the trade costs can be estimated using Equation 11:

$$\tau_{ij} \equiv \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} \right)^{\frac{1}{2}} - 1 = \left(\frac{x_{ii}x_{jj}}{x_{ij}x_{ji}} \right)^{\frac{1}{2(\sigma-1)}} - 1 \quad (11)$$

In this equation, τ_{ij} represent the costs of bilateral trade, t_{ji} and t_{ij} are the costs of foreign trade, t_{jj} and t_{ii} are the costs of domestic trade, x_{ii} and x_{jj} represent the rate of domestic sales, and x_{ij} and x_{ji} are the rates of each country's foreign sales (Novy, 2011). In this way, variations

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in the growth of Iran's exports to a selected group of countries were calculated based on the changes of the bilateral trade between Iran and the countries and counting the market penetration costs. Then, variations in the growth of export rates is examined (Table 3).

Table 3: Separating of average growth factors affecting export growth of target countries

growth of the entry of new firm	growth of new consumers	intensive growth	country
0.80	0.03	0.13	Afghanistan
0.59	0.20	0.54	Iraq
0.64	0.10	0.30	Pakistan
0.32	0.07	0.16	Armenia
0.39	0.17	0.44	Uzbekistan
0.09	0.47	0.82	Russia
0.52	0.13	0.34	Oman
0.55	0.17	0.26	Kuwait
0.42	0.19	0.37	UAE
0.51	0.13	0.34	Kazakhstan
0.99	incomputable	0.002	Qatar
0.79	0.09	0.15	Azerbaijan

Source: Research findings

The analyses of this section (Table 3) shows that the increase in cement exports due to variations in the trade costs of various countries has diverse forms of elasticity. Then, separating the factors that could influence the growth of exports showed that when each one of the factors increased in all of the investigated countries, the rates of exports grew, as well. However, the factors were found to influence the growth of exports differently in the investigated countries. Thus, in the majority of the countries, For example Afghanistan, Pakistan, Armenia, Kazakhstan, the UAE, Oman, Kuwait, Azerbaijan, and Qatar, the entry of new firms was one of the most significant factors in the growth of exports. In countries like Iraq, Russia, and Uzbekistan, market concentration played the most remarkable role in the growth of exports. New consumers' margin growth showed that Russia ranked first (0.47), while Iraq (0.20), the UAE (0.19), Uzbekistan (0.17), and Kuwait (0.17) ranked next. It should be noted that investigating the markets of the above countries showed that Iran had a significant number of export competitors in them. On the other hand, applying the costs of penetration in markets like Russia and Iraq, which attracted a lot of counties, could play a remarkable role in the growth of

exports. The same was for countries like the UAE, Uzbekistan, and Kuwait. However, investigating countries like Afghanistan and Armenia showed that Iran's competitors were the least compared to other countries. In other words, Iran had the highest export tonnage during the investigated period. Thus, new consumers' margin growth in Afghanistan and Armenia had the lowest rate of growth (0.03 and 0.07, respectively).

4.3. Separating the effects related to the growth of factors influencing the welfare of the cement export targets

This section investigates and analyzed the average welfare growth of each country during 2003-20 according to the growth of the intensive margin growth, new consumers' margin, and new firms' margin. The results are provided in Table 4.

Table 4: Separating of the average growth of the factors affecting the growth of the welfare of the target countries

growth of the entry of new firm	growth of new consumers	intensive growth	country
0.72	0.006	0.27	Afghanistan
0.55	0.09	0.56	Iraq
0.52	0.03	0.44	Pakistan
0.04	0.04	0.94	Armenia
0.58	0.03	0.38	Uzbekistan
0.81	0.05	0.13	Russia
0.92	0.008	0.06	Oman
0.68	0.03	0.28	Kuwait
0.52	0.07	0.29	UAE
0.86	0.009	0.12	Kazakhstan
0.52	incomputable	0.48	Qatar
0.65	0.01	0.32	Azerbaijan

Source: Research findings

The results illustrated in Table 4 were not unexpected. The increased rate of the establishment of manufacturing firms in the country, the economic depression, and the negative competition between manufacturers to increase their shares of the target markets influenced the target markets.

Thus, it could be seen that out of the above three factors, the entry of new firms to the target markets had the most significant effect on the welfare of the majority of the companies, and the intensive margin growth ranked next. Thus, it was found that the share of the market penetration costs, which could result in the growth of new consumers in the target markets, was negligible during the investigated period. Consequently, it could be concluded that based on the effects and consequences of the penetration costs on the growth of exports, governments and firms needed to put the factor on their agenda to penetrate their target markets and influence the welfare of their countries.

5. Conclusion

Various models on international marketing and the activity of heterogeneous firms in monopolistic competition circumstances were introduced in the present study to better understand the factors that influenced firms' entry to target markets. Then, the statistics and information on Iran's cement producers during 2003-20 were implemented to analyze the firms' entry according to the size of the target markets and the market penetration costs. Two modes of penetration costs were considered in the investigation of the effects of market penetration costs. In the first mode, penetration costs were considered fixed and uniformed for all firms. On the other hand, the second mode considered the costs as endogenous according to each firm's productivity. The results obtained from nonlinear programming showed that when the costs were endogenous, the rates of sales and the firms' entry into target markets increased. As a result, their sales would improve. Thus, variations in the growth of exports and welfare were investigated relative to variations in the trade costs according to endogenous costs. The results of the investigations showed that when the firms included the penetrations costs in their export activities according to the level of their productivity, this could have diverse effects on the growth of exports in each country. For instance, in countries like Afghanistan and Armenia where Iran is a major exporter and the most powerful competitor for other exporting countries, the effects of the costs were less pronounced. On the other hand, the costs had a more significant share of the firms' exports in countries like Russia, Iraq, and the UAE where the number of export competitors was much higher. In addition, investigating the growth of welfare during the specified period showed that the new firms' margin and intensive margin growth had the most significant impacts on the

selected countries. This showed that the status of the cement industry inside Iran influences other countries, as well. Thus, as the establishment and operation of firms increased over the past few decades, variations in the import index of the target countries were influenced by it. As a result, the following suggestions could be made:

1. A firm's productivity has a direct relationship with its export rates. The relationship is so strong that in each target market, firms can influence the market penetration costs according to the level of their productivity.
2. Investigating the markets of the target countries shows that Russia, Iraq, the UAE, Kuwait, Uzbekistan, and Qatar are attractive choices for a lot of cement-exporting countries. Moreover, research findings indicate that the costs of penetrating such markets – compared to others - play a more significant role in the growth of exports. Thus, international marketing studies, branding activities, and the enhancement of economic diplomacy should be highlighted more than ever in them.
3. Analyzing the growth of welfare in the target countries shows that the intensive margin growth and new firms' margin are more influential on the index compared to the new consumers' margin. Thus, if firms and governments intensify their endeavors in the field of market penetration and try to introduce their products to their ultimate consumers in various ways, they can overcome domestic and foreign threats and barriers.

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