

Investigating the role of investment and productivity of Arvand, Qeshm, and Kish free zones on export development

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Abstract

In today's competitive economy, free zones are a vital artery for countries possessing these strategic areas. Investing in these zones can be highly advantageous due to enhanced access to target markets, leading to the prosperity of the production sector and, consequently, employment growth in both the zones and neighboring regions. The purpose of this research is to investigate the role of investment and productivity in the export development of the Qeshm, Kish, and Arvand Free Zones. This research tested two hypotheses regarding the significant effects of investment and productivity on export development. To test the hypotheses, a 20-year dataset covering the period from 1996 to 2016 was analyzed using panel data econometric methods. The empirical results demonstrated that both investment and productivity variables have positive and statistically significant effects on export development across the investigated free zones.

Keywords: productivity, export development, investment, free zones.
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1 Introduction

A free zone is an area of the country's territory that is outside physical, legal, and administrative boundaries and customs facilities. The entry and exit of capital and profits, as well as the movement of specialized labor in the region, are easily accomplished. Furthermore, foreign goods and materials that do not have legal restrictions can be stored in its warehouses or processed and turned into other goods in factories located there, without any customs and transit barriers [13]. Among the types of free zones, we can mention commercial zones, export processing zones, special economic zones, tourist free zones, and corporate free zones [13].

The commercial-industrial free zones of Kish and Qeshm are among the seven free zones of Iran located in Hormozgan province. Kish Island, which is a part of Bandar Lengeh county in Hormozgan province in terms of political divisions, is the second largest island in the Persian Gulf after Qeshm, with an area of about 91 square kilometers. It is worth mentioning that according to the country's laws, since 1969, Kish Island has been outside the normal territory

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of the country's customs and has been considered a free zone in a way. In the 1950s, with the increase in oil revenues, the possibility of huge investments in Kish was provided with the cooperation of multinational companies, especially French firms [15]. Qeshm is the largest island in the Persian Gulf, with an area of over 1,400 square kilometers, located 37 kilometers south of Bandar Abbas and at the mouth of the Strait of Hormuz, along the maritime routes from the Persian Gulf to the Oman Sea and the Indian Ocean and vice versa. In the years after the Islamic Revolution, to establish social justice, balance facilities and services in the country, remove deprivation in Hormozgan province, and improve the development indicators of this province, the creation of free zones in the islands and less developed areas of the province was considered by the country's policymakers [17, 6].

The Arvand Free Zone, with an area of over 170 square kilometers, is located in the southwest of Khuzestan province, between the cities of Abadan and Khorramshahr. It is situated at the confluence of the Arvand and Karun rivers and shares land and sea borders with Iraq, Kuwait, Saudi Arabia, and other neighboring countries of the Persian Gulf. The most important goals of establishing the Arvand Free Zone are: helping the industrial and commercial development of the region and the country, creating employment, eliminating deprivation and creating social welfare, accelerating the reconstruction of the region, increasing national income, establishing industrial and commercial relations with neighboring and Muslim countries, stabilizing national security, making optimal use of the industrial and commercial potential of the region, optimal exploitation of existing marine resources and facilities, and recovering the past industrial and commercial role of the region [9].

Investing means participating in a project or business or buying a type of asset with the aim of gaining profit and increasing value due to the future price growth of that asset. Investment, as the driving engine of economic growth, is necessary to achieve economic and social development. An increase in investment leads to higher production, increased added value, higher income, improved welfare, increased employment, a decrease in the unemployment rate, and a decrease in poverty. The category of capital and investment is of special and fundamental importance in the process of economic development. On this basis, in order to achieve an advanced and dynamic economy, governments pay the necessary attention to it through the establishment and application of special laws and regulations, creating platforms, and improving the necessary infrastructure. They focus on the optimal use of resources, facilities, capacities, and capabilities, and the application of principled, scientific, and logical management in order to provide the means for the transformation and progress of the country and society [4]. Economic development requires investment in various economic sectors and activities. Without investment in infrastructure and superstructure projects, one cannot expect to expand employment, production, and economic prosperity [8]. Today, the experience of many countries such as China, South Korea, and Taiwan shows that by creating free trade zones, it is possible to attract foreign investment, increase the development of industrial goods exports, and, as a result, create jobs and increase the country's foreign exchange earnings [10].

Since the growth and development of any country depend on its level of technical and scientific development, the growth of foreign trade is considered the basis of scientific and technical development for any nation. Therefore, the importance of foreign investment in free zones and efforts to remove legal obstacles are considered among the most important issues for the economic and scientific growth and improvement of the country. Foreign investment in free zones requires reassurance in two areas: first, the country's internal institutions, laws, and regulations must provide the infrastructure for accepting foreign capital; second, the tendencies and beliefs of foreign economic activists must provide a kind of guarantee for economic continuity and stability [19].

Regarding the role of free zones in the economy, there are four general views that view free zones as sources of technology transfer and human capital development. The first view: free zones have a specific lifespan and, after the implementation of regular commercial, economic, and currency reforms at the national level, they lose their importance. The second view: this perspective considers free zones according to their export value; in other words, in a country where other areas have not been liberalized, free areas can remain as production areas with limited participation in the economy. The third view: based on this perspective, free zones serve as a laboratory for testing open-economy and free-market-oriented policies, where new products, labor laws and regulations, and financial issues are evaluated before being implemented in the entire economy. The fourth view: in this perspective, free zones are created with the aim of attracting foreign investments, and efforts are made to gain superiority over neighboring countries by adopting motivational policies to attract such investments [5].

Productivity is defined as the effective and efficient use of inputs or resources to produce products or provide outputs [1]. In economic literature, total factor productivity is the amount of output obtained from a certain amount of inputs. Examining countries that have experienced significant economic growth in the last few decades shows that most of them have obtained a major share of their economic growth through increasing productivity; for instance, industrialized countries achieve about 50% of their economic growth through productivity improvements, and in successful developing countries such as Malaysia, the contribution of productivity to ensuring economic growth is

significant [12].

An export development strategy is a set of measures and arrangements designed and implemented to achieve export development goals. The essence of this strategy is the regular development of exports and the transition from a limited and inward-looking trading regime to an outward-looking and free trade. Many countries turning to export development have first experienced trade liberalization locally and, after learning the necessary lessons, have expanded it to the entire economy. The experience of using free zones in developing countries has been a main component of the export development strategy framework, aimed at attracting foreign investment, developing industrial exports, creating jobs, and acquiring new technology. Therefore, different countries have tried to create industrial-commercial zones in various ways. For this purpose, one of the useful and appropriate methods is establishing commercial-industrial free zones. Since this program was placed at the top of national macro-programs, and considering that capital is one of the main factors in the growth and development of countries, other economic variables such as employment, gross national product, and the supply of goods and services are directly affected by this factor [10].

Salami et al. conducted a study entitled "The role of free zones in economic development and the necessity of its creation in Kurdistan" [14]. In this research, while showing the theoretical position, the motivation and necessity of establishing a free trade zone in the Kurdistan region were investigated using a descriptive-analytical method. In [7], Hadyani and Rahmani analyzed the effects of the Chabahar commercial-industrial free zone on the economic and physical aspects of Chabahar city. The results showed that the opinion of Chabahar citizens based on the Likert scale regarding the physical and economic conditions before and after the establishment of the commercial-industrial free zone indicates that the average score for physical expansion increased from 2.4 to 3.8, urban services from 2.04 to 3.01, and employment and income from 1.9 to 2.3.

In [18], Wang examined the formation of the China-ASEAN Free Trade Area and analyzed its development effects on regional trade using panel data between 2003 and 2016, an econometric model, and China's export, import, and GDP variables. The results showed that the development of free trade has actively expanded in this region, and the share of China's exports to ASEAN in total Chinese exports has steadily increased in recent years, having a significant impact on the development and promotion of the China-ASEAN Free Zone. In another study, Spence evaluated how free trade zone activities and maritime operations affect port development, focusing on a case study of the port of Kingston. Using different statistical tools, taking into account variables such as the value of the free zone, export and import volumes, ship arrivals, investment, employment, and income, and employing a regression model, this research proved that the country, through the implementation of free trade zones, has been able to develop its economic indicators around its ports, successfully attracting foreign direct investment and increasing employment and income [16].

In this research, the impact of the economic activities of the Arvand, Kish, and Qeshm Free Zones—especially the role of investment and productivity on economic development—has been investigated with regard to the economic growth and export development variables of Khuzestan and Hormozgan provinces.

2 Materials and Methods

In terms of its purpose, this study is classified as applied research. In terms of its methodology and nature, it is classified as correlational research. Regarding its subject matter and scientific scope, this study falls within the field of macroeconomics and investigates the role of investment and productivity in the export development of the Arvand, Qeshm, and Kish free zones of the Islamic Republic of Iran over the period 1996–2017. The dependent variable of this study is export development. To calculate exports from the free zones, the total value of exports from the Arvand, Qeshm, and Kish free zones was used, expressed in billions of rials. The data required to calculate these variables were obtained from statistical information available on the websites of the Statistical Center of Iran and the Central Bank of the Islamic Republic of Iran.

In this study, the capital accumulation equation was used to estimate the investment variable ($I_{i,t}$), as follows:

$$K_{i,t} = (1 - \delta)K_{i,t-1} + I_{i,t}$$

In the above equation, K denotes the capital stock, I represents gross investment, and δ is the depreciation rate, which was assumed to be 4% for all countries, following Romer's theory. It is worth noting that the depreciation rate has been estimated at approximately 4% in various economic studies conducted in Iran. The perpetual inventory method (PIM) was used to obtain the initial capital stock. Based on this method, the initial capital stock ($K_{i,t}$) was

calculated using the following equation:

$$K_{i,t-1} = \frac{I_{i,t}}{1 + \delta}$$

In the above equation, r denotes the average annual growth rate of investment. Total factor productivity ($TFP_{i,t}$) was calculated using the Divisia method, according to the following equation:

$$TFP_{i,t-1} = \frac{GDP}{K^\alpha * L^{1-\alpha}}$$

In the above equation, GDP denotes the gross domestic product of the studied free zones, K represents the capital stock, L denotes employed labor, α represents the share of capital in production, and $\alpha - 1$ represents the share of labor in production. The exchange rate ($Le_{i,t}$) in this study refers to the annual price of the US dollar in rials.

To estimate the accumulation of research and development expenditure ($KR\&D_{i,t}$), an assumption of exponential growth in research and development expenditure was adopted. The initial accumulation of research and development expenditure was calculated using the following relationship:

$$KR\&D_{i,t} = \frac{CR\&D_{i,t}}{r}$$

In the above equation, $KR\&D_{i,t}$ denotes the accumulated stock of research and development expenditure, C represents research and development expenditure at constant prices, and r is the average annual growth rate of research and development expenditure over the study period. The accumulation of research and development expenditure in subsequent years was calculated using the following relationship:

$$KR\&D_{i,t} = KR\&D_{i,t-1} + CR\&D_{i,t}$$

To test the research hypotheses, the following regression model was used: Research model:

$$Exportdev_{i,t} = \alpha_0 + \alpha_1 I_{i,t} + \alpha_2 TFP_{i,t} + \alpha_3 CR\&D_{i,t} + \alpha_4 Le_{i,t} + \alpha_5 LP_{i,t} + \varepsilon_{i,t}$$

The data were collected through documentary and library-based research. The statistical sources included the World Bank, the Central Bank of the Islamic Republic of Iran, and the statistical yearbooks published by the Statistical Center of Iran. In addition, cross-sectional data for Khuzestan and Hormozgan provinces and their respective free zones were obtained from relevant statistical sources. Interviews, observations, and free-zone databases were also used to supplement the data for different years. The time series used to estimate the model covered the available data for the period 1996–2019. It should be noted that the plan to establish a special economic zone was approved in December 1996.

The data were analyzed using both descriptive and inferential statistical methods. In the descriptive analysis, descriptive statistics, including the mean, mode, and median, were calculated for the research variables. In the inferential analysis, the relationships among the research variables were examined based on the research literature. Econometric regression techniques and panel data methods were used to analyze the data. Furthermore, to enhance the quality of the research, the opinions of regional and provincial experts were collected through questionnaires. After estimating the productivity of production factors in the Arvand, Qeshm, and Kish free zones, descriptive analysis was conducted to examine the level and trends of productivity in these zones.

3 Research Findings

This study was conducted to investigate the impact of investment and productivity on the export development of the Arvand, Qeshm, and Kish free zones. The dependent variable of this study is export development. To calculate exports from the free zones, the total value of exports from the Arvand, Qeshm, and Kish free zones was used, expressed in billions of rials. The data required to calculate these variables were obtained from statistical information available on the websites of the Statistical Center of Iran and the Central Bank of the Islamic Republic of Iran. The results of the unit root tests for the variables at levels and first differences are presented in Table 1. To examine the stationarity of the research variables, the generalized Dickey–Fuller test was applied at levels. Since the research variables were stationary at levels, tests at first and second differences were not performed. The results are presented in Table 1.

Table 1: Results of the stationarity tests for the research variables

Result	Generalized Dickey–Fuller				Title of test
	First difference		Level		
	P.V	Statistics	P.V	Statistics	
I(0)	-	0/0000	-9/15	Export Development	Export Dev
I(0)	-	0/0000	-10/69	Efficiency	TFP
I(0)	-	0/0000	-15/51	Investment	I
I(0)	-	0/0000	-15/12	Exchange rate	Le
I(0)	-	0/0000	-9/91	Price index	LP
I(0)	-	0/0000	-5/51	Research and development expenditure accumulation	KR&D

Table 2: Results of the Limer F-test (equality of intercepts across cross-sectional units) and the Hausman test for the research model

Test type	Test result	P.V	F statistic	Chow test: null hypothesis (H0)
Panel Data	H0 is rejected	0/0000	6/005	Equal intercepts across cross-sectional units
Test type	Test result	P.V	Chi.sq	Hausman test
Fixed effect	H0 is rejected	0/0001	27/83	Relationship between independent variables and estimation error

The observations in this study consist of data for the three free zones of Arvand, Qeshm, and Kish over the period 1996–2017. Therefore, the pooled data method was used to test the research hypotheses. To select the appropriate estimation method for the models across the different sections and time periods of the pooled data, the restricted F-test (Chow test) was employed.

The results of the Chow test for the research model are presented in Table 2. The results of the restricted F-test indicate that the panel data method is appropriate for estimating the research model, as the significance level is below 5%. Therefore, the Hausman test was used to determine whether a fixed-effects or random-effects model was appropriate. Since the p-value of the Hausman test for the model is below 5%, the fixed-effects model was selected.

The Breusch–Pagan test was used to examine the homogeneity of the variance of the residuals in the research model. The results are presented in Table 3. As shown in Table 3, the p-value of the test is greater than 5%. Therefore, the test results do not indicate heterogeneity of variance, and the null hypothesis of homogeneity of variance cannot be rejected. In other words, the residuals obtained from estimating the research model have constant variance. Under these conditions, the ordinary least squares (OLS) method can provide the best linear unbiased estimator, provided that the other required assumptions are satisfied.

The Durbin–Watson statistic was used to examine the autocorrelation of the regression residuals. The F-statistic for the research model is 4.09, and its p-value indicates that the model is statistically significant at the 1% level. In addition, the adjusted coefficient of determination (R^2) for the model estimated to test the research hypotheses is 0.67. This value indicates that 67% of the variation in the dependent variable is explained by the regression model (Table 4).

The regression results in Table 4 show that the t -statistic for the investment variable is 1.90, its p-value is 0.0081, and its coefficient is 0.07. Given that the significance level for this study was set at 0.05, the investment variable has a positive and statistically significant effect on the export development of the free zones. As shown in Table 4, the t -statistic for the productivity variable is 0.06, its p-value is 0.0223, and its coefficient is 0.03. Given the significance level of 0.05, the productivity variable also has a positive and statistically significant effect on the export development of the free zones.

4 Discussion and Final Conclusion

The first research hypothesis aimed to investigate the effect of investment on the export development of free zones. The test results showed that investment has a positive and statistically significant effect on the export development of

Table 3: Results of the homogeneity of variance test for the regression residuals of the research model

Breusch–Pagan test		
0/56 0/19	F statistic	Research model
	P.V	

Table 4: Regression results for the second research model using the OLS method with pooled data

$Exportdev_{i,t} = \alpha_0 + \alpha_1 I_{i,t} + \alpha_2 TFP_{i,t} + \alpha_3 CR\&D_{i,t} + \alpha_4 Le_{i,t} + \alpha_5 LP_{i,t} + \varepsilon_{i,t}$					
VIF	P.V	T-STATISTIC	Standard error	Coefficient	Description
	0/0084	2/67	0/31	0/84	Intercept
3/85	0/0081	1/90	0/04	0/07	I
2/81	0/0223	0/06	0/62	0/03	TFP
1/89	0/7533	0/01	0/75	0/01	Le
2/92	0/0283	2/12	0/02	0/05	LP
2/76	0/0000	0/10	0/63	0/064	KR&D
0/67			Adjusted R-squared		
4/09			F-statistic		
0/0000			Prob(F-statistic)		
2/29			Durbin-Watson statistic		
63			Total observations		

free zones. With the increasing trend of economic relations and the integration of countries into the global economy, the volume of foreign direct investment has also increased. Increased investment, particularly foreign investment, which has greater freedom of operation in free zones, is one of the factors that plays an important role in economic globalization and can provide a basis for export growth. Azarbaijani and Shahmohammadi, in their study of the long-term relationship between exports, foreign direct investment, and economic growth in Iran, reported a positive long-term relationship between exports and economic growth, as well as between foreign direct investment and economic growth [2]. Kazroni et al., in their study of the relationship between foreign direct investment, exports, and gross domestic product, reported a unidirectional causal relationship between foreign direct investment and exports, running from foreign direct investment to exports. They also reported a Granger causality relationship involving foreign direct investment and gross domestic product [11].

The second research hypothesis examined the effect of productivity on export development in free zones. The test results showed that productivity has a positive and statistically significant effect on export development in free zones. Consistent with the findings of this study, Azarbaijani et al., in their investigation of the effect of total factor productivity on the development of non-oil exports, reported that total factor productivity has a positive effect on the non-oil exports of the countries studied [3]. Previous research has shown that productivity is one of the most important factors in achieving sustained economic growth. Given its increasing importance, the role of total factor productivity and its determinants has received considerable attention in recent decades. Growth in total factor productivity reduces production costs and enhances the competitiveness of producers and exporters in global markets. This is because productivity growth can lower the price level and average production costs while increasing the profitability of manufactured products. These effects can, in turn, increase demand for domestic products and improve their competitiveness in international markets. Azarbaijani et al. reported that growth in total factor productivity reduces production costs and strengthens competitive capacity. Accordingly, it can be expected to enhance the competitiveness of domestically produced goods in foreign markets and promote the growth of non-oil exports [3].

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