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RESEARCH PAPER

The Impact of Market Penetration Costs and Rival Countries' Exports on Iran's Cement Export Profits in an Oligopoly Framework[1]

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Abstract

This research is devoted to Iran's cement export market, one of Iran's primary and strategic industries, considering the significance of non-oil export developments. This study aims to determine the effect of market penetration costs and rival countries' exports on the profits of Iran's cement export heterogeneous firms. Thus, using the models by Melitz and Chaney, panel data, and dynamic panel econometrics, the impacts of the investigated factors on the export markets of Iranian cement were studied from 2003 to 2020. The results showed that the effect of market penetration costs on the export profits of firms was negative, and around 45%. The results of estimating the model under oligopoly conditions using Stackelberg's method showed that competitors' exports had a negative impact on Iran's annual cement exports at almost 4%. Moreover, it was found that the share of penetration costs increased to 58% showing the significance of this effect on the country's export profits.

Keywords: Cement Export, Export Development, Market Penetration Costs, Oligopoly Market, Rival Countries' Exports.
JEL Classification: F1, M30, D43.

1. Introduction

The development of international trade is one of the primary factors in economic growth. In a way, least developed and developing countries have located themselves in global trade by utilizing international trade, benefiting from

[1]. This paper is an extract from a PhD thesis.

economic growth, and locating themselves next to developed countries (Neely and associates, 2020). Therefore, the industrial production section is the ultimate stimulus for the country's economic growth and increasing national income. The cement industry is one strategic industry that plays a crucial role in economic growth and national development. In 2018 Iran achieved the 11th and 10th position worldwide in order of production amount and production capacity (Chehregani, 2019), while in the same year, Iran allocated a 5.8% share of exports among the top 10 countries with amount of 6.5 million tons of cement exports (The union of cement employers of the Iran, 2021). The cement industry has a monopolistic structure in the global market considering the inverse Herfindahl index (23.86). The calculations on the amount of focus on Iran's cement industry (Herfindahl index 0.04 in 2003 and 0.01 in 2020) show a decrease in the industry's monopolistic power. Reviews show domestic trade barriers such as export motives, management understanding of the firm's globalization, firms' experience in marketing and exports, firms' growth, excess capacity, and foreign trade barriers, including domestic market limited opportunities, government trade policies, environmental change, and unsolicited order by foreign countries are among the barriers of the trade within this industry (Iran's parliament research center, 2020).

As some studies paid attention to the marketing potential of entrepreneurial firms in studying the export markets of a country (Behzadnia and Senobar, 2019), Dehghani and Sheikh (2016) focused on the intensity of studies and advertising, Darvishi (2011) focused on the role of real capital, human capital, and the concentration of firms on their export markets, and Dimmerhan (2016) investigated firm size, workforce productivity, profitability, technology, marketing costs, capital intensity, credit restrictions, liquidity ratio, and the actual currency rate in export markets, the present study concentrated on the effects of the costs of penetration into target markets and the exports of competitors on Iran's cement exports in Stackelberg's oligopoly conditions according to Iran's economic structure and the combination of the models proposed by Melitz (2003) and Chaney (2008). For this purpose, this research is divided into five sections. The second section is assigned to theoretical foundations and similar studies following the introduction. The third section introduces variables, and the fourth and fifth sections will be assigned to analyze the results and set the conclusions.

2. Theoretical Foundations

In this study, market penetration costs are considered the accessibility cost to an exact number of consumers in a market. Firms sustain marketing costs to reach the consumer in various countries. These costs occur through distribution channels and establishments. Therefore, the market penetration cost will be calculated considering the market cap and the consumer country population. This section is devoted to the theories that took market activity costs for selling the product considering the consumer country population in a monopoly market structure.

2.1 Market Penetration Cost Theory

- **Dorfman–Steiner** theorem was one of the first formal theories of the optimal level of advertisement in 1954. a firm that can influence the demand for its product by advertising will, to maximize its profits, choose the advertising budget such that the increase in gross revenue resulting from a one-dollar increase in advertising expenditures is equal to the ordinary elasticity of demand for the firm's product. Advertising cost means any expenditure that influences the form or position of a firm's demand curve and enters the firm's cost function as a fixed cost (Dorfman-Steiner, 1954).

This theory recognizes the main attributes of monopolistic advertising and provides a framework for developing more advanced theories on monopolistic advertising (Bagwell, 2007).

- **Grossman and Shapiro**'s model analyzes the role of advertising in the markets with heterogeneous goods. According to this model, each firm uses advertising as a competitive tool to attract customers away from other firms. In cases where products are homogeneous, this socially unproductive expense of resources is undoubtedly the predominant effect of advertising because once a consumer is aware of at least one brand, the social benefits of more advertisements to that consumer are zero (if the price is the same for all firms). Therefore, studying advertising in a homogeneous product setting is inappropriate and possibly misleading. If products are heterogeneous, we must consider the social benefit deriving from the improved consumer awareness of the brand (Grossman and Shapiro,1984).

2.2 Monopolistic Competition and Product Diversification

- The Melitz Model, the most important innovation of this model is introducing the dynamic, forward-looking entry decision of firms facing hidden costs. Firms face these costs not just for their domestic market but also for any potential export market. These costs are in addition to the trade costs. Melitz shows within this model that the export market entry costs depend on various firms' distribution and diversified products in the export market, affecting the country's prosperity. One of the significant attributes of this model is that it can predict the impact of trade policy on inter-firm reallocations. These trade policies can be transient costs or transitional costs, and there is a possibility that they are overlooked in the process (Melitz, 2003).

According to this model, export causes various countries to join the global economy when additional trade costs are erased. However, the evidence shows that export firms face variable costs such as transportation, tariffs, and fixed costs based on export volume. Firms in differentiated product industries face significant fixed costs associated with entry into export markets.

Firms that export will set higher prices in foreign markets. The revenues are earned from domestic sales and export sales in every market, so $r_d(Q) = R(P\rho Q)^{\sigma-1}$ and $r_x(Q) = \tau^{1-\sigma} r_d(Q)$, where (R) and (P) denote the expenditure and price index in every country. The balance of payments condition implies that R also represents the revenue of firms in any country. The combined revenue of a firm, $r(Q)$, depends on its export status, so If a firm does not have exports: $r(Q) = r_d(Q)$ and $r(Q) = r_d(Q) + nr_x(Q)$ if the firm exports to all countries.

- Chaney Model (2008), Chaney expanded the Melitz model. He considered a world with many symmetrical countries, separated by asymmetrical barriers. He then studied the strategic choices of firms to export or not and which countries they target to export. Chaney embeds his model in a global equilibrium that generates predictions for the structure of bilateral trade flows. Therefore, it can be pinned down which firm from which country can enter a market and how it is affected by competition from domestic and other foreign firms, even in the presence of asymmetric bilateral trade barriers. The fixed costs associated with exports and the heterogeneity of the firms' profit are also added to this model.

The firm in each selected target country sets prices for its goods. Consumers choose the quantity consumed of each good by its domestic given price. All agencies move simultaneously. Firms decide whether to enter a market depending

on how much competition they expect to face in that market. The productivity threshold and equilibrium price index affect the firms' entry into target markets.

According to the productivity threshold, less productive firms cannot generate enough profits abroad to cover the fixed cost of entering foreign markets. Therefore, only a subset of domestic firms by defining the productivity threshold as Q_{ij}^{*} with the profit rate $\pi_{ij}(Q_{ij}^{*}) = 0$ as the productivity of the least productive firm in the country (*i)* able to export to the country (*j)* then :

$$\mathbf{Q_{ij}^{*} = \lambda_1 (\frac{f_{ij}}{Y_j})^{1/(\sigma-1)} \frac{w_i \tau_{ij}}{P_j}} \quad (1)$$

λ_1 is a fixed coefficient, and f_{ij} and τ_{ij} are the fixed costs and variables of the trade. It is assumed that trade costs are high enough where $Q_{ij}^{*} > 1$.

According to the productivity threshold, the set of firms that export to the designated country depends only on country (*j*) characteristics. by using the productivity thresholds from (Equation 1), equilibrium price and equilibrium exports are $x_{ij}(Q)$ gathered.

$$\mathbf{P_j = \lambda_2 \times Y_j^{1/\gamma - 1/(\sigma-1)} \times \theta_j} \quad (2)$$

$$x_{ij}(Q) = \lambda_2 \times (\frac{Y_j}{Y})^{(\sigma-1)/\gamma} \times (\frac{\theta_j}{w_i \tau_{ij}})^{\sigma-1} \times Q^{\sigma-1}, \text{if } Q \geq Q_{ij}^{*} \quad (3)$$

In asymmetric cases, θ_j is a weighted average of bilateral trade barriers. The amount of output Y and w_i is the amount of labor wage in the country i. In (Equation 3), exports are a function of destined and origin countries, firms' profit, fixed and variable costs, and substitute elasticity of import. Concerning that, not only do the variable costs increase the amount of export but also make ways for new firms to enter the trade.

According to the theories mentioned, advertisement costs are rationalized only when heterogeneous firms operate in the target market. Also, it depends on the consumer's elasticity of demand and the firm's position in the market. Therefore, advertisement costs are notable concerning the target country population as the market penetration cost. Also, the study of monopolistic models that analyze heterogeneous export firms shows that the firm's profitability as the most determining factor of the firm's export activities can be critical for the firm's entry and exit into export markets. Meanwhile, firms face entry costs while entering export markets, such as opportunity costs, sales, advertisement, etc.

3. Literature Review

Behzadnia and Sanoubar (2019) studied the impact of marketing skills on Iran's agricultural entrepreneurial firms' revenue of exports. The statistical population in this study includes the firms with export revenues in the years between 2015 and 2017. They surveyed 423 CEOs and executives of the trading firms. The result of this study, which was achieved by using the modeling and structural equation, showed that marketing skills do not directly affect the export firms' revenue, and they affect the export firm's profits by increasing their competitive advantages. Dehghani and Sheikh (2016) examined the mutual relation between functional variables and market behavior in Iran's workshops active in woodcraft productions (on a four-digit basis) between the years 1995 to 2011. Therefore, the advertising intensity and research intensity variables are considered market behavior variables, and export intensity as a functional variable is used in Iran's woodcraft productions. The result of this study achieved by estimating the seemingly unrelated regressions model showed that advertising intensity and research intensity variables have a positive and significant effect on Iran's woodcraft exports. Darvishi (2011) emphasized the firms' productivity as a crucial factor in the firms' exit and entry into export markets in his thesis. He used Melitz's (2007) model to examine the crucial effects of the firms' exit and entry into the export markets. Using the data gathered from 29 companies' ISIC 3-digit industry code between the years 2001 to 2008, he calculated exporting and non-exporting firms' productivity. Using the Tobit panel mode, he then examined the impact of factors such as real capital, labor capital, focus index, and productivity on firms' exit and entry into export markets. This research showed that real capital had a negative effect while labor capital positively affected the market entry rate.

Meanwhile, productivity significantly affected firms exporting their products to high-tech countries. Also, the decrease in the value of money positively affected firms' exit rates from the market, which explains the firm dependability on imports and raw materials. Demirhan (2016) analyzed the crucial factors of Turkey's production firms' entry and exit using the discrete-time model. He used Roberts and Tybout model (1997) to analyze the firms' decisions in export markets. The study collected data from 654 companies, such as balance shit, income statements, employment, date of establishment, firm location, and legal status from 1989 to 2010. the variables used in this research include the size of the firm (small, average, and large), labor productivity, profitability, technology and marketing costs,

capital intensity, credit limit, liquidity rate, and real exchange rate. According to this research, the average amount of time it takes to be an exporter is 4.4 years, and the amount of time to enter the market is four years. Also, the symmetrical impacts of the firm's size, productivity, credit limit, and marketing investments on export dynamics are shown by analyzing the firm's level. Mao and Zhang (2015) examined the market penetration rates of the Chinese export destination countries; they calculated the market penetration rate index in the Chinese export destination countries between 2002 and 2014 and then used the gravity equation to analyze the significant factors in china's market penetration rate. The result showed that the increased labor costs had a considerable negative effect on the MPR, and the effect was compensated to an extent by decreasing the country's trading costs with its trading partners. At the same time, productivity growth and real exchange rate increase had little or no effect in economic terms. Melitz (2003) wrote an essay adapting to the Krugman monopoly competition with heterogenous goods model and examined the impacts of Intra-industry international trade on firms. He developed the Krugman model. The Krugman model shows that only the firms with high levels of productivity can enter the export markets, and the firms with lower productivity stay in the domestic market meanwhile the firms with the least amount of productivity exit the market. The Melitz more developed model shows how the industry's productivity growth increases because of the reallocation of prosperity in trading. Therefore, it mentions the profits made from trading, which have not been mentioned in the past model. The characteristics of this model include the heterogeneity of the firm's goods, different productivity, and monopolistic competition market. In this model, entering the export market includes costs, and the firm's decision to enter the market is made after they know their amount of productivity. If the firm's productivity level moves to an upper level of its threshold, the firm engages in exports.

Examining the domestic studies shows that researchers generally paid attention to the impacts of marketing, advertising, and trading costs on export revenue. While the researchers considered the two variables as exogenous ones, the present study considered international marketing as the market penetration cost according to the market size of each targeted country. Furthermore, they also reviewed the productivity variable as a crucial factor for the firm survival in domestic and foreign markets. However, all these researches have overlooked the impacts of the industry's productivity and productivity threshold for each country

without considering the hidden costs of the trade (i.e., the cost of reaching the consumers) that the gap was dealt with in the present study. Analysis of foreign research shows that researchers noted variables such as productivity and variable and fixed costs of trading in studying export revenues of production firms in various market structures as a crucial fact in the firms' survivability. However, none of these studies have mentioned the impacts of the rival countries' exports on the origin country's export profit and studying the items contributes to the strength of the study if the structure of monopolistic competition and oligopoly conditions are taken into consideration. Thus, considering a productivity threshold for the targeted countries, the effects of market penetration costs on Iran's cement exports, and the exports of the competitor countries under Stackelberg's oligopoly conditions can be regarded as the major contributions of the present study.

4. Research Methodology

Based on the research goals, first, the research hypotheses were introduced and then the Arkolakis monopoly model was chosen for this study, considering the impacts of market penetration costs on export profit. Then by utilization of that model, the effect of the rival countries' exports on the firm's export profits would be explained by the Stackelberg market structure.

4.1 Research Hypotheses

1. Market penetration costs influence the profitability of Iran's cement exports.
2. When oligopoly dominates the global market, the cement exports of the competitor countries to the target markets of the cement industry have negative effects on the profitability of Iran's cement exports

4.2 Introducing the Model

Suppose that a country with a population of j has a subset of L_j which $L \in [0, L_j]$ consumers who have access to a Ω_j^l set of diversified products.

There are a set of J_i firms in any given country i, with different productivity levels of (Q). We assume there is a symmetrical equilibrium in which the firms with (Q) from the i country face the product price of P_{ij} in the destined country $P_{ij}(Q)$. Therefore, there is an $n_{ij}(Q)$ probability for them to reach their consumers. A high number of firms means that every consumer in the j country faces an equal distribution of diversified products. The existence of a high number of consumers

in the j country means the total amount of consumers who are the customers of the firms with (Q) productivity in the **i** country is equal to $n_{ij}(Q)L_j$.

Firms use the constant returns to scale technology. Work labor is only a factor of production. Delivering a unit of good from origin i to destination j requires trade costs of $\tau_{ij} \geq 1$ per unit to be produced and delivered. The condition for a firm to enter the j market to reach consumers is gaining profit amount of the equation below.

$$\pi_{ij}(p,n;Q) = nL_j y_j \frac{p^{1-\sigma}}{P_j^{1-\sigma}} - nL_j y_j \frac{p^{-\sigma}\tau_{ij}w_i}{P_j^{1-\sigma}Q} - w_j^{\gamma} w_i^{1-\gamma} \frac{L_j^{\alpha}}{\psi} \frac{1-(1-n)^{1-\beta}}{1-\beta} \quad (4)$$

The firms' total profit is the sum of profit made in destination countries. Furthermore, we analyze the impact of rival countries' exports on the cement export firm's profits by using this model.

4.3 The Impact of the Foreign Rival

Countries usually compete to increase their share of profitable international markets (Brander and Spencer, 1985). In this section, we will use the Stackelberg market structure to examine the impact of rival countries' exports on Iran's export profit, including the penetration costs. Therefore, we make three assumptions. The goal of every country is to make an oligopoly market structure, two countries make substitute goods and sell them to the third country, and there is only one decision variable for every country, which is the amount of its exports.

In the Stackelberg market model, we need the leader and the follower countries' profit function and reaction function to measure their export profit function. That being the case, the leader country's profit function acts as a function of rival countries, and the leader country's export, the leader country's variable costs, and the leading country's penetration costs. The profit function of the follower country is derived from the export level of the follower country to get the reaction function of the follower country, in which the following country's exports are a function of the leading country's export. The reaction function of the leader country is obtained by placing the reaction function of the follower country in the leader country's profit function.

Therefore, Iran's rival countries in exports are specified in every target market and then utilized with the model provided by Asgari and Saghaian (2013)

(Equation 5) to calculate the demand function of exports (reaction function) for the rival countries. This function applies to every country. With the identification of variables of the demand function, the variables needed for every rival country and target country between 2003 and 2020 are gathered in the shape of Panel data.

$$\ln p_{jt} = \alpha_{i0} + \beta_{jj}\ln q_{jt} + \beta_{ji}\ln q_{it} + \beta_{ig}\ln y_t \quad (5)$$

In this equation, the *j*, *i*, *t*, and ***g*** indexes are relative to the exporting country, rival country, year, and target country. p_j being the exported goods price of the exporting country, q_j the amount of export by the exporting country, q_i the amount of the rival country's export to the target country, and y the target country's income per capita.

In continuation, (Equation 4) is used to extract the rest of the equations. Therefore, if we consider two rival countries in the target market, while i is the leading country and r is the follower country, the profit function of the leader company is:

$$\pi_{ij} = p_i(q_i + q_r)q_i - \frac{\tau_{ij}w_i}{Q}(q_i) - w_j^{\gamma}w_i^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta} \quad (6)$$

4.4 Research Variables and Statistical Sources

Regarding the information provided in previous sections, variables are introduced to calculate the firm's profit and extract the relation of the amount of exports with the market size and the country's productivity threshold. The description of these variables and their sources are mentioned in Table 1.

Table 1. Research Variables Introduction

The Source	Description	Variable name
Research calculations	The export firms' profit made from exporting cement to the destination countries in the year (*t*) Arkolakis (2010).	$\boldsymbol{\pi_{ijt}}$
Firms' financial records and Research calculations	The value of the firm exports to the destination country in the year (*t*).	$\boldsymbol{q_{ijt}}$
Trade map and Research calculations	the price of the exported cement to the destination country (fixed for every firm)	$\boldsymbol{p}$
The world bank	The destination country's population	$\boldsymbol{L_j}$
Arkolakis (2010)	The absorption per capita from the sum of production and exports of the country, minus the exports of that country divided by its population	$\boldsymbol{y_j}$

International Labor Organization	The minimum wage in every country	w
Bajzik et al. (2020)	The substitute elasticity of exports is the substitute elasticity between the domestic and foreign products of the country	$\boldsymbol{\sigma}$
Anderson and Wincoop (2003)	Calculated the total share of the importing country's prices to the destination country in every destination country	$\boldsymbol{P_j^{1-\sigma}}$
The World Bank	The Iceberg cost was calculated using Novy's (2013) method. On the World Bank website, this variable is estimated for most countries	$\boldsymbol{\tau_{ij}}$
Arkolakis (2010)	The cost per unit of advertisement according to the labor needed to attract consumers	$\boldsymbol{\psi}$
Parameters of the model		
Ahmadi et al. (2022)	The market size factor expresses the robust relationship between the firms' entry and the market size in export markets	$\boldsymbol{\gamma}$
Ahmadi et al. (2022)	The market size factor expresses the robust relationship between the firms' entry and the market size in export markets.	$\boldsymbol{\alpha}$
Ahmadi (2022)	The internal determining parameter ($\beta > 0$) or fixed ($\beta = 0$) market penetration costs, the internal parameter is estimated (0/37) in this research, meaning that the firms participate in marketing activities based on their productivity model	$\boldsymbol{\beta}$
Variables of the demand function of exports		
Trade map and Research calculations	The exported goods price of the exporting country in the year (t)	$\boldsymbol{p_{jt}}$
Trade map	The amount of exported goods by the exporting country in the year (t)	$\boldsymbol{q_{jt}}$
The World Bank	the income per capita of the target country	$\boldsymbol{y}$

4.5 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 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 were available in 2003. Therefore, the research period is from 2003 to 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 2020, samples have been chosen from the countries that allocate the most share of Iran's exports. 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.

5. The Analysis of the Results

The main goal of this section is to study the impact of the market penetration costs on exporting firms, in which the amount of their productivity is more than the productivity threshold of entering countries. Therefore, to answer the first research hypothesis, adapting to Arkolakis's (2010) study. The export profit rates for every firm are considered as $\frac{X_{ij}}{\sigma}$, Ergo, all the firms that participated in cement exports between 2003 and 2020 are categorized by country. Finally, the required stats are used to estimate (Equation 4) in the shape of Panel Data (Appendix 1). With the determination of the variables required stats, variables logarithm were used to measure the elasticity of export profits relative to each variable. Then, for the stationary process of each variable, The Dicky-Fuller generalized test is used in Sata11 software. The results are shown in (Table 2).

Table 2. Dickey-Fuller Generalized, Chow, Hausman Tests Results

Variables	(x^2) Chi-sq.	P-Value	Status
$ln\pi_{ij}$	604.19	0.000	stationary
$lnL_j y_j \frac{p^{1-\sigma}}{P_j^{1-\sigma}}$	82.12	1.000	no Stationary
$Lag(1) lnL_j y_j \frac{p^{1-\sigma}}{P_j^{1-\sigma}}$	184.87	0.01	Stationary
$lnL_j y_j \frac{p^{-\sigma}\tau_{ij} w_i}{P_j^{1-\sigma} Q}$	234.29	0.000	Stationary
$lnw_j^{\gamma} w_i^{1-\gamma} \frac{L_j^{\alpha}}{\psi} \frac{1-(1-n)^{1-\beta}}{1-\beta}$	85.23	1.000	no Stationary
$dlnw_j^{\gamma} w_i^{1-\gamma} \frac{L_j^{\alpha}}{\psi} \frac{1-(1-n)^{1-\beta}}{1-\beta}$	329.35	0.000	Stationary
Test type	**statistics**	**P-Value**	**Result**
Chow	3.58	0.000	panel model
Hausman	1.23	0.87	The model has random effects

Source: Research finding.

The stationary process of variables shows that the logarithm of the profit variable is on a stationary level, but the variable of the total income with a break, the variable of the variable costs with a trend, and the variable of penetration costs stationaries with a differentiation. First, the ordinary OLS and Fixed Effect models were utilized to diagnose whether the model is Pooled or Panel. The result of the Chow test showed that the model is a Panel model. Then to diagnose whether the model is a fixed or a random effect model, the Hausman test showed that the model includes random effects. Because of the existence of stationary and non-stationary variables in the model, The Kao Cointegration test was used to avoid false regression and prove there is a long-run equilibrium relationship between the variables. This test also considers the width of individual interception in collaborative relationships. It is not possible to consider the trend in this test. The statistical significance of this test shows a long-run equilibrium relationship between the research variables. Therefore, there is no false regression between the variables of the dynamic panel data model (Samedi and associates, 2013). The results are shown in (Table 3).

Table 3. Kao Residual Cointegration Test

Test	t-Statistic	P-Value
Kao	4.10	0.000

Source: Research finding.

The significance of Kao's test indicates a long-run equilibrium relationship between the research variables. In continuation, the dynamic panel-data model is used with the generalized method of moments (GMM) Arellano-Bover/ Blundell-Bond Dynamic Panel Data Two-Step Estimator. As a conventional econometric model, the generalized method of moments (GMM) includes lagged dependent variables. Therefore, it is also called the dynamic tabular data model. Arellano and Bover (1995) and Blundell and Bond (1998) made some alternations in the differential one-step GMM model and came up with the orthogonal GMM method. The difference between the Arellano-Bond and the Arellano-Bover/ Blundell-Bond method is the approach that individual effects include in the model. One of the benefits of the second model over the first model is the increased accuracy and the distortion of the sample volume limitation. Therefore, the estimations are more efficient and accurate (Zarei et al., 2019). In panel models, the dynamic form is obtained by entering lagged dependent variables as an independent variable on the model's right side. The GMM model is efficient when the number of sections (the

number of firms in different years in each country) is higher than the number of time series. Because of the existence of lagged dependent variables on the right side of the model, one of the vital assumptions of the classic models being the lack of autocorrelation between independent and component variables is violated. Therefore, it is not possible to use the least squares method to estimate the eco-efficiency of the model. After the estimation of the GMM model, the **(x^2)** parent function is used to ensure the significance of the model's coefficients. The parent statistic result is that the null hypothesis states that all coefficients in the model are equal to zero except the width in origin, and the virtual variable is not accepted (Samadi et al., 2013). There should be no serial correlation between the error statements and instruments for the estimators' compatibility and the instruments' validity. Therefore, we use the Sargan test and (AR1) and (AR2) statistics. In these tests, the failure to reject the null hypothesis means there is no second-order serial correlation in error statements of the first-order differential GMM estimations. It confirms the validity of the instruments (Harighi et al., 2021). Therefore, the more specified version of (Equation 4) is used in (Equation 7). Also, to examine the impact of the sanctions on Iran's exporting firms, the D symbol is assigned in (Equation 13) as a virtual variable for sanctions against Iran in 2010, 2011, and 2018. The outcome of this equation is the result of using Stata11 software, in Table 4.

$$\boldsymbol{ln\pi_{ijt} = \beta_1 ln\pi_{ijt-1} + \beta_2 laglnL_{jt}y_{jt}\frac{p^{1-\sigma}}{P_j^{1-\sigma}} - \beta_3 lnL_{jt}y_{jt}\frac{p^{-\sigma}\tau_{ij}w_i}{P_j^{1-\sigma}Q} - \beta_4 dlnw_{jt}^{\gamma}w_{it}^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta} + D} \quad (7)$$

Table 4. The Results of the Relationship of Factors Affecting the Export Profit of Companies

Variables	Coefficient	Z-Statistic	P-Value
$ln\pi_{ijt-1}$	0.07	5.33	0.000
$laglnL_{jt}y_{jt}\frac{p^{1-\sigma}}{P_j^{1-\sigma}}$	0.05	4.80	0.000
$lnL_{jt}y_{jt}\frac{p^{-\sigma}\tau_{ij}w_i}{P_j^{1-\sigma}Q}$	0.07	9.74	0.000
$dlnw_{jt}^{\gamma}w_{it}^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta}$	-0.45	-14.04	0.000
D	-0.18	-11.72	0.000

Test Type	Statistics	P-Value	Result
Wald	55807.73	0.000	Verification of estimate
Sargan	62.58	0.10	Verification of instrumental variable
autocorrelation AR (1)	-4.58	0.000	First-order autocorrelation
autocorrelation AR (2)	-1.78	0.07	absence of the second-order autocorrelation

Source: Research finding.

According to the results of (Table 4), the significance of the parent test means the validity and relevance of the model coefficients estimation. The compatibility of GMM estimation is justified by the lack of relevance of the Sargan test (x^2), and the failure of second-order autocorrelation is proven by the lack of significance of the (Z) test. In this model, examining the coefficient variables such as export profits and the firm's total profits shows that each one has an impact (7%) and (5%) on the firm's export profits in the next year. Also, the variable of the variable costs has a (7%) impact on exports each year. Meanwhile, the market penetration costs have a (-45%) impact on the firms' profit, and the factors made by sanctions have an (-18%) effect on the export profit rate. These results show that the firms can significantly impact their export profit rates by focusing on market penetration costs. Therefore, the first research hypothesis is confirmed. In continuation, the impact of penetration costs and the amount of exports of the rival countries has been examined.

5.1 The Impact of the Rival Countries' Exports on the Firm's Export Profits

In this section, the second hypothesis dealt with the effects of the competitor courtiers' exports on the firms' export profitability. Thus, first, the export market of the targeted countries was investigated.

Reviewing the export target markets revealed that Iran has been one of the main competitors of the other rival countries in exporting cement since 2010. Also, by examining rival countries that export cement to Afghanistan, it has been determined that Iran and Pakistan have a hold on this country's cement market. Pakistan is the top rival of Iran in this country. In a way, Pakistan exported a higher tonnage of cement than Iran between 2003 and 2016, and Iran exported a higher amount of cement to Afghanistan compared to Pakistan from 2017 to 2020. In Pakistan's cement export market, the UAE is the most important country and holds

a high share of this country's imports. UAE has constantly been among the countries with a higher share of Pakistan’s imports than the other rivals since 2003. Between 2003 and 2020, countries such as China, Germany, Oman, and Iran have been major exporters to Pakistan in an inconstant manner. In a way, Iran constantly has a higher share of cement exports to Pakistan compared to UAE since 2014. Among the reviewed countries, Iraq is one of the significant target countries. Among 36 firms that are observed, 23 firms export to this country. In the studied years, Iran has constantly achieved a higher share of exports to this country compared to other rivals. For consecutive years, Turkey and Oman have been Iran's rival countries in Iraq, and Saudi Arabia, China, and the UAE have also been Iran's rivals in the country for some years. By studying Kazakhstan's cement export market in the mentioned years, it can be seen that Russia has a major share in this country's cement supply. Iran has established itself as one of Russia's rivals since 2010. During these years, countries including Uzbekistan, China, and Kyrgyzstan were among Iran's main rivals after Russia. Iran has a high share of Armenia's cement export market. In a way, after reviewing the Armenia cement market, it can be seen that in all these years, Iran has been among the most important rival countries, such as Turkey and China, in this market. In Uzbekistan's cement export market, Kyrgyzstan and Kazakhstan are among Iran's top rival countries, which supply a major share of Uzbekistan's cement. In the Azerbaijan market, Russia and Georgia are among the top countries with a major share of this country's imports. Iran has placed itself among the major exporters of cement to this country since 2009. Somehow between 2010 to 2020, Iran had a higher tonnage in a sequenced manner compared to Russia, one of the major exporters to Azerbaijan. Many countries such as Estonia, Turkey, Belarus, and Latvia have a major share of cement imports in Russia. Iran has acquired a higher position among these countries relative to the tonnage exported to Russia. In Oman's market, UAE has been a consistent rival of Iran in imports to this country. Also, Pakistan has been Iran's rival in this country for some years. Iran has been exporting to Oman since 2009. Between 2009 and 2020, Iran has placed itself among the countries that export 80% of its cement to this country. In the Kuwait market, many rival countries supply 80% of cement imports in this country besides Iran. The mentionable countries that were active during the examined years are UAE and India, Saudi Arabia, and China in some years. Iran's major rival in UAE is India, followed by China. Iran has been the main exporter of cement to this country since

2012. Many countries hold a high share of exports to Qatar. Iran's major rival in this country is Pakistan, followed by UAE and India. Iran has established itself as a major rival to other countries in Qatar since 2010.

Therefore in (Equation 3), Iran is considered the leading country. With the determination of the rival countries' reaction function (Equation 8)[1], according to the Stackelberg method, this function is relative to the Iranian firm's profit. Then it has been estimated to measure and analyze the impact of rival countries' exports alongside market penetration costs. Also, D has been assigned to the impact of the sanctions. It is mentionable that because the main purpose of this research is the impact of rival countries' exports alongside market penetration costs (Equation 9), to simplify and estimate the main coefficients from the rival country reaction function (Equation 8), only the leader and the follower country coefficients are considered in the equation.

$$\mathbf{lnp_{jt} = -1.03\alpha_0 + 0.41lnp_{jt-1} + 0.08lnq_{ji} - 0.009lnq_{it} + 0.43y} \tag{8}$$

$$\begin{aligned} &log\pi_{ijt} \\ &= \beta_1 2(0.009) log q_{it} + \beta_2 0.08 ln q_{ji} + \beta_3 0.08 log q_{it} \\ &- \beta_4 log L_{jt} y_{jt} \frac{p^{-\sigma}\tau_{ij} w_i}{P_j^{1-\sigma} Q} - \beta_5 log w_j^{\gamma} w_i^{1-\gamma} \frac{L_j^{\alpha}}{\psi} \frac{1-(1-n)^{1-\beta}}{1-\beta} + D \end{aligned} \tag{9}$$

Therefore, stationary variables were first analyzed, then the model type was determined to calculate (Equation 9). The results are provided in (Table 5).

[1]. Estimation of the relationship (11) in Appendix 2

Table 5. Dickey-Fuller Generalized, Chow, Hausman Tests Results

Variables	(x^2) Chi-sq.	P-Value	Status
$log\pi_{ijt}$	283.34	0.000	Stationary
$logq_{it}$	282.60	0.000	Stationary
$logq_{ji}$	493.53	0.01	Stationary
$logL_{jt}y_{jt}\frac{p^{-\sigma}\tau_{ij}w_i}{P_j^{1-\sigma}Q}$	213.90	0.000	Stationary
$logw_j^{\gamma}w_i^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta}$	42.57	1.000	no Stationary
$dlogw_j^{\gamma}w_i^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta}$	316.88	0.000	Stationary
Test type	**statistics**	**probability**	**Result**
Chow	2.07	0.000	panel model
Hausman	6.83	0.14	The model has random effects

Source: Research finding.

Like the previous estimations, with the stationary examination of the variables by the stationary test method, it is revealed that the variables, including export profits, the firm's exports, and the rival countries' exports, are on a stationary level and the variable of the variable costs is in a stationary trend. The penetration costs variable is stationary with one differentiation. The Chow and Hausman test showed that the Panel model includes random effects. The Kao Cointegration test was used considering stationary points to determine the long-run equilibrium relationship. The results are provided in (Table 6).

Table 6. Kao Residual Cointegration Test

Test	t-Statistic	P-Value
Kao	-9.41	0.000

Source: Research finding.

The Kao Cointegration test results prove the existence of a long-run equilibrium relationship between the research variables. In continuation, the dynamic Panel random method (Arellano-Bover/Blundell-Bond) is used because of the dynamic effect of the variables on the export profit rates. The results are provided in (Table 7).

Table 7. The Results of the Relationship between the Factors Affecting the Export Profit of Companies Counting the Costs of Market Penetration

Variables	Coefficient	Z-Statistic	P-Value
$log\pi_{ijt-1}$	0.05	3.11	0.000
$logq_{it}$	0.31	34.02	0.000
$logq_{ji}$	-0.04	-3.75	0.000
$logL_{jt}y_{jt}\frac{p^{-\sigma}\tau_{ij}w_i}{P_j^{1-\sigma}Q}$	0.007	2.71	0.007
$dlogw_j^{\gamma}w_i^{1-\gamma}\frac{L_j^{\alpha}}{\psi}\frac{1-(1-n)^{1-\beta}}{1-\beta}$	-0.58	-3.29	0.001
D	0.13	-2.19	0.02
Test type	**statistics**	**P-Value**	**Result**
Wald	7429.36	0.000	Verification of estimate
Sargan	41.28	0.10	Verification of instrumental variable
autocorrelation AR (1)	-5.6	0.000	First-order autocorrelation
autocorrelation AR (2)	-1.8	0.07	absence of the second-order autocorrelation

Source: Research finding.

It has been established that the results obtained from the Wald test show that the estimation from the model coefficients is significant. Also, the lack of significance in the Sargan test and the second-order autocorrelation proves the variable instrument's selection and the autocorrelation failure. Estimating (Equation 9) shows that the firm's export profit variable has a positive (0.05) impact on the export profits, followed by a one-year gap. The firm's amount of exports has a positive effect (0.31) on the firms' profit every year. Also, the amount of the profits affectability from changing the variable costs and market penetration are equal to (+0.007) and (-0.58). That shows that penetration costs, besides the other factors, can have a crucial impact on the firm's profits. Estimating the rival countries' exports coefficient shows a negative effect (-0.04) on the firms' profit each year. Therefore, the second research hypothesis is confirmed. According to the analysis of the impact of the sanctions on the firm's exports and their export profits, this model shows a (-0/13) effect on the firm's export profits made by the sanctions.

6. Conclusion

Supporting exports and exporters is part of the government’s agenda as it tries to reduce trade costs by signing multiple agreements with export destinations. Thus, as Iran has been under economic sanctions for various periods, the existing opportunities can be utilized to increase exports to the countries in the range. In this regard, some facts about the status of export products in the targeted markets need to be determined.

Considering the significance of the export firms' penetration in target markets, especially for Iran as a country that suffered from the impacts of economic sanctions on the country's profit during the past years, focusing on the impact of market penetration costs and rival countries exports can strengthen the firms' share of the target markets. Therefore, a case study of the cement industry has been researched by utilizing international marketing methods and the firms' activity in monopolistic conditions in this study. By considering the productivity levels of the firms active in exports relative to the productivity threshold of the target countries, firms with higher productivity than the productivity threshold have been distinguished. Then the amount of their profits' affectability from penetration costs has been examined using the dynamic Panel data method. The results of the model estimation showed that penetration costs have a (0/45) effect on export profits and when we consider the rival countries' exports the penetration costs have a higher impact of (0/58) on export profits. This result shows the high importance of penetration costs. The findings confirmed the results of the previous studies in international marketing. Similar to the latter in which it was shown that advertising has a positive impact on exports, the present study showed that within a monopolistic competition structure, various firms can change their export profitability by offering heterogeneous commodities according to their productivity levels and the market size based on market penetration costs. Also, by considering the rival countries' exports in the firm's export profits it was revealed that the rival countries' exports have a (-0/04) effect on the firm's export profits. Therefore, it is recommended:

1- Governments consider market penetration costs as export costs and compensate for them by providing export subsidies to firms to encourage exports and firms.

2- The government can apply market penetration costs as tariffs on exports and create a market for the sales of the intended commodities.

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Appendix 1

The present study estimated coefficients γ and α by confirming the direct relationship between the targeted countries' market size and cement export rates. Then, the threshold of productivity was estimated for each country. Moreover, parameter β was utilized to calculate the market penetration costs. Then, countries were specified according to their productivity ratio in a particular year to their productivity threshold values.

Table A1. FGLS Test Results to Calculate the Relationship between Exports and Market Size

Variables	Coefficient	Z-Statistic	P-Value
LnL_j	0.29	2.36	0.01
Lny_j	0.26	2.09	0.03

Source: Ahmadi et al. (2022).

Table A2. The Results of the Estimation of 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: Ahmadi (2022).

Table A3. Calculated Productivity Thresholds in Selected Countries

Qatar	UAE	Kuwait	Oman	Kazakhstan	Russia	Azerbaijan	Uzbekistan	Armenia	Iraq	Pakistan	Afghanistan	Country/ year
22.72		0.90	0.94	0.65	0.20	1.09	0.92	2.37	1.18	0.88	4.65	2003
26.71		1.03	1.78	0.81	0.26	1.35	1.20	3.39	1.16	1.14	3.59	2004
32.30	0.57		2.04	1.01	0.31	1.53	1.53	4	1.72	1.27	6.66	2005
43.83		1.36	2.44	1.14	0.39	1.61	2.30	4.70	1.92	1.47	5.79	2006
48.75	0.89	1.95	3.55	1.63	0.59	2.13	5.36	7.22	2.95	2.18	4.94	2007
73.58	1.16	2.30	5.39	2.09	0.75	2.96	5.17	9.74	2.79	2.74	11.91	2008
82.28		2.97	2.08	2.42	1.01	4.37	6.15	13.82	3.52	3.16	12.67	2009
90.80		3.43	6.99	2.87	1.12	5.35	5.60	34.56	3.62	3.67	12.08	2010
12.48		3.99	8.90	3.07	1.23	5.14	6.56	19.89	6.28	4.16	14.42	2011
101.60	1.94	4.12	5.29	2.98	1.33	5.55	11.47	18.18	4.09	4.83	13.68	2012
79.32	1.04	2.60	5.10	2.03	0.88	3.62	4.64	10.97	2.09	3.03	8.05	2013
12.86	3.38	2.97	4.73	1.77	1.81	4	3.81	10.83	3.71	2.99	7.28	2014
100.14	2.38	3.20	4.63	2.35	0.77	3.84	3.79	10.54	3.86	3.20	7.61	2015
	1.73	3.53	4.98	1.74	0.81	3.82	3.73	10.78	3.42	3.52	8.22	2016
143.74	1.56	3.89	5.6	2.16	0.94	4.96	3.34	10.43	4.68	3.87	8.74	2017
124.84	1.42	3.74	11.75	2.28	0.94	4.90	3.45	12.18	4.26	3.11	8.18	2018
200.23	2.17	7.06	11.90	3.16	1.50	8.75	5.52	27.17	6.95	4.89	12.31	2019
286.65	1.94	7.70	5.29	3.90	1.99	12.09	7.33	37.84	9.07	6.40	19.90	2020

Source: Ahmadi et al. (2022).

Appendix 2

Table A4. Dickey-Fuller Generalized, Chow, Hausman Tests Results

Variables	Chi-sq.	P-Value	Status
lnp_{jt}	474.60	0.000	stationary
lnq_{jt}	705.13	0.000	stationary
lnq_{it}	828.60	0.01	Stationary
lny_t	606	0.000	Stationary
Test type	**Statistics**	**Probability**	**Result**
Chow	8.78	0.000	panel model
Hausman	8.93	0.03	The model has Fixed effects

Source: Research finding.

Table A5. Estimation Results of Export Demand Function of Rival Countries

Variables	Coefficient	Z-Statistic	P-Value
lnp_{jt-1}	0.41	183.75	0.000
lnq_{jt}	0.08	32.18	0.000
lnq_{it}	-0.009	-7.24	0.000
lny_t	0.43	12.95	0.000
α	1.03	-3.29	0.001
Test type	**statistics**	**P-Value**	**Result**
Wald	69777.55	0.000	Verification of estimate
Sargan	73.52	0.10	Verification of instrumental variable
autocorrelation AR (1)	-3.04	0.002	First-order autocorrelation
autocorrelation AR (2)	0.23	0.81	absence of the second-order autocorrelation

Source: Research finding.

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