



Research Article

## How economic freedom affect the ease of doing business? Cross-country quantile regression mixture approach

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### ABSTRACT

The significance of the Economic Freedom Index (EFI) dimensions as influencing factors of the Ease of Doing Business Index (EDB) has been increasing in recent years. The main purpose of this study is to examine the nexus between the dimensions of EFI and EDB using 160 countries between 2017 and 2019. Considering that the impact of EFI dimensions on the different levels of EDB may differ, the Quantile Regression Mixture Model approach is applied in this study. Thus, the impact of the dimensions of EFI on EDB will be analyzed in different quantiles. The results show that there are five different clusters where the impact of the dimensions of EFI on EDB are differentiated. The major finding of this study is that Property Rights, Trade Freedom, and Business Freedom are the most important factor affecting EDB. As a result of the study, it is shown that different action plans should be created for each cluster to increase EDB.

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### INTRODUCTION

Setting up a business is always requiring a complex decision-making process to make a profit and enhance employment opportunities. Thus, to conclude whether investing to set up a business in a country, many financial and non-financial metrics should be taken into consideration and analyzed about that country. Foreign Direct Investments, Gross Domestic Products per Capita, Net Income, and Foreign Trade Deficit could be said as the

financial metrics. On the other hand, the Ease of Doing Business (EDB) perception, the Economic Freedom Index (EFI), the Human Development Index (HDI), and the Corruption Perception Index (CPI) are the example of non-financial metrics of a country. All of these metrics show the level of development of a country directly or indirectly.

The term Economic Freedom refers to the extent to which a country's policies, incentives, and resource allocation are implemented effectively and freely over a while

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[1–2]. Also, in every society, Economic Freedom stands for the fundamental right of every human being to invest, produce, or consume in any way they please. To measure economic freedom of a country, The Heritage Foundation proposes an index named as “The Index of Economic Freedom (EFI)”, which consists of 12 different dimensions. Thus, an environment is provided that countries can analyze their position among other countries in terms of economic freedom. EFI of a country is from 0 to 100, where 0 represents the lowest and 100 represents the highest economic freedom.

EDB, which was conducted by the World Bank, measures how easy to set up a firm using 12 dimensions about the regulatory environment of a country for domestic firms. These dimensions are starting a business, dealing with construction, permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency, regulation on employing workers, and contracting with the government [3]. According to the methodology of EDB, regulations on employing workers and contracting with the government are not included in the EDB perception index calculation. EDB index of an economy is from 0 to 100, where 0 represents the lowest and 100 represents the best performance in terms of regulatory applications. In the EDB survey, more than 48,000 professionals in 190 countries participate every year.

Through long ages, business experts, economists, and entrepreneurs try to describe the best environment for business development [4]. Gross domestic product per capita (GDP), foreign direct (or indirect) investments (FDI), economic growth, tax rate, and corruption metrics associate to ease of doing business in the literature [5–11]. Besides, entry barriers such as procedures about starting a business, and the cost of doing business are the factors affecting EDB [6–14]. Also, it is shown that high tax rate and inflation are highly correlated to lower FDI and growth [15–19]. Another study in the literature shows that investor protection is highly correlated to EDB [20–21].

Based on the study of Zohrab in 2019, it is revealed that tariff rate and regulatory barriers to trade are the crucial factors for doing business [22]. Not also regulations on trade but also regulations on financial services have an important impact on doing business in two different ways: (i) these regulations protect the customer, and (ii) prevent fraud and limit the risk of investors [23]. Thus, a safer financial environment is provided to the customers.

In the literature, some factors that are related to the framework of starting a business such as starting capital, labor regulations, administrative costs, procedures, and time of firm creation. Van Stel, Storey, and Thurik (2007) show that capital and labor regulations have a significant effect on EDB while administrative costs have no effects on EDB [13]. In another study in the literature, procedures of creating a business and time are associated with doing

business [12]. Furthermore, corruption and high bureaucracy hurt EDB [24–27].

The number of studies examining the correlation between EDB perception and EFI is limited in the literature. Thus, in this study, the aim is to make a connection between EDB perception and the dimensions of EFI using the Quantile Regression Mixture Model (QRMIX) approach, which is the main contribution to the literature. With this approach, the determinants affecting EDB can be figured out in different quantiles of the EDB, which is the distinctive feature among related methods. Besides, best to the authors’ knowledge, there has not been a study covering the relationship between EDB perception and dimensions of EFI using the QRMIX approach. Also, since the EFI covers 12 different dimensions from property rights to financial freedom, EDB perception was examined with all dimensions of EFI. In this way, various action plans can be proposed in 12 different areas.

The remaining paper is structured as follows: In Section 2, the research problem and areas to be focused on are described in detail. Research methodology including the general framework of the EDB and EFI, datasets, and statistical approach used in the analysis, and each step of the analysis process are given in Section 3. Section 4 presents the descriptive statistics and model outputs. Section 5 is the discussion on the empirical results, and finally, in Section 6, the conclusion and limitations of this study are given.

## RESEARCH PROBLEM AND FOCUS

In the extant literature, the number of studies examining the relationship between EDB perception and EFI is limited. Furthermore, examining the relationship between these two indexes directly could not be enough to model EDB perception to provide action plans. Since significant factors affecting the EDB perception could differ from the lower level of EDB to the higher level of EDB, the advance statistical technics should be applied to illuminate the relationship between the dimensions of EFI and the EDB perception. Examining the factors affecting EDB perception at different levels separately is not an issue that has been adequately addressed in the literature. This study was aimed at closing the gap in the literature.

In this research, Ease of Doing Business perception was tried to be explained by using the dimensions of the Economic Freedom Index using the Quantile Regression Mixed Model approach. At the end of this study, it was aimed to find answers to the following questions:

1. Which dimensions of EFI are influencing EDB?
2. Do the significant factors affecting EDB differ according to the level of EDB? If so, which factors are more important at which levels of the EDB?
3. Which precautions should be taken to increase the EDB perception of a country?

## RESEARCH METHODOLOGY

### General Background

In this study, EDB and EFI datasets, which contain 494 observations, from 160 countries between 2017 and 2019 were used. EDB is conducted in every year in 190 economies to rank countries in terms of the regulatory performance level using 12 different dimensions. These dimensions are starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, trading across borders, enforcing contracts, resolving insolvency, employing workers, and contracting with the government [3]. Procedures, time, and cost parameters are taking into consideration in almost all dimensions.

EFI has 12 dimensions, which are Property Rights, Judicial Effectiveness, Government Integrity, Tax Burden, Gov't Spending, Fiscal Health, Business Freedom, Labor Freedom, Monetary Freedom, Trade Freedom, Investment Freedom, and Financial Freedom.

Property Rights covers the physical property rights, intellectual property rights, strength of investor protection, risk of expropriation, and quality of land administration. Thus, it can be regarded as the efficiency of the country's legal framework. Judicial independence, quality of the judicial process, and favoritism in obtaining judicial decisions are the underlying factors of the Judicial Effectiveness dimension. The basic motivation of this dimension is to protect the rights of all citizens against all other parties, which is an essential framework for everyone.

Government Integrity represents the level of public trust and economic vitality. The high level of government integrity decreases the cost of control in economic activity such as irregular payments, transparency of government policy and service, and perception of corruption.

Tax Burden, Government Spending, and Fiscal Health are mostly related to the financial status of a government. Tax Burden consists of the top marginal tax rate on individual (and also corporate) income and the total tax burden as a percentage of GDP. Any expenditures made by the government represent the Government Spending dimension. Fiscal Health, which is composed of average deficits as a percentage of GDP and debt as a percentage of GDP, reflects the government budget management.

In EFI, there are six dimensions related to the freedom of different topics: Business Freedom, Labor Freedom, Monetary Freedom, Trade Freedom, Investment Freedom, and Financial Freedom. Business Freedom consists of the operational process of starting, obtaining, closing, or getting electricity for business. Steps of the process, time, and cost are the main factors for each subject. The Labor Freedom dimension, which represents the employment opportunities in the market, composed of regulations about minimum wages, laws in preventing layoffs, severance pay conditions, and regulations about hiring and working

hours. The inflation rate and qualitative evaluation of price manipulation done by the government via direct control or subsidies are the two inputs of the Monetary Freedom dimension. In Trade Freedom, similar to the Monetary Freedom, there are two inputs: tariff rate and qualitative judgment about non-tariff barriers that have a significant impact on import and export. Restriction such as payment and transfers on the flow of investment about both internally and externally is not an issue for an economically free country. With the Trade Freedom dimension of EFI, it is measured whether a country is free for trade in terms of the flow of investment. Financial Freedom, which is one of the freedom dimensions in EFI, reflects the banking efficiency. Government regulations on financial services, intervention in the allocation of credits, and openness to the competition are the inputs of the Financial Freedom.

### Instrument and Procedures

Quantile regression has been a popular method in various applications including economics, biostatistics, and finance to identify the effect of independent variables (covariates) on the distribution of the dependent (response) variable. Finite Mixture Models (FMM) are great flexibility in modeling complex data with unobserved heterogeneity of the population by mixing classical regression methods. Mixture models are widely used for classification, clustering, and density estimation [28].

The Quantile Regression Mixture Model (QRMIX), which is a modified approach of the Finite Mixture Models (FMM), was applied to identify the influential factors on different levels of EDB. QRMIX is proposed to allow regressions of the conditional quantiles in the dependent distribution while controlling the covariates without any parametric assumption on the error densities. The error distribution may be unknown or there may be outliers and extreme values. Since the proposed model identifies quantiles instead of the mean, it both improves the robustness of the model and enables inference on the dependent variable at the various conditional quantile functions [29].

Consider independent variables  $x_i$  ( $i = 1, \dots, n$ ), with specific parameter vector  $\theta_j$  and  $\Theta$  can be described by  $(p_1, \dots, p_K; \theta_1, \dots, \theta_K)$ . The density function is described as follows:

$$f(y|x, \Theta) = \sum_{j=1}^K p_j f_j(y|x, \theta_j) \quad (1)$$

where  $p_j$  are the mixture weights, with  $\sum_{j=1}^K p_j = 1$ . More specifically,  $f_j(y|\theta_j)$  are conditional densities.

### Data Analysis

Two different data sources were used in this study: the Economic Freedom dataset from the Heritage Organization and the Ease of Doing Business (EDB) perception from the World Bank. Dataset consists of the EDB index and the



Figure 1. Steps of the analysis process.

dimensions of the Economic Freedom Index of approximately 160 countries. In this study, the glmnet package in R was used for Least Absolute Shrinkage and Selection Operator (LASSO) Regression to determine the important variables affecting the EDB index, and then qrmix package in R was used for Quantile Regression Mixture Models (QRMIX). The visualization of the analysis process is shown in Figure 1 with details.

The first step is data collection and aggregation, where the datasets gathered from different data sources were combined. In the data cleaning process, which is the second step of the process, missing values were determined and excluded from the dataset using the listwise deletion method. LASSO Regression is applied for determining factors that have a significant impact on the EDB index in step 3 and 4 [30]. As a result of the LASSO Regression approach, all dimensions of EFI have a significant impact on the EDB index. Thus, none of the dimensions were excluded from the analysis. QRMIX approach was performed in step 5, and in the final step results obtained from the model were interpreted and proposed suggestions on how to improve the EDB index.

## RESEARCH RESULTS

Descriptive statistics of variables are given in Figure 2. The mean, standard deviation and median of EDB score are 62.7, 13.3, and 62.9, respectively.

In Figure 2, TB has the highest mean score among the dimensions of economic freedom, which is 77.1. However, GI has the lowest mean score, which is 43.1. The coefficient

of variation of all variables used in the study is lower than 40%, except JE, GI, and FH.

In the QRMIX approach, generally, the Root Mean Square Error (RMSE) and the Mean Absolute Error (MAE) statistics are used to determine the number of clusters that are statistically significantly differentiated. RMSE and MAE statistics are given in Figure 3.

RMSE and MAE statistics of the 5-cluster model were relatively lower than others and the size of clusters was higher than 30. Since the number of clusters increases, the size of clusters decreases to about 20, which is a relatively low basis to create a regression model. Thus, a 5-cluster model was used in this study.

According to Table 1, the sample size for each cluster is higher than 30, and the median values from Cluster 1 to 5 are 57, 59, 61, 69, and 71. Besides,  $R^2$  statistics of all clusters are higher than 97%, which is quite enough to interpret the results.

In Figure 4, each filled point represents that the impact of the related dimension of EFI on EDB is statistically significant in the related cluster while unfilled points represent that the impact of the related dimension of EFI on EDB is not significant. Although the effect size of the EFI dimensions on EDB varies, for all clusters, the impact of Property Rights, Judicial Effectiveness, Government Integrity, Business Freedom, Trade Freedom, Investment Freedom, and Financial Freedom on EDB is statistically significant. The impact of the Tax Burden and Monetary Freedom on EDB is not statistically significant in Cluster 1, Cluster 2, and Cluster 3 while Government Spending has a statistically significant impact on EDB in Cluster 3, Cluster

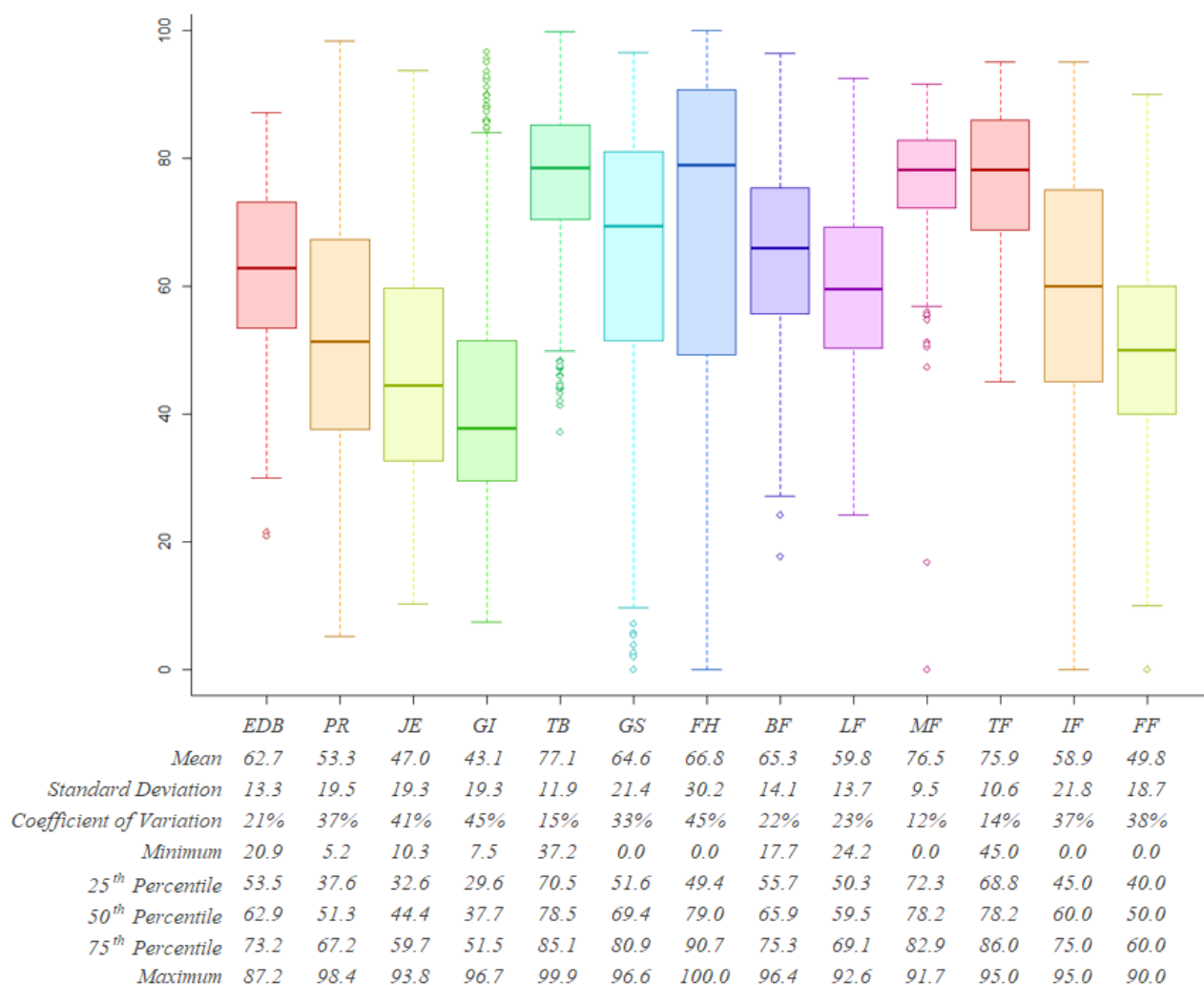


Figure 2. The Box-Whisker Plot and descriptive statistics of variables.

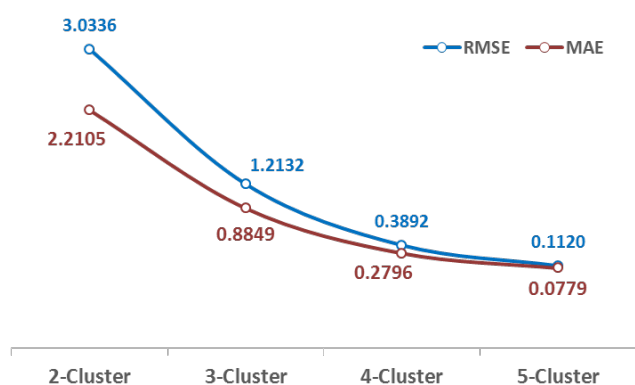


Figure 3. RMSE and MAE statistics for different clusters.

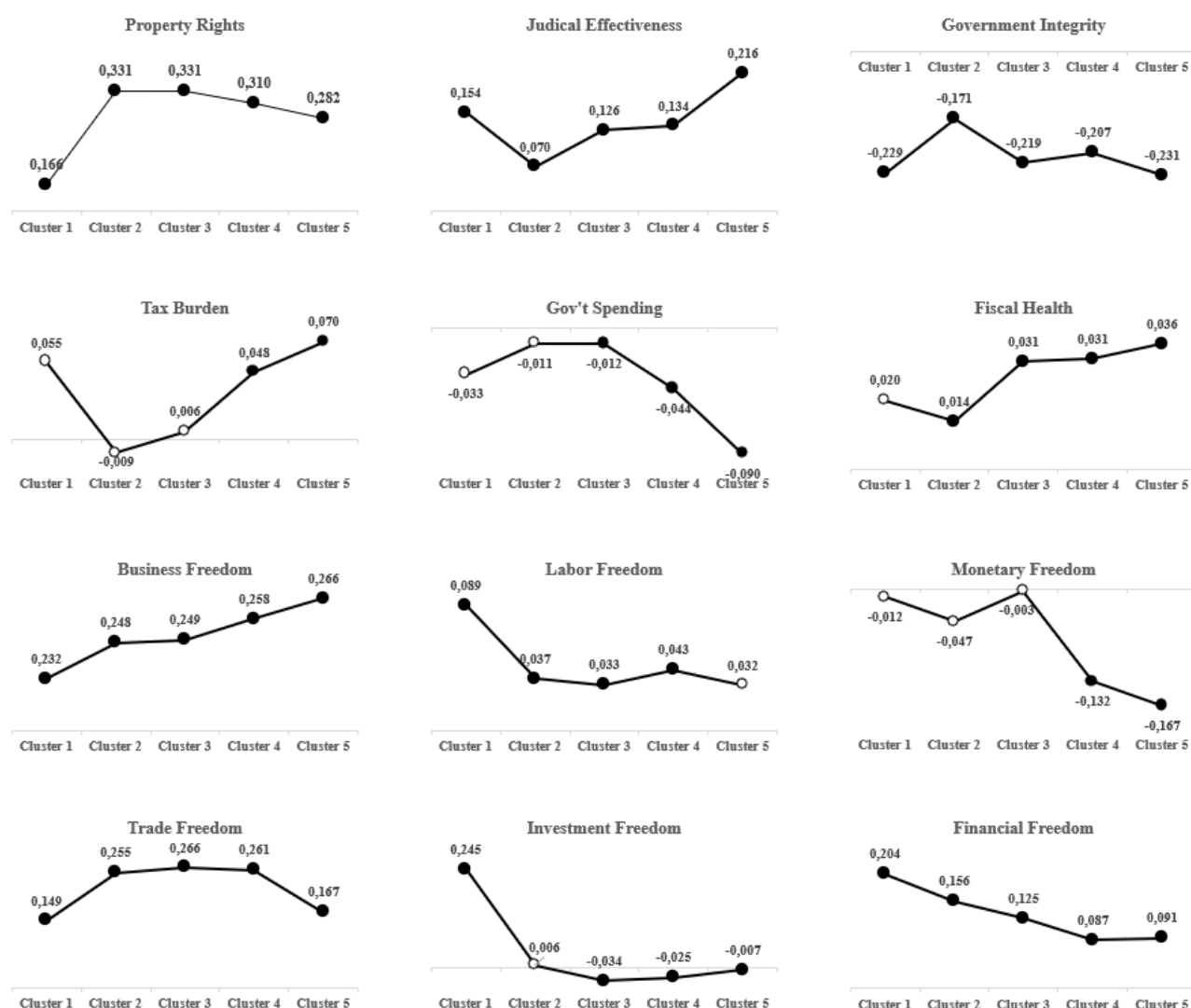
4, and Cluster 5. On the other hand, the impact of Fiscal Health, Labour Freedom, and Investment Freedom are not statistically significant in Cluster 1, Cluster 5, and Cluster 2, respectively. Also, the Government Integrity, Government Spending, and Monetary Freedom dimensions of EFI

hurt EDB. As a result of the analysis, it was found that the impact of Labour Freedom, Investment Freedom, and Financial Freedom is weakened from Cluster 1 to 5, while the impact of Judicial Effectiveness, Tax Burden, Fiscal Health, and Business Freedom is increasing from Cluster 1 to 5.

According to Table 2, in Cluster 1, where the countries have the lowest EDB score, Investment Freedom, is the most important dimension of EFI affecting EDB while in other clusters Property Rights relatively more important than other dimensions of EFI. Based on the QRMIX model, the importance of Investment Freedom is relatively weak in Cluster 3, 4, and 5. Besides, Trade Freedom plays a crucial role in Cluster 2, 3, and 4. On the other hand, its impact on EDB is getting weaker in countries that have the lowest EDB score. To sum up, in general, Property Rights, Business Freedom, Trade Freedom, Government Integrity, and Judicial Effectiveness are the most important instruments in predicting the EDB score.

**Table 1.** Quantiles, # of the sample, median values of EDB, and R<sup>2</sup> for each cluster in the QRMIX approach with 5-cluster model

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Quantiles	4%	20%	50%	78%	96%
# of sample	46	131	142	113	62
Median of EDB Index	57	59	61	69	71
R <sup>2</sup>	98.3%	99.1%	99.2%	99.0%	97.4%



**Figure 4.** Impact of the dimensions of economic freedom on ease of doing business index.

## DISCUSSION

The dataset of this research was composed of 494 observations from 160 countries between 2017 and 2019, which were obtained from the Economic Freedom Index Study of Heritage Foundation and Doing Business Study of the World Bank. In this research, countries were grouped

using their EDB score and factors affecting their EDB score, simultaneously. Thus, the impact of the EDB-related factors could be identified for each cluster.

One of the major findings of this study is that Investment Freedom, Business Freedom, and Government Integrity are the most important factors that should be improved

**Table 2.** Variable importance of the dimensions of EFI on EDB

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Business Freedom	2	3	3	3	2
Financial Freedom	4	5	6	7	7
Fiscal Health	–	8	9	11	10
Government Integrity	3	4	4	4	3
Gov't Spending	–	–	10	9	8
Investment Freedom	1	–	7	12	11
Judicial Effectiveness	6	6	5	5	4
Labor Freedom	8	7	8	10	–
Monetary Freedom	–	–	–	6	6
Property Rights	5	1	1	1	1
Tax Burden	–	–	–	8	9
Trade Freedom	7	2	2	2	5

1 represents the most important variable, 12 represents the least important variable

to increase EDB score for a country where is located in Cluster 1. These results were aligned with the studies in the literature. Corruption perception and high bureaucracy, which were highly related to the Investment Freedom and Government Integrity dimensions of EFI, were found as important factors affecting EDB in the literature [24–27]. Also, similar to the studies in the literature, it was shown that starting capital, labor regulations, cost of doing business, entry barriers of starting a business, and the time of a firm creation, which were sub-criteria of the Business Freedom dimension of EFI, were highly correlated to EDB score [13–14]. Thus, a country where was located in Cluster 1, which has a median of EDB score was 57, should create strict policies about the absence of corruption, preventing irregular payment, transparency of government service to increase the Investment Freedom dimension. Moreover, these countries should reconsider the policy about procedures and time of firm creation, starting capital, labor regulations, cost of doing business, and entry barriers of starting a business to increase EDB score.

In the study of Castro, Clementi, and MacDonald (2004) and Haidar (2009), it was shown that factors related to the Property Rights dimension of EFI were highly correlated to the EDB score [20–21]. In Zohrab's study in 2009, it was revealed that the factors related to the Trade Freedom dimension of EFI had a crucial impact on the EDB score [22]. Also, in many studies in the literature, it was shown that the Business Freedom dimension of EFI had an important role to explain the change in EDB score. Similar to the literature, the top 3 important factors affecting EDB scores were the same for Cluster 2, 3, and 4 in this study: Property Rights, Trade Freedom, and Business Freedom. As a result of this finding, it was revealed that policies about physical and intellectual property rights, investor protection policy, tariff rate and regulatory barriers on trade,

labor regulations, cost of doing business, entry barriers of starting a business, and the time of firm creation should be improved for a country in Cluster 2, 3, or 4.

In this study, it is shown that the policies about physical and intellectual property rights, and investor protection policy which were the important criteria of the Property Rights dimension of EFI had a significant impact on EDB in Cluster 5, which is similar to the results of the studies in the literature [20–21]. The Business Freedom and the Government Integrity dimensions of EFI were the other important factors affecting the EDB score in Cluster 5. Thus, similar to the actions in Cluster 2, 3, and 4, labor regulations, cost of doing business, entry barriers of starting a business, the time of firm creation, the absence of corruption, preventing irregular payment, transparency of government service should be improved for a country in Cluster 5 to improve EDB score.

Many researchers studied the effects on the tax rate and inflation rate on FDI, GDP growth, and EDB in the literature [5–6;15;18;31–33]. Similar to these studies, it was found that the inflation rate which was one of the criteria of the Monetary Freedom dimension, and tax rate which was one of the criteria of the Tax Burden dimension had a significant impact on EDB in Cluster 4 and 5 in this study. However, similar to the study of Van Stel, Storey, and Thurik (2007), it was revealed that labor regulation which was one of the criteria of the Labor Freedom dimension was an important role in EDB in all clusters, except on Cluster 5, in this study [13].

Finally, similar to the literature, it was shown that the Financial Freedom and Judicial Effectiveness dimensions of EFI were found as crucial factors affecting EDB in this study [23], although the impact of the Financial Freedom had decreased from Cluster 1 to Cluster 5 while the impact of the Judicial Effectiveness had increased from Cluster 1 to Cluster 5.

## CONCLUSIONS AND IMPLICATIONS

As highlighted in the introduction section, many metrics can be used to decide on setting up a business or not in a country. Measuring, monitoring, and improving these metrics are highly important for a country to improve its financial metrics such as GDP, FDI, etc. Thus, the relationship between the dimensions of EFI and EDB, which are important factors affecting the financial metrics of a country, was examined in this research to understand how to improve the EDB score.

In conclusion, countries were grouped as 5 clusters based on their level of EDB score using the QRMIX approach. As a result of the proposed method, it was shown that the impact of factors affecting EDB scores was differentiated in each cluster. Thus, the country's ranking regarding EDB would be crucial when action plans are created for that country. Since the importance of factors affecting the country's EDB was different in each cluster, different action plans should be created to improve the EDB score. In this research, the most crucial determinants in EDB scores were examined and possible action plans that should be taken were proposed.

## AUTHORSHIP CONTRIBUTION

Authors equally contributed to this work.

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## DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. Raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

## CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## ETHICS

There are no ethical issues with the publication of this manuscript.

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