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## MODELLING BUSINESS FAILURE AMONG SMALL BUSINESSES IN NIGERIA

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### ABSTRACT

**Purpose** - Despite the reported high bankruptcy rate among small businesses (SMEs) in Nigeria, this study is the first to develop failure prediction models specifically for SMEs using financial and non-financial variables.

**Methodology** - The study employed logistic regression to a sample of 344 SMEs during the period 2000–2014.

**Findings**- The increased in the predictive accuracy of the model shows that data relating to the age of business and location make a significant contribution. Additionally, the study finds that high leverage and operational expenses and low profitability are associated with SMEs failure. The prediction accuracy rate was 92.1 and 93.8 percent for model 1 and model 2 respectively.

**Conclusion**- The findings will serve as an early warning signal for management to take proactive measures to overcome the threats of failure. Financial institutions such as banks will benefit from this study as it will help them set their internal control systems and procedures to manage credit risk for SMEs.

**Keywords:** Business failure, financial ratios, non-financial information, logistic regression, small medium-sized enterprises.

**JEL Codes:** G32, G33

## 1. INTRODUCTION

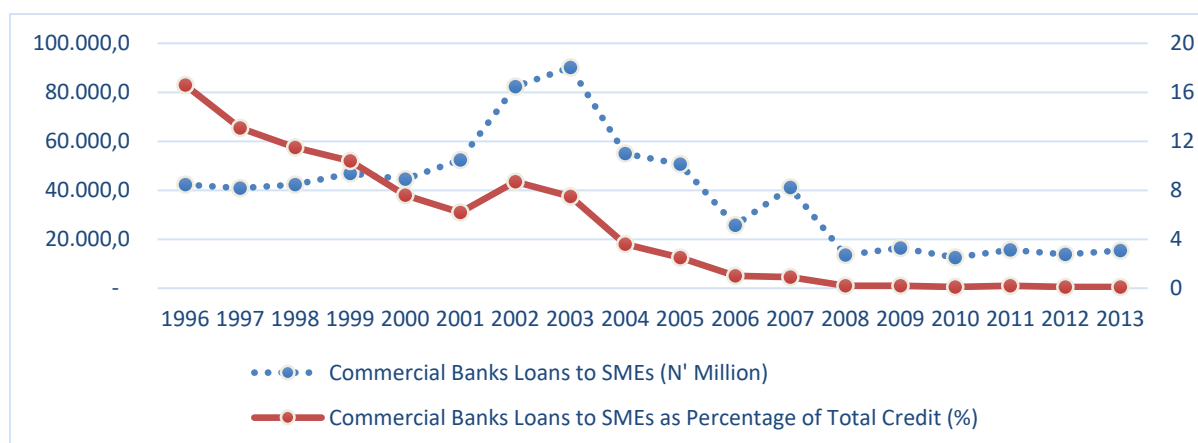
Small and medium-sized enterprises (SMEs) contribute significantly to the economic growth of many countries around the globe. More than 95 percent of the established enterprises across the world are SMEs, contributing approximately 60 percent to the private sector manpower (Ayyagari, Demirgüç-Kunt and Maksimovic, 2011). For instance, SMEs contribute between 51 to 56 percent of the US gross domestic product (GDP) and provide approximately 75 percent of the net jobs to the economy. Similarly, in the UK, SMEs employ around 65 percent of the private workforce and contributing 53 percent to the GDP (ACCA, 2013). SMEs in the Association of Southeast Asian Nations (ASEAN) region make up 96 percent of total business enterprises, with a 50 to 95 and 30 to 53 percent of contribution to the domestic employment and GDP, respectively (SME Corp Malaysia, 2014).

Similarly, in an emerging economy like Nigeria, SMEs also play a significant role in re-engineering the socio-economic landscape of the country. National Bureau of Statistics (NBS) reports that SMEs in Nigeria account for 97 percent of the total business formations in the country, contribute 87.9 percent of the workforce and account for 48 percent of industrial output in terms of value added (Olukayode and Somoye, 2013). Besides, Nigeria seen as regional powerhouses in Africa and is the 20th largest economy in the world, worth more than \$500 billion in terms of nominal GDP (Anyanwu and Yameogo, 2015), SMEs contribute 48.7 percent of the country's nominal GDP (Nnabugwu, 2015).

Recognising the potential of SMEs in terms of employment generation, improvement of local technology, output diversification and forward integration with large-scale industries, various measures, policies and programmes were designed and implemented by the government to stimulate SMEs development to a more vibrant contributor to the Nigerian economy. For example, the Nigerian government approved a plan to recapitalise Bank of Industry, a development-centred finance institution to assist SMEs with a financial constraint by tripling the bank total capital from USD1.57 billion to USD4.72 billion (ACCA, 2013). As of December 2014, over 158,700 SMEs have been issued the loan at a single digit rate through the Bank of Industry and the Bank estimated the number of SMEs seeking for the loan to substantially increase between 2015 to 2016 (Central Bank of Nigeria, 2014).

However, despite these initiatives by the government, there has been gross underperformance of the SMEs sub-sector and this has undermined its contribution to economic growth and development. This is largely associated with the high number of failure among SMEs in the country where reports show that between 60 to 70 percent of the SMEs fail in the first three years of the operations (Akingbolu, 2010). Financial stability and going concern of an SME is an important objective for the company and its stakeholders. For instance, banks as the major providers of loans to SMEs would find themselves into financial loss as a result of having to write off the debts owed to the banks. Banks in return would reduce their lending to SMEs in the future. This is evident in figure 1 where statistics from the Central Bank of Nigeria (2014) shows that commercial banks in Nigeria have reduced the total lending to SMEs due to the high failure rate. As a consequence, SMEs would find it difficult to grow further and new start-ups will find it difficult to access loans from banks. Furthermore, employees will lose their jobs thereby increasing the number of the unemployment rate in the country. The government will also have a shortage in terms of income generation due to less corporate and personal taxes. Therefore continuous tracking of a company's potential business failure would be a significant deal for the corporate sector and the economy.

**Figure 1: Commercial banks loan to SMEs** (Central Bank of Nigeria, 2014).



The ability to predict business failure has gained considerable attention from academicians and practitioners. This is because an effective business failure prediction model can reduce economic losses as the model would enable stakeholders to detect early signals of potential business failure and take corrective measures prior to the failure event (Jones, 1987). This study aimed at identifying the best performing SME business failure prediction model in Nigeria using financial and non-financial indicators. Literature of business failure prediction mainly seeks evidence from listed companies because of the easy access to firm's financial and non-financial information. Previous studies carried out in Nigeria focus mainly on listed companies (Abiola, Felicia and Folasade, 2015; Olaniyi, 2007; Okozie, 2011; Wilson and David, 2012). This is because it is more challenging to have adequate access to SMEs financial and non-financial information, and thus empirical evidence on SMEs business failure prediction models is still limited. To the best of our knowledge, no study has developed a business failure prediction model to examine the indicators that could potentially lead to the SMEs failure in Nigeria. Additionally, looking at the significance of the Nigerian economy in West Africa and the entire African continent and SMEs contributing nearly half to the economy, thus the motivation to undertake this study.

In this study logistic regression is applied to a sample of 344 Nigerian SMEs and SME failure prediction model built based on financial, non-financial variables. The primary findings suggest that profitability, debt and expense ratios play a dominant role in predicting business failure among SMEs in Nigeria. The findings show that inclusion of business location and age of SME to the prediction model improves the performance of the model marginally. Finally, combining financial and non-financial variables improves SME default prediction accuracy rates as compared to prediction based only on financial variables.

This paper is organised as follows. Section 1 is the introductory part of the paper then followed by section 2, an overview of the literature on failure prediction. In section 3, the sample and research design are elaborated. Section 4 focuses on the analysis of results and section 5 concludes the paper.

## 2. LITERATURE REVIEW

Academic research on business failure prediction models mainly focuses on listed companies due to the easy access to publicly available information (see Abdullah et al., 2008; Altman, 1968; Altman and Loris, 1976; Altman et al., (2016); Beaver, 1967; Deakin, 1972; Md-Rus et al., 2013; and Zulridah, 2012). Applying a default prediction model developed on large corporate data to SMEs will result in lower prediction power and likely a poorer performance of the entire corporate portfolio than with separate models for SMEs and large corporates. SMEs are different to the large corporation in terms of

management structure, size, credit risk point of view and business operations. As such, studies have extended their interest to SMEs' failure despite the difficulty in accessing the data which is motivated by their significant contribution towards economic development and the reported high business failure among them. Many studies on SMEs evolve around the search for an efficient business failure prediction model using a set of explanatory variables based on various modelling techniques. Traditionally, the detection of company operating and financial difficulties is a subject which has been mainly susceptible to financial ratio analysis.

### **2.1. Financial Indicators**

Review of literature shows that there are four major categories of financial indicators which are found to be significant predictors of SMEs' failure, which include; profitability, leverage, liquidity and asset management. Financial indicators are internal or external factors that influence the performance of a firm. Management effectiveness (or ineffectiveness) and good (or poor) strategic implementation of the financial indicators can usually lead to the success (or failure) of the firm. Profitability is the primary goal of all businesses because, without profitability, the business will not survive and sustain in the long run thereby going into distress. Pecking order theory also maintains that businesses with a high level of profitability adhere to a hierarchy of financing sources and prefer internal financing when available, and debt is preferred over equity if external financing is required (Myers, 1984). The commonly used proxies for profitability are the net profit to total assets (Abdullah, Ma'aji and Khaw, 2016) and pre-tax profit to total assets (Ferreira, Grammatikos and Michala, 2014). Profitability measures should be regarded as one of the major determinants of business failure for small firms and one for which the influence of trends is paramount.

The financial risk of a firm is often measured by leverage. High leverage is good for a company as proposed by MM Proposition II, where the firm enjoy the advantage of interest tax shield (Modigliani and Miller, 1963). However, at a certain point when the leverage increases, the financial and bankruptcy risk of the business will also increase as suggested by the trade-off theory (Robichek and Myers, 1965). Studies use different measurement for leverage and majority of the studies finds that leverage to be a significant predictor of business failure among SMEs. The inspiring study of Edmister (1972) who uses current liabilities to equity to measure leverage, finds that leverage is positive and a significant predictor of business failure. High level of gearing will potentially lead to business failure of the firm and a low debt-to-equity ratio relative to the industry reduces the chance of failure. Total debt to total assets (Behr and Guttler 2007), current liabilities to the total asset (Abdullah et al., 2016) and short-term to equity book (Altman and Sabato, 2007) are the common use proxies for leverage and are positively related to SMEs failure.

Liquidity measures are the class of financial ratios that are used to determine a company's ability to pay off its short-terms and long-term debts obligations when due. Generally, the higher the value of the ratio, the larger the margin of safety that the company possesses to cover fixed obligations which will reduce the probability of default. SMEs rely heavily on short and long term borrowing as their major source of financing as such liquidity factors are considered important determinants of SMEs failure due to the nature of SMEs business operations. The mostly used proxies for liquidity are the current assets to current liabilities (Abdullah et al., 2016), EBIT to interest expenses (Ferreira et al., 2014), cash to total assets (Pervan and Kuvak, 2013) and current asset minus inventory to current liabilities (Moscalu, 2012). The empirical analysis shows that all these measures for liquidity are negative and significant predictor of SMEs failure. High liquidity lowers the default probabilities of the SMEs significantly while a lower funds flow relative to short-term commitments is a predictor of failure.

Activity ratios measure a firm's ability to convert different accounts within its balance sheets into cash or sales. Activity ratios are used to measure the relative efficiency of a firm based on the use of its assets, leverage or other balance sheet items. Working capital to sales ratio as a measure for activity ratios is negative and significant predictor of small businesses failure, indicating that a relatively high working capital turnover portends failure (Edmister, 1972). Inventory to net sales is found it to be a significant predictor of small business failure as well (Moscula, 2012). Similarly, sales to total assets are also used as a proxy for activity ratio (Abdullah et al., 2016). The variable is negative and significant predictor of business failure in Italian context indicating a high value for the sales to total asset indicator means good performances on the market and, therefore, a low probability of default (Pederzoli and Torricelli, 2010). However, the variable was not significant predictor in the Malaysian manufacturing SMEs (Abdullah et al., 2016).

### **2.2. Non-Financial Indicators**

Financial ratios use in business failure prediction studies have received a lot of debate within the corporate finance literature. Financial ratios are determined based on past performance, and thus the prediction models may not be suitable for future failure prediction (Keasey and Watson, 1987). The use of historical cost in accounting principles may affect the significance of the prediction models since there is a tendency of manipulations of information especially in the case of SMEs where there is a lack of sound and effective internal control mechanism (Agarwal and Taffler, 2007). For this reason, non-financial factors are based on non-accounting or qualitative variables.

Business failure prediction models that compliment financial and non-financial variables are found to overcome some of the drawbacks associated with financial ratios mentioned earlier by providing a higher predictive accuracy rate and increase the validity of the models developed. A growing number of studies have confirmed that financial indicators together with non-financial indicators (such as business age, education of managers, auditing, business location, industry etc.) may prove useful in business failure prediction for SMEs (Abdullah et al., 2016; Altman et al., 2010; Keasey and Watson, 1987). SMEs size and age are among the non-financial variables that have been given much attention by researchers due to the nature and structure of small businesses. Age and firm size (using a proxy of the logarithm of total assets or share capital for size) are found to be negative and significant predictors of SMEs failure. Younger SMEs seems to be more likely to fail as compared to longer existence SMEs due to lack of experience in the business environment and growth development potentials (Abdullah et al., 2016; Altman and Sabato, 2007).

Other non-financial variables that were found to be significant predictors include the location of company business and business sector. Results show that regional factor is an important driver of SME's failure in Germany. The findings show that companies in eastern Germany are substantially riskier than their counterparts in western Germany because of eastern German firms are on average younger, have worse cost structures and operate in a more difficult economic environment (Behr and Guttler, 2007). Likewise in developing countries (for example like Nigeria), the regional factor could also make a lot of influence on business success or failure. For example, some states or cities will be much more developed as compared to others in terms of infrastructure, ease of doing business, and business opportunities among other factors.

Financial and non-financial variables used in this study were selected based on their popularity in the literature that shows their significance in predicting business failure among SMEs. A combination of financial and non-financial variables (Model 2) should improve SME failure prediction accuracy rates, compared to prediction based only on financial variables (Model 1).

### 3. DATA AND METHODOLOGY

The sample consist of both failed and non-failed SMEs for a fifteen-year period from 2000 to 2014. Corporate Affairs Commission of Nigeria (CAC) database was used to obtain the relevant information on the SMEs. CAC an autonomous body that functions as a one-stop centre for corporate information, regulation, supervision of the formation, incorporation, management and winding up of companies and development of the conducive business environment. Companies were matched based on the same industry group and close in asset size, i.e. failed companies were matched against non-failed companies that have an almost similar total asset. Financial statements were used to extract the financial variables and the companies profile was used to obtain the non-financial governance variables. The study focused on companies in the manufacturing sector as the sector contributes 30 percent of the country total export (ACCA, 2013). The manufacturing sector is the third-largest on the continent and produces a large proportion of goods and services for the West African sub-region (The Economist, 2014).

The final sample for the estimation model is 344 companies that consist of 50 percent non-failed cases and 50 percent failed cases. Twenty percent (68 companies) of the estimated sample was retained as a hold-out sample to test on the prediction model. The sampled companies were selected based on the SME's definition adopted by the National Policy on SME, where the total asset does not exceed NGN1000 million. Secondly, the companies were selected based classification under winding off by Court Order under Section 408 (d) of The Companies And Allied Matters Act, LFN 2004 of Nigeria. Data for three years were used in the estimation analysis because most of the failed companies did not submit their financial reports when the winding-up period approached, which led to a very small sample for the two and one years prior to failure. Additionally, the majority of the failure prediction studies have been based on one year before the failure event. However, models developed on data several years before eventual failure might well provide more informational value to interested parties than those which 'predict' well but relatively late in the day.

The study uses logistic regression as an appropriate statistical technique to estimate the data. Logistic regression is used to predict a binary response from a binary predictor, used for predicting the outcome of a categorical dependent variable based on one or more predictor variables (Altman et al., 2010). Logistic regression incorporates non-linear effects and uses the logistical cumulative function in predicting a bankruptcy (Laitinen and Kankaanpaa, 1999). To investigate whether non-financial variables influence the occurrence of distress, a logistic regression model of the following form is estimated:

$$Y_{it} = \alpha_0 + \beta_1 ROE_{it} + \beta_2 EBIT_{it} + \beta_3 TLA_{it} + \beta_4 LTA_{it} + \beta_5 CLA_{it} + \beta_6 CLE_{it} + \beta_7 LQT_{it} + \beta_8 WCT_{it} + \beta_9 AST_{it} + \beta_{10} EXP_{it} + \beta_{11} LogTA_{it} + \beta_{12} LogCAP_{it} + \mu_t \quad (1)$$

$$Y_{it} = \alpha_0 + \beta_1 ROE_{it} + \beta_2 EBIT_{it} + \beta_3 TLA_{it} + \beta_4 LTA_{it} + \beta_5 CLA_{it} + \beta_6 CLE_{it} + \beta_7 LQT_{it} + \beta_8 WCT_{it} + \beta_9 AST_{it} + \beta_{10} EXP_{it} + \beta_{11} LogTA_{it} + \beta_{12} LogCAP_{it} + \beta_{13} AGE_{it} + \beta_{14} BLC_{it} + \mu_t \quad (2)$$

where  $i$  refers to firm,  $t$  refers to time, and  $Y$  is a binary variable that equals to 1 for failed, zero otherwise. ROE is ratio of net income to total equity. EBIT is ratio of earnings before interest and tax to total asset. TLA is ratio of total liabilities to total assets, LTA is a ratio of long term liabilities to total assets. CLA is a ratio of current liabilities to total assets. CLA is a ratio of

current liabilities to total equity. LQT is ratio of current assets to current liabilities. WCT is ratio of working capital to total debt. AST is ratio of total sales to total assets. EXP is ratio of selling, general and administrative expenses to total sales. LogTA is logarithm of total assets. LogCAP is logarithm of share capital, AGE is years of SMEs business operations and BLC is a dummy variables for business location which takes the value of 1 if the firm business location is in industrialised region, 0 otherwise. Model 1 (equation 1) utilising only financial variables will act as a benchmark model by which to compare the results obtained by model 2 (equation 2). Model 2 that incorporates the financial and non-financial variables is design to test whether the two set of information are able to produce superior result to those obtained from model 1.

#### 4. FINDINGS AND DISCUSSIONS

Table 1 presented the results of mean differences on the variables used to estimate the logit model between the failed and non-failed SMEs. Overall, the result shows that there is significant different between the two groups. Failed SMEs appears to be less profitable, lower liquidity, incurring high operational expenses and less efficient in utilising their assets as compare to non-failed SMEs.

**Table 1: Descriptive Statistics**

Variables	Panel Pool (3 years prior)				VIF
	Failed SMEs (172)		Non- Failed SMEs (172)		
	Mean	Standard Deviation	Mean	Standard Deviation	
ROE	0.745367	0.260007	2.48751	0.185314	1.427
EBIT	0.863793	0.236490	1.15898	0.318551	2.562
TLA	0.898241	1.121907	0.440321	0.349391	1.122
LTA	0.659141	0.456884	0.147748	0.235662	2.384
CLA	0.742129	0.506087	0.397661	0.618153	1.678
CLE	0.508701	0.519683	0.125891	0.576853	1.855
LQT	0.570782	0.416254	2.37815	1.054361	2.181
WCT	0.572816	0.296863	0.903751	0.643823	1.915
AST	0.572816	1.175928	1.089221	0.965388	1.288
EXP	0.697674	0.583379	0.450561	0.268901	1.824
LogTA	14.18181	2.295036	12.74269	2.984732	2.086
LogCAP	15.09886	1.835847	15.46198	2.089885	1.631
AGE	15.76162	7.855131	25.37426	10.53789	1.279
BLC	0.366907	0.486279	0.678362	0.468471	1.096

Note: Earnings before interest and tax to total asset (EBIT), return on equity (ROE), current assets to current liabilities (LQT), working capital to total debt (WCT), total liabilities to total assets (TLA), long-term debt to total assets (LTA), current liabilities to total asset (CLA), current liabilities to total equity (CLE), asset turnover (AST), selling, general and administrative expenses to sales (EXP), logarithm of total assets (LogTA) and logarithm of share capital (LogCAP), years of business (AGE), location of business (BLC). VIF refers to variance inflating factor.

Both groups are considered to be relying heavily on debt liabilities to finance their day-to-day business operations. Smaller companies often rely heavily on trade finance from suppliers when bank finance is not available to them (Altman et al., 2010). Though non-failed SMEs stand in a better position due to higher profitability and liquidity which will enable them to meet their short and long-term obligations when due. Non-failed SMEs are mostly located in industrialised (which consist of 5 states namely Kano, Lagos, Rivers, Delta and Abuja) states in Nigeria. The states jointly contribute 45.03 percent to the country's GDP in 2014 (Eniola, 2015; Service, 2016), accounting for 38.2 percent of the total established SMEs and 40 percent of the total employment across the country (Central Bank of Nigeria, 2014). Therefore, the states are considered to be much more developed as compared to others in terms of infrastructure, access to finance, and ease of doing business, business opportunities among other factors.

A Pearson correlation test was employed to investigate the relationship between the independent variables and the results are summarised in Table 2. The findings show that the correlations among the variables are moderately low ranging from -0.006 to 0.596 and majority of the relationships are significant. Multicollinearity is not a threat to this study as indicated by the low pair-wise correlation among the variables. To further verify that multicollinearity is not a problem to this study, a variance inflating factor (VIF) is reported in Table 1. The VIF ranges from 1.096 to 2.562 which is less than 10 indicating there is no issue of multicollinearity to this study.

Tables 2: Pearson Correlation

	EBIT	ROE	TLA	LTA	CLE	LQT	WCT	AST	EXP	CLA	LogTA	LogCAP	AGE	BLC
EBIT	1													
ROE	.255**	1												
TLA	-.125*	-.067	1											
LTA	-.361**	-.264**	.120*	1										
CLE	-.222**	.268**	.021	.312**	1									
LQT	.261**	.182**	-.051	-.513**	-.137*	1								
WCT	.190**	.020	-.074	-.246**	-.117*	.596**	1							
AST	.182**	.044	-.070	-.237**	-.117*	.157**	.154**	1						
EXP	-.317**	-.182**	.212**	.524**	.331**	-.206**	-.168**	-.319**	1					
CLA	-.165**	-.107*	-.062	.385**	.179**	-.405**	-.417**	-.009	.256**	1				
LogTA	-.174**	-.075	-.017	.322**	.348**	-.116*	-.123*	-.336**	.303**	.195**	1			
LogCAP	-.060	-.168**	-.087	.012	-.198**	-.033	-.143**	-.065	-.091	.045	.347**	1		
AGE	.126*	.042	-.008	-.209**	-.223**	.127*	.184**	.130*	-.331**	-.141**	-.137*	.169**	1	
BLC	.070	.020	-.099	-.117*	-.004	.035	.098	.120*	-.214**	-.052	-.109*	-.021	.177**	1

Note: \*, \*\*, \*\*\* significant at 10 percent, 5 percent and 1 percent levels respectively. Earnings before interest and tax to total asset (EBIT), return on equity (ROE), current assets to current liabilities (LQT). Working capital to total debt (WCT), total liabilities to total assets (TLA). Long-term debt to total assets (LTA), current liabilities to total asset (CLA), current liabilities to total equity (CLE), asset turnover (AST), selling, general and administrative expenses to sales (EXP), logarithm of total assets (LogTA) and logarithm of share capital (LogCAP), years of business (AGE), location of business (BLC).

Further estimations using logistic regression models are made where the binary dependent variable equals one if the company fail and zero otherwise. The score between zero and one gives a clear indication of the probability of default of a company. A stepwise procedure is applied to the logistic regression models which allowed the predictors to be included only based on the contribution they made. A stepwise procedure is usually applied when there is a lack of theoretical basis in the selection of the predictor variables (Low, Mat Nor and Yatim, 2001). Table 3 reports the stepwise logistic regression results. In the regression, the debt ratios (TLA, LTA and CLE), profitability ratio (EBIT) and expenses ratio are significant for both models with the expected sign. The findings show that firm with a high level of leverage would likely default on its fixed obligations due to a high level of financial risk (Abdullah et al., 2016). When the debt ratio is high, the company has a lot of debt relative to its assets. It is thus carrying a bigger burden in the sense that principal and interest payments take a significant amount of the company's profit, and a hiccup in financial performance or a rise in interest rates could result in default.

With the high level of leverage and lower profitability, the likelihood of default is high. The result shows that profitable SMEs face lower default probabilities because of higher firms' performance. The Firms are able to meet their short and long-term commitments while unprofitable SMEs would likely not be able to meet its obligations (Arslan and Karan, 2009; Moscalu, 2012). Profitable SMEs are likely to use less amount of debt as the company will utilise more of its retained earnings (at zero cost issuance as compare to other sources like debt or equity) as a major source of finance (Myers, 1984). This is further illustrated as shown in Table 1 where the non-failed SMEs carries relatively lower debt burden as compared to failed SMEs. The implication is that the less profitable an SME is, the less self-sufficient it becomes through reinvestment of profits, the more likely it will need to depend upon short-term or long-term debt financing for its assets and activities. Lower profitability would result in the firms' inability to meets its debt obligation.

Furthermore, the findings show a significant extent of managerial discretion in spending company resources using the expense ratio. A high expense ratio indicates inefficiency and inability of managers to control costs, whereas a low expense ratio indicates efficiency and the ability to control costs (Anderson et al., 2007). Firms with high expense ratios are expected to experience a high probability of business failure due to the inability of the management to control cost that will trim the company's profit.

**Table 3: Stepwise Logistic Regression**

Variables	Model 1 Coefficient	Model 2 Coefficient
Constant	41.397***	14.975***
EBIT	14.380***	14.555***
ROE	12.286***	-
TLA	1.717***	2.161***
LTA	4.402***	4.688***
CLE	4.292***	0.495*
LQT	0.694***	-
EXP	1.733***	1.658***
AGE	-	0.129***
BLC	-	1.474***
Hosmer-Lemeshow test	2.144 (0.976)	5.811 (0.668)
-2 Log likelihood	131.330	120.720
Cox-Snell's R <sup>2</sup>	0.633	0.645
Nagelkerke's R <sup>2</sup>	0.844	0.858
McFadden R <sup>2</sup>	0.737	0.788
Area under ROC curve (AUC)	0.976 (SE = 0.006)	0.980 (SE = 0.005)

Note: \*, \*\*, \*\*\* significant at 10 percent, 5 percent and 1 percent levels respectively. Model 1 developed using only financial variables. Model 2 developed using financial and non-financial variables. Earnings before interest and tax to total asset (EBIT), return on equity (ROE), current assets to current liabilities (LQT), total liabilities to total assets (TLA), long-term debt to total assets (LTA), current liabilities to total equity (CLE), general and administrative expenses to sales (EXP), years of business (AGE), location of business (BLC). SE refers to standard errors.

When non-financial variables are added to the model (Table 3), the findings show that regional factor is negative and a significant driver of SME's failure in Nigeria. The findings show that companies in less industrialised states are substantially riskier than their counterparts in industrialised states. This is because SMEs in less industrialised states in Nigeria on average are younger, less profitable due to the higher risk they face and operate in a more difficult economic environment. AGE of company is negatively related to failure and is significant in predicting failure among SMEs in Nigeria. The longer the company survives then the less likely that it is to fail. Finding is in line with previous studies like that of Abdullah et al., (2016), Altman et al., (2010) and Shane (1996) among others all in support of the argument. Younger firms are more likely to fail because they face greater variability in their cost functions while they learn about their industry and management capabilities (Shane, 1996). Thus, the longer the company has existed, the higher the chance of it to survive as a result of their ability to learn, experience and management capabilities.

Table 3 also presents the model fit measures. The Hosmer and Lemeshow test for logistic regression is widely used to answer the question on how well does the model fit the data. The test suggests that both models are adequate and that the models fit the data because the observed and expected event rates in subgroups are similar which indicates that the models are consistent with the data. This could be clearly observed in the p-value of model 1 (p-value= 0.976) and model 2 (p-value= 0.668). Furthermore, McFadden R-squared, Cox-Snell's R-squared and Nagelkerke's R-squared tests suggest a relative increase in the model's performance when company age and business location were added to the specification.

Table 4 provides a summary of the misclassification rate of the models for the estimated and holdout sample. Model 1 has an accuracy rate of 92.06 percent and the holdout sample is having an accuracy rate of 85.51 percent. Luppi et al., (2007) also reported a similar result of 85 percent of the holdout sample. Furthermore, model 2 accuracy rate of the estimated (93.82%) and holdout (86.96%) sample is higher than of model 1. The result of the holdout sample is close to the accuracy rate reported by Abdullah et al. (2016) of an accuracy rate of 87.5 percent.

**Table 4: Misclassification Rate**

	Estimated Sample (Training)	Holdout Sample (Validation)
Model 1	0.07636	0.14493
Model 2	0.06182	0.13044

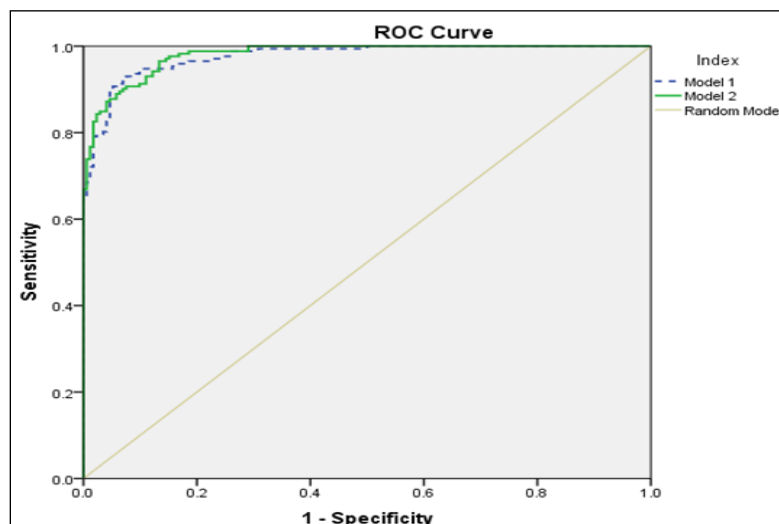
Notes: Model 1 developed using only financial variables. Model 2 developed using financial and non-financial variables.

It is necessary to assess the models for robustness of the key findings. Thus, it is expected that the main conclusions as derived from the classification rate of each model should be same or with a reasonable different that is not far from the actual results. To further check the robustness of the model's prediction and performance, the receiver operating characteristic (ROC) was



utilised in the analysis. Receiver operating characteristic (ROC) curve is useful for assessing and provide a comprehensive and visually attractive way to summarise the accuracy of predictions. The area under the ROC curve is used in logistic regression to further check and validate on the robustness of the predictive accuracy of the models' estimates (Bauer and Agarwal, 2014). Figure 2 presents the ROC curve for models 1 and model 2.

**Figure 2: Comparison of ROC Curves between Model 1 and 2**



Clearly, the two models perform and predict failure better than the random model. It also illustrates that Model 2 area under the ROC curve is marginally larger as compared to model 1, suggesting that Model 2 has a higher performance. A marginal increase in AUC is observed when the non-financial variables were added (from an AUC of 0.976 to an AUC equal to 0.980). Both models are considered excellent in discriminating between failed and non-failed as their area under the ROC curve is above 0.8 (Hosmer et al., 2013). However, model 2 is marginally superior with the inclusion of the non-financial variables.

## 5. CONCLUSION

It is timely and imperative to develop SMEs failure prediction model for Nigerian SMEs. Among some of the reasons are; first, the high rate of business failure among SMEs in Nigeria. Secondly, Nigerian government recommitment towards improving and developing the SME sector to a more vibrant economic contributor. Finally, the scare of Nigerian literature provides little or no evidence on the relationship between financial and non-financial indicators and business failure of SMEs. Therefore, this study contributes to the literature on modelling business failure among SMEs in Nigeria.

The financial ratios EBIT (profitability ratio), TLA, CLE, LTA (leverage ratios) and EXP (efficiency ratio) are among the financial variables that are found to be significant predictors in both model 1 and 2. The findings show that SMEs with huge debt liabilities are likely to go bankrupt due to the high level of financial risk. Additionally, the finding shows that profitable SME faced lower bankruptcy risk because of higher performance. The results show there is extent of managerial discretion in spending company resources among failed SMEs in Nigeria. The finding also reveals that among the non-financial variables, the longer the SME is been in business, the less likely it is to fail. The findings show that companies in less industrialised states are relatively riskier and more likely to go fail than their counterparts located in more industrialised states such as Abuja, Delta, Lagos, Kano and Rivers. The results further indicate that the inclusion of business location and age of companies, as non-financial variables, are important for predicting failure among SMEs. The misclassification rate reduces thereby improving the accuracy rate of the model once business location and age were included in the model.

The models developed would enable stakeholders such as management of SMEs, financial institution and policymakers to detect failure signals as early as three years before the potential business failure and take corrective measure. For example, the findings of this study could assist the management of SME to understand the characteristics of financial ratios that have the likelihood of putting their firm into potential failure. This will assist the management in finding timely solutions and enable the SME to develop viable financial strategies to avoid going bankrupt. For example, SMEs should decrease the exposure to debt liabilities as the findings indicate that with high level of debt financing, the likelihood of going into bankrupt is high. This is because principal and interest payments take a significant amount of the company's profit. Moreover, the results suggest that management of SMEs should exploit operating efficiency, in place of debt as a principal source of business finance. This can be achieved through asset utilization, waste reduction in manufacturing process and optimal production output.

Financial institutions such as banks would also benefit from the findings of this study as it help them in setting their internal systems and procedures to manage credit risk for SMEs. Specifically, the findings would help banks in assessing the credit risk of an SME. The finding of this study also stress the usefulness for banks to include corporate governance variables in their credit-rating systems. Moreover, non-financial information, such as age of SMEs and business location, can be rechecked frequently allowing banks to correct their credit decisions in a timely manner. Moreover, the findings of this study would enable banks with the ability to implement changes using the macroeconomic variables used in their credit risk assessment to better go along with the economic changes in the business environment. Similarly, suppliers who are also considered as close associates or trade creditors to SMEs would also benefit from the findings of this study. The business bankruptcy prediction models developed in this study would provide additional information for these trade creditors to understand the going concern of the SMEs and to decide on the credit policy.

The Nigerian government do realize the importance of SMEs sector because of the contribution to the economies and domestic employment. For this reasons each year, resources are allocated to support the development of SMEs. The models developed in this study would benefit regulatory bodies like SMEDAN the main/key policy-making bodies to formulate strategies for SME development. The findings from the study would assist them in monitoring and evaluating SMEs in order to access their well-being before deciding on any form of assistance for their sustainability and continuous development.

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## TRADE LIBERALIZATION AND ECONOMIC GROWTH: A PANEL DATA ANALYSIS FOR TRANSITION ECONOMIES IN EUROPE

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### ABSTRACT

**Purpose-** In this study, the long-term and the short-term relationships between economic growth and trade liberalization for 13 transition countries in Europe were examined.

**Methodology-** The dataset includes 303 observations from 1995 to 2016 for the variables of gross domestic product (GDP), export (EXP), import (IMP), gross fixed capital formation (GFCF), foreign direct investment (FDI) and human capital (HC). PLS Test, Pesaran (2004) CD-Test, Pesaran (2007) Unit Root Test, Swamy S Homogeneity Test conducted before causality and cointegration analysis. Dumitrescu & Hurlin (2012) Granger Panel Causality Test for short-term causality, and Westerlund ECM Panel Cointegration and PDOLS Estimator for long-term relationships analyses were employed.

**Findings-** The short-term outcomes revealed that there is a bidirectional causality between (a) EXP and GDP, (b) GFCF and GDP, (c) FDI and GDP, (d) HC and GDP, and a unidirectional causality (e) from IMP to GDP. The long-term results show that (i) a 1% raise in EXP boosts GDP by 0.39%, (ii) a 1% raise in IMP boosts GDP by 0.11% (iii) a 1% raise in GFCF boosts GDP by 0.37% (iv) a 1% raise in FDI reduces GDP by 1.35%, (v) a 1% raise in HC boosts GDP by 0.54% in the long-term.

**Conclusion-** Both in the short-term and the long-term trade liberalization has a positive impact on economic growth in mutual way between EXP, IMP and GDP as it is argued by the feed-back hypothesis.

**Keywords:** Economic Growth, Trade Liberalization, Export, Import, Panel Data Analysis

**JEL Codes:** O47, O40, E21

## 1. INTRODUCTION

Trade liberalization reflects the degree of freedom of trade policies implemented by countries in the process of trade relations with the rest of the world (Saçık, 2009: 280). Trade openness, a channel in which goods and services, foreign direct investments and capital inflows move across borders or to certain countries and regions, is the basis of economic growth for developing countries (Özcan et al., 2018: 62).

The view that trade liberalization affects economic growth goes back to Adam Smith (Majeed, 2010: 204). This concept has been the subject of intense debate up to the present day, starting with the basic views of economists such as Hume, Smith and Ricardo, who advocated the School of Mercantilism and Classical Economics. Trade liberalization, which has come to the fore frequently after the crisis period in the 1970s and the structural economic transformation of neo-liberal policies proposed in the 1980s, can bring economic effects according to the competitiveness of the countries and the market shares of the exporting countries (Yapraklı, 2007: 68).

The comparative advantages created by trade openness provide the optimum distribution of resources and increase income level by improving the division of labor and specialization in the economy (Türedi and Berber, 2010: 303). The idea that Classical Economics put forward in the 18th and 19th centuries, that free trade increases economic efficiency and thus growth by encouraging international specialization, began to be reshaped in the later periods in line with the arguments developed

for and against it. However in the theoretical framework; from theory to practice, the notions that emphasize the advantages of openness began to be more clearly seen in Singapore, Taiwan, South Korea and Hong Kong, the countries of Southeast Asia in the early 1960s, and widely in many developing countries in the 1970s and 1980s (Medina-Smith, 2001: 2). The orthodox economic policies, implemented in these years where significant structural economic transformations took place, have adopted the target of integrating the world economies by shifting the aggregate demand from the domestic market to the foreign market within the scope of export-oriented growth strategies. Thus, the emphasis on foreign trade in the direction of orthodox stabilization programs has been the most basic goal since 1990s (Emsen and Değer, 2007: 162).

Removal of restrictions on trade in goods and services encourages growth by enabling countries to produce and export commodities that they specialize in (Ümit, 2016: 256). The foreign exchange obtained from the increase in exports provided with trade liberalization helps to increase the national income level by increasing the imports of raw materials and intermediate goods which cannot be produced within the country. Free trade enables the development of new technologies and production techniques in accordance with the demand for the goods of foreign countries, resulting in an increase in total factor productivity and thus increased production, employment and consumption. Moreover, it increases the efficiency in production by positive externalities created by providing information dissemination among countries (Yapraklı, 2007: 69).

International trade and capital movements which increase with globalization allows the economies to be more integrated with each other. In some cases; trade liberalization, which is the dynamics of growth for emerging economies, may adversely affect the macroeconomic indicators of countries or cause crises. Especially in countries that cannot turn free trade into advantages, as trade liberalization increases, the country's imports are increasing and foreign trade deficits are seen. In addition, the increase in the dependence of the countries that have started to be opened to the world economy on the other countries may cause the country's economy to be exposed to the economic fluctuations in the global markets. In order to eliminate these negative impacts in the economy, countries should perceive trade openness as a mechanism that can increase the level of domestic production and should take economic measures to minimize potential risks arising from the foreign market (Çeliköz et al., 2017: 105).

In general, it should be noted that trade openness positively affects the growth rates of countries. In this context, many countries are trying to liberalize their economies by removing trade barriers. With the acceleration of globalization, the importance of protectionist policies is gradually decreasing and free market economy policies come to the fore. Although trade liberalization has positive and negative effects in the present, it can be said that it benefits all countries in the long-term.

In the study, following the introduction, foreign trade theories are discussed and their views and assumptions about trade liberalisation and economic growth are explained. In addition, it is mentioned through which channels trade liberalisation affects growth. After giving a summary of the literature about the subject, econometric tests are used to examine the relationship between the variables and the results of the analysis are evaluated.

## **2. THEORETICAL FRAMEWORK**

Foreign trade provides various benefits to countries in many ways. Firstly; trade increases the efficiency of distribution of world resources by equalizing the values of goods and services. Secondly, the trade enables countries to specialize in the areas where they are comparatively most effective (in the production of goods and services) and in this way to obtain earnings. Finally, trade offers consumers a number of benefits from more efficient production techniques. Large-scale production of goods and services with small market volumes is not economically profitable. However, goods and services can be offered to consumers at cheaper prices as large-scale production reduces costs (Tupy, 2005: 2).

Free trade can lead to growth, in case a foreign trade policy is implemented in which the national economies can be integrated with the international structure and the resources allocated for production are directed to the sectors determined by foreign demand. Therefore, the dynamism required to achieve industrialization and growth is actualised by foreign demand rather than domestic demand (Mercan and Göçer, 2014: 28).

The mercantilist view that prevailed in the 16th and 17th centuries, argued that only the exporting country would benefit from the trade between two countries. Today, however, this opinion has lost its validity and it is accepted that static and dynamic gains from trade are obtained. Adam Smith explains the view with the Theory of Absolute Advantage that trade will increase growth and prosperity in two countries in the long-term (Saçık, 2009: 280). According to Smith, free foreign trade in a country with specialization and division of labor increases the efficiency of produced goods and services and efficiency in resource allocation. The effectiveness of domestic producers in foreign competition increases with their emphasis on R&D and technology investments, which increases product range and quality. All these developments contribute to the welfare of the countries and the growth of their economies (Mercan and Göçer, 2014: 30).

David Ricardo who developed "Comparative Advantages Theory" upon A. Smith's theory; under the assumptions of full employment and perfect competition, provided that the international price ratio of the goods is between the rates of

domestic opportunity costs, suggests that countries may acquire welfare gains from trade by specializing in the goods they produce with the lowest opportunity cost and by exporting the overproduction on domestic demand and importing the goods from other countries that they can produce relatively expensive. These gains arising from the trade increases, resulting from the transfer of resources from one sector to another sector with increasing specialization are called “static gains” according to comparative advantages. These gains which create prosperity in trade are characterized as “static”, because they are the result of a one-time acquisition and removal of tariff barriers and no more resources for redistribution (Saçık, 2009: 281).

Dynamic trade gains contain positive effects of trade that contribute to economic development and growth. Such gains consist of gains from trade that consistently benefit. These are countervailing of output gap and resources, market creation for domestic surplus, creating a large market volume that allows to take advantage of economies of scale, increasing competition, development of domestic market demand and creating economic dynamism (Saçık, 2009: 281). Moreover, trade can indirectly promote economic development through other channels such as technology transfer, product variety and efficient allocation and distribution of resources. However, in cases where the technology and capital accumulation of trading partners are considerably different from each other, economic integration might have negative effects on countries even if it increases growth rates worldwide (Özcan et al., 2018: 62).

The Heckscher-Ohlin-Samuelson model, a theory which suggests that trade is an economic activity that makes both sides profitable, analyzes the welfare gains of two countries as a result of trade openness. The basic proposition of the model in the context of international trade is that trade will allow the redistribution of economic resources between sectors, each country to export the commodity for which it uses a relatively cheap and abundant factor in production, and import the commodity produced by using the relatively scarce and expensive factor. The Heckscher-Ohlin-Samuelson model is important in that trade liberalization is an important policy for raising real wages and promoting economic growth in developing countries (Özcan et al., 2018: 62).

In economic growth models, the results of the relationship between foreign trade and economic growth are not clear and precise. The Harrod-Domar Model, which is one of the contemporary growth theories and the only capital as the production factor, propound that trade liberalization positively affects economic growth. However, this is only possible if the marginal efficiency of capital is positive. The Neo-Classic Growth Model, also known as the Solow Model, was built on the assumption of a closed economy in the 1950s. In the model, it is assumed that technological changes are exogenous and there is no foreign trade (Özcan et al., 2018: 62).

Economists such as Krueger (1978), Balassa (1985), Singer and Gray (1988), and Greenaway and Sapsford (1994), who contributed a bit more to Neo-Classical Economics, established models that emphasized export-based growth and suggested that increase in export has a positive impact on real GDP growth. In the export-oriented growth strategy, the neo-classical supply-side growth model which represents openness reveals the association between total factor productivity and economic growth. The Neo-Classical Growth Model is the most commonly expressed by the Cobb-Douglas type production function. By adding the export variable to this function, the increase in total factor productivity can be determined (Emsen and Değer, 2007: 163-164).

There are also some studies focusing on the demand side of economic growth. These studies addressing economic growth in the context of demand are Keynesian-based. In this respect, the growth model that Kaldor (1970) builds on Hicks’ growth model stands out (Emsen and Değer, 2007: 164). Kaldor (1970), taking into account the demand size of economic growth, says that the main constraint of economic growth in open economies is foreign demand. It is suggested in the hypothesis that the increase in autonomous demand driven by the long-term growth rate is at the center of the growth, and thus export or foreign demand in the open industrialized economies has a key importance in growth (Federici and Marconi, 2002: 323).

The dynamic gains obtained as a result of opening to international trade constitute the main elements of the endogenous growth theories led by Romer (1986) and Lucas (1988). In endogenous growth models, it is possible to establish long-term relations between trade liberalization and economic growth. It is stated in the model that in parallel with the liberalization of imports, advanced capital goods will encourage technology transfer through imports. High levels of foreign capital inflows and growing export revenues increase the import of technology intensive capital goods (Özcan et al., 2018: 62). At this point, R&D activities are becoming important. Import is an important channel for reaching new information and technologies developed in the world and contributes to long-term growth (Korkmaz and Aydın, 2015: 52). In addition, open economies can benefit from technological fluctuations that encourage trade, which can lead to economic growth (Özcan et al., 2018: 62).

Endogenous growth models deal with the relation between liberal trade and growth in terms of comparative advantage. The contribution of trade to economic growth may change, depending on whether the power of comparative advantage may lead economic resources to long-term growth-producing activities or move away from such activities. In addition, the aforementioned theories point out to financial and technological constraints in less developed countries and say that these countries may be deprived of social capability required to adopt technologies produced in developed economies. Thus, the effect of trade on economic growth may vary according to the level of economic development (Zahonogo, 2016: 42).

It should be noted that trade encourages growth in many ways. In order to increase the growth rates, it is important to make the resource allocation in the country effectively. The fact that countries specialize and produce in areas where they have relative cost advantages over other countries increases foreign trade earnings and growth. This leads to an increase in productivity by enabling countries to use more labor and capital in sectors where they gain high earnings in foreign markets.

Trade is expanding the markets by attracting domestic manufacturers. Domestic producers can profit from foreign trade by performing their production at the most efficient scale and lowering their costs. Trade leads to dissemination of new ideas and technologies which increases the productivity of labor and employers. Also, technology transfers through trade are of particular importance for developing countries that use underdeveloped technologies and do not have enough capacity to produce new technologies. The removal of trade barriers (taxes on imports, import quotas, etc.) increases the purchasing power and living standards of consumers by allowing them to access cheaper products. Free trade also allows companies to purchase cheap inputs, resulting in lower production costs and increased competitiveness (Majeed, 2010: 204).

Foreign companies entering the market with foreign trade may cause the profits of existing domestic firms to fall. It is possible for domestic firms to contribute to financial development and economic growth by using new technologies, focusing on new investments and developing new production techniques against the risk of decreasing their profits in the competition environment. In this context, trade liberalization can lead firms to innovate, and this tendency can enable to economic growth by increasing output level and quality (Çeliköz et al., 2017: 106-107).

The increase in international trade enables the expansion of technology and knowledge through the direct import of high-tech products, thus contributing economic growth. Trade facilitates economic integration through innovations and increases acquisitions from foreign direct investments. Trade openness expand the market and allow production under the conditions of increasing returns to scale and specialization.

Some theoretical studies suggest that trade openness sometimes hampers economic growth although it may potentially stimulate growth (Zahonogo, 2016: 42). According to Lucas (1988), Young (1991), and Redding (1999), opening up to trade may reduce long-term growth if a country specializes in comparatively disadvantaged sectors where potential productivity growth, technological innovations or learning by doing have largely lost effectiveness. In such economies, the selection of appropriate protectionist policies in foreign trade can accelerate technological progress.

### 3. LITERATURE REVIEW

The academic studies conducted throughout the world about the subject are summarized in Table 1. When the results of the study given in the table are analysed, it is understood that there is no consensus on the effect of trade liberalization on economic growth. Hence, the hypothesis on the theoretical level in terms of the relationship between trade liberalization and economic growth differs depending on the period examined, country and foreign trade policies. In general, however, the existence of a mutual and the same directional causal relation between free trade and economic growth has been determined. In most cases, conclusions have been reached in accordance with endogenous growth theories that say that trade liberalisation has a positive effect on economic growth.

**Table 1: Empirical Literature Review**

Researcher	Data Span and Methodology	Findings
Tullock (1967)	Theoretical Study	Suggested that the elimination of the social welfare costs of rent-seeking activities, protectionism, monopolies and customs tariffs would significantly increase domestic income.
Ram (1985)	1960-1970 and 1970-1977, 73 Countries, Cross-Section Analysis	In his analysis with country dummy variables based on the real growth rate of labor and exports and the share of investments in GDP, found a positive correlation between foreign trade and economic growth, but state that this is due to foreign demand.
Grossman and Helpman (1991)	Theoretical Study	Stated that economies of scale, technological innovations and rapid, high quality and low-cost production will bring competition, thus increase economic growth by providing dynamic gains from trade.
Levine and Renelt (1992)	1960-1989, 119 Countries, Cross-Section and Sensitivity Analysis	In their study for developed and developing countries, found that there is a strong relationship between trade and investments, and between investments and economic growth. Moreover, they suggest that trade liberalization positively affects economic growth through investments.
Sprout and Weaver (1993)	1970-1984, 72 Less Developed Countries,	In their analysis, they divided the countries into three groups according to their dependence on exports and used the variables of

	Two-stage Least Squares Method	the average labor force growth rate and the share of investment and exports in real GDP. Authors found statistically significant and positive relationships in oil exporting countries, but no correlation between economic growth and trade liberalization in countries with primary commodity exporters.
Greenaway et al. (1997)	1950-1985, 13 Developing Countries, Time Series Analysis	Found no linear relation between trade liberalization and economic growth and observe that in the early periods of liberalization, the economy shrinks and that there is an increase in growth in the later periods.
Edwards (1997)	1980-1990, 93 Countries, Panel Data Analysis	Concluded that foreign trade increases total factor productivity and thus economic growth.
Frankel and Romer (1999)	Year 1985, 150 Countries, Least Squares Method	In their study using the geographical components of trade, have addressed the ratio of trade to GDP as a function of geographic factors; and concluded that a non-coastal country has a low level of foreign trade and trade partners' distance from each other adversely affects trade. In the study, it is found that a 1% increase in the share of import and export increases the GDP per capita by 2% or more.
Abu-Qarn and Abubader (2001)	The Middle Eastern and North African Countries, 1968-1996 (Algeria and Sudan) 1966-1996 (Egypt, Morocco, Tunisia, Turkey) 1974-1995 (Iran) 1976-1996 (Israel), Time Series Analysis	Found that while exports and manufacturing industry exports increase economic growth in Algeria and Sudan, there is no such relationship for other countries.
Greenaway et al. (2002)	Data for the Last 20 Years, 73 Developing Countries, Panel Data Analysis	Observed that trade liberalization adversely affects the GDP per capita, but this negativity disappears and economic growth improves over time. The results of the study show that there is a relationship between the variables in the shape of a "J" curve.
Vamvakidis (2002)	1920-1990, 62 Countries, Regression Analysis	Suggested that the relationship between trade liberalization and economic growth is negative for the period of 1920-1940, but positive for 1970-1990. On the other hand, the author couldn't find any correlation between the variables for the period of 1950-1970.
Yanikkaya (2003)	1970-1997, 100 Countries, Panel Data Analysis	Although he found positive relations between Export/GDP, Import/GDP and Export + Import / GDP and economic growth; found that there is a relationship between the tariffs, export taxes, the taxes on foreign trade and growth, which are contrary to the literature. That is to say, as trade barriers increase, economic growth will increase.
Dollar and Kraay (2004)	1975-1997, 101 Developed and Developing Countries, Time Series Analysis	Found a positive relationship between the share of foreign trade in GDP and growth. The results of the study show that developing countries which significantly reduce tariffs with globalization process grow faster than developing countries which are not open to foreign trade and even developed countries.
Santos-Paulino and Thirlwall (2004)	1972-1997, 22 Developing Countries, Panel Data Analysis	Found that the increase in export due to trade liberalization has an impact on income distribution, wage inequality, employment and economic growth. Authors conclude that the increase in import has weaker effects on these variables and liberalization worsens the countries' balance of payments by increasing imports more.
Samman (2005)	1985-2003, 100 Countries, Time Series Analysis	Handled the work of Dollar and Kraay (2004) with a different methodology. Author put forward that the share of foreign trade in GDP, which he takes as a criterion for trade liberalization, yield misleading results. In the study, it is determined that trade liberalization considerably affects economic growth in the long-term. But the size and direction of the relationship between variables is not clear.



Parida and Sahoo (2007)	1980-2002, 4 South Asian Countries (India, Pakistan, Bangladesh, Sri Lanka), Panel Data Analysis	Propound evidence supporting the hypothesis that exports and manufacturing exports increase economic growth.
Kilavuz and Topçu (2012)	1998-2006, 22 Developing Countries, Panel Data Analysis	Found that high-technology manufacturing industry export, investment and low-technology manufacturing industry import have a significant and positive effect on growth.
Gül et al. (2013)	1994-2010, 6 Countries (Kazakhstan, Krgyzstan, Uzbekistan, Tajikistan, Turkmenistan and Turkey), Panel Granger Causality Test	Found a positive relationship between economic growth and foreign trade in the long-term.
Bourdon et al. (2013)	1995-2009, 157 Countries, GMM Method	Showed different results in different country groups and determine that trade liberalization affects economic growth negatively in countries where exports vary.
Dao (2014)	1980-2009, 71 Countries, Panel Data Analysis	Found a statistically significant and positive relationship between trade liberalization and economic growth.
Sağlam and Egeli (2015)	1999-2013, Turkey, Granger Causality Test	In the short-term, they found a bidirectional causality between two variables; but in the long-term, only unidirectional causality from export to growth.
Zahonogo (2016)	1980-2012, 42 Sub-Saharan Africa Countries, Pooled Mean Group Estimation Technique	Introduced the existence of a trade threshold below which greater trade liberalization positively affects economic growth and above which the impact of trade on growth decreases. The empirical results show an inverted-U curve response, indicating the non-fragility of the association between free trade and growth for SSA countries. The results of the study reveal that free trade can influence growth in the long-term, but the linkage between the variables is not linear.
Idris et al. (2016)	1977-2011, 87 Developed Countries, GMM	Indicated that trade liberalization has a positive impact on economic growth. This result is consistent with the endogenous theory.
Acet et al. (2016)	1998-2013, Turkey, Granger Causality Test	Suggested that there is a unidirectional causality from both export and import to economic growth. However, they emphasize that the effect of export on growth is based on imported inputs and highlight the impact of imports on growth.
Şerefli (2016)	1975-2014, Turkey, Granger Causality Test	Could not find a causal relationship between the variables of export, import and economic growth.
Silajdzic and Mehic (2017)	1992-2014, EU Transition Economies, CCE	Argued that trade liberalization positively affects economic growth in countries which use technology intensive methods of production.
Tunçsiper and Rençber (2017)	2002-2016, Turkey, Granger Causality Test	Asserted that there is a unidirectional causality from import to economic growth and export. The results obtained from this study prove the validity of “import-push growth” and “import-based export” hypotheses for Turkish economy.
Özcan et al. (2018)	1992-2015, 18 Emerging Market Economies, Panel Data Analysis	Suggested that there is a causal relationship between variables, from GDP per capita to trade liberalization.
Yurdakul and Aydın (2018)	2003-2016 and 2008-2016, Turkey, Engle-Granger, Johansen and Dynamic Least Squares	The results of the analysis using the real values of the variables show the validity of the import-oriented growth hypothesis for Turkey during the period 2003-2016; but when the nominal values of the variables are used, it is seen that there is a long-term equilibrium relationship between variables and the export-led growth hypothesis holds true for the country. On the other hand, in the analysis carried out for the period of 2008-2016, it is concluded that the export-oriented growth hypothesis is valid in Turkish economy.

#### 4. ECONOMETRIC ANALYSIS

#### 4.1. Data Set, Variables, Methodology

The dataset includes 312 observations from 1995 to 2016 for the variables of “gross domestic product (GDP), export (EXP), import (IMP), gross fixed capital formation (GFCF), foreign direct investment (FDI) and human capital (HC)” belong to 13 transition economies<sup>1</sup> of European Union. The data set was obtained from World Bank database.

In this study, primarily, the functional, the statistical and the VAR model will be defined. Before examining the long-term relationships and the short-term causality between the series, the correlation between the units, the stationaries of the series and the homogeneity of the parameters will be tested so as to define the appropriate panel causality and cointegration testing method. By considering the test results it will be defined the short-term causality test method and panel cointegration test method that reveals the long-term relationships.

#### 4.2. Model

The functional expression of the model can be described as in Eq.1. In the model GDP represents the economic growth and is the predicated variable of the model, while exports (EXP), imports (IMP), Gross fixed capital formation (GFCF), foreign direct investment (FDI) and human capital (HC) are the predictor variables of the model.

$$GDP = f(EXP, IMP, GFCF, FDI, HC) \quad (1)$$

GDP	: “Gross Domestic Product (constant 2010 US\$)”
EXP	: “Exports of goods and services (constant 2010 US\$)”
IMP	: “Imports of goods and services (constant 2010 US\$)”
GFCF	: “Gross fixed capital formation (constant 2010 US\$)”
FDI	: “Foreign direct investment, net inflows (BoP, current US\$)”
HC	: “Secondary education, pupils”

It is needed to convert the functional model to statistical model to carry on analysis. Eq.2 shows the statistical model below.

$$GDP_{it} = a + \beta_1 EXP_{it} + \beta_2 IMP_{it} + \beta_3 GFCF_{it} + \beta_4 FDI_{it} + \beta_5 HC_{it} + u_{it} \quad (2)$$

In equation (2),  $a$  symbolises the “constant term”, while  $\beta$  typifies the coefficients that specify the relationship between the predicated variable and the predictor variables;  $i$  ( $i = 1 \dots N$ ) denotes the countries, and  $u_{it}$  refers to the error term.

The VAR model can be described with the dynamic equation, which is defined by taking the delayed values of the series, as in Eq.3

$$dGDP_t = a_1 + \sum_{l=1}^n \beta_{1l} dGDP_{it-l} + \sum_{l=1}^n \beta_{2l} dEXP_{it-l} + \sum_{l=1}^n \beta_{3l} dIMP_{it-l} + \sum_{l=1}^n \beta_{4l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{5l} dFDI_{it-l} + \sum_{l=1}^n \beta_{6l} dHC_{it-l} + u_{1t} \quad (3)$$

$$dEXP_t = a_2 + \sum_{l=1}^n \beta_{7l} dEXP_{it-l} + \sum_{l=1}^n \beta_{8l} dGDP_{it-l} + \sum_{l=1}^n \beta_{9l} dIMP_{it-l} + \sum_{l=1}^n \beta_{10l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{11l} dFDI_{it-l} + \sum_{l=1}^n \beta_{12l} dHC_{it-l} + u_{2t} \quad (4)$$

$$dIMP_t = a_3 + \sum_{l=1}^n \beta_{10l} dIMP_{it-l} + \sum_{l=1}^n \beta_{11l} dEXP_{it-l} + \sum_{l=1}^n \beta_{12l} dGDP_{it-l} + \sum_{l=1}^n \beta_{13l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{14l} dFDI_{it-l} + \sum_{l=1}^n \beta_{15l} dHC_{it-l} + u_{3t} \quad (5)$$

$$dGFCF_t = a_4 + \sum_{l=1}^n \beta_{16l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{17l} dEXP_{it-l} + \sum_{l=1}^n \beta_{18l} dIMP_{it-l} + \sum_{l=1}^n \beta_{19l} dGDP_{it-l} + \sum_{l=1}^n \beta_{20l} dFDI_{it-l} + \sum_{l=1}^n \beta_{21l} dHC_{it-l} + u_{4t} \quad (6)$$

$$dFDI_t = a_5 + \sum_{l=1}^n \beta_{22l} dFDI_{it-l} + \sum_{l=1}^n \beta_{23l} dEXP_{it-l} + \sum_{l=1}^n \beta_{24l} dIMP_{it-l} + \sum_{l=1}^n \beta_{25l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{26l} dGDP_{it-l} + \sum_{l=1}^n \beta_{27l} dHC_{it-l} + u_{5t} \quad (7)$$

<sup>1</sup> These transition countries are “Albania, Bulgaria, Croatia, Czech, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Slovak Rep. and Slovenia.”

$$dHC_t = a_6 + \sum_{l=1}^n \beta_{28l} dHC_{it-l} + \sum_{l=1}^n \beta_{29l} dEXP_{it-l} + \sum_{l=1}^n \beta_{30l} dIMP_{it-l} + \sum_{l=1}^n \beta_{31l} dGFCF_{it-l} + \sum_{l=1}^n \beta_{32l} dFDI_{it-l} + \sum_{l=1}^n \beta_{33l} dGDP_{it-l} + u_{6t} \quad (8)$$

In Eq.3  $d$  displays “the first difference for the relevant series”,  $u_{1t}, \dots, u_{6t}$  denote the “error terms”. It is assumed that the lagged values of the variables are the same and are symbolised as  $n$  in each of equations. VAR Model is a system of equations in which each variable is linear function that covers lagged values of both predicated variable itself and other variables in the system. Therefore, the current values of the predicated variables are at the left side of the equation. The lagged values of all series are at the right side of the equation.

### 4.3. Application and Findings

In order to carry on the causality analysis, the series should be stationary at the same level. Therefore, primarily, the stationarity of the series will be determined by proper unit root test. So as to select the appropriate unit root test, the existence of correlation between the units should be tested. If there is a correlation between the units, “the first-generation panel unit root tests”, if not, “the second-generation panel unit root tests” will be employed.

#### 4.3.1. Cross Dependence Analysis

The correlations between the units was examined with “Pesaran 2004 Cross-section Dependence Test” and the outcomes are summarized in Table 3.

**Table 2: CD-Test**

Variables	CD-test	p-value	Corr	Abs(corr)
<i>LnGDP</i>	40.34	0.000*	0.960	0.960
<i>LnEXP</i>	39.94	0.000*	0.951	0.951
<i>LnIMP</i>	40.75	0.000*	0.970	0.970
<i>LnGFCF</i>	34.52	0.000*	0.822	0.822
<i>LnFDI</i>	26.55	0.000*	0.633	0.633
<i>LnHCS</i>	34.91	0.000*	0.830	0.830
MODEL - mgres	6.49	0.000*	0.155	0.225

Note: Under the null hypothesis of cross-section independence  $CD \sim N(0,1)$

In Table 2, shows the values of CD-test statistics, probabilities, correlation coefficients and the absolute correlation coefficients. According to the test results, the p-values of the variables are less than 0.05. Therefore, “the null hypothesis that presents no correlation between units” was rejected and it is concluded the existence of correlation. Therefore, “the second generation unit root tests” should be preferred to test the stationary of the series.

#### 4.3.2. Stationary Analysis

Pesaran (2007) added the “cross-sectional averages of the lagged values of the series” at level, and at the first order differences of the series as factors to the DF or ADF regression so as to eliminate the correlation between the units. Thus, in this method, the ADF regression was extended by the lagged values of cross-sectional averages and the first differences of this regression obscures the correlation between the units. The results of CIPS tests developed by Im, Pesaran and Shin are given in Table 4.

**Table 3: Pesaran CIPS Unit Root Test**

lag	t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
<i>LnGDP</i>	-2.536	-2.140	-2.250	-2.450	-2.847	0.002*
<i>LnEXP</i>	-2.383	-2.140	-2.250	-2.450	-2.277	0.011**
<i>LnIMP</i>	-2.798	-2.140	-2.250	-2.450	-3.819	0.000*
<i>LnGFCF</i>	-2.708	-2.140	-2.250	-2.450	3.488	0.000*
<i>LnFDI</i>	-2.492	-2.140	-2.250	-2.450	-2.684	0.004*
<i>LnHCS</i>	-2.775	-2.140	-2.250	-2.450	-3.736	0.000*

Based on the results of Table 3, because of the “absolute values of t-bar (CIPS) statistics” are greater than the absolute values of the confidence level at %1, %5 and % 10, it is concluded that the series are “stationary at level.” Similarly, due to the p-values of Z [t-bar] statistics of all series are less than 0.05 and therefore the series are stationary at the level.

### 4.3.3. Homogeneity Analysis

Before implementing causality analysis, it is needed to be determined the homogeneity of the parameters, so as to define whether the heterogeneous panel data analysis or homogenous panel data analysis will be employed. For this purpose, Swamy S Homogeneity Test was employed and the outcomes are presented in Table 4.

**Table 4: Homogeneity Test**

Reg.	$\chi^2 (72)$	Prob > $\chi^2$
$GDP_{it} = \alpha + \beta_1 EXP_{it-1} + \beta_2 IMP_{it-1} + \beta_3 GFCF_{it-1} + \beta_4 FDI_{it-1} + \beta_5 HC_{it-1} + u_{it}$	6057.23	0.0000*

"H0: parameters are homogeneous" the null hypothesis is tested against "HA: parameters are heterogeneous" the alternative hypothesis. Because the probability value of  $\chi^2$  presented in Table 5 is less than 0.05, "H0 hypothesis is rejected and It is concluded that the parameters are heterogeneous". Therefore, heterogeneity will be taken into consideration when determining the appropriate method for panel causality and cointegration tests.

### 4.3.4. Short-Term Causality Analysis

In the short-term causality analysis between the series, Dumitrescu & Hurlin (2012) Granger Panel Causality Test, which takes into account the heterogeneity, is employed and the outcomes are shown in Table 6.

**Table 5: VAR Panel Causality Test Results**

H <sub>0</sub> :	W-bar Stat.	Z-bar Stat. (p-value)	Z-bar tilde (p-value)
EXP $\nRightarrow$ GDP	3.5031	6.3817 (0.0000)*	5.0367 (0.0000)*
GDP $\nRightarrow$ EXP	1.9851	2.5115 (0.0120)**	1.8403 (0.0657)***
IMP $\nRightarrow$ GDP	2.9141	4.8800 (0.0000)*	3.7965 (0.0001)*
GDP $\nRightarrow$ IMP	0.6117	-0.9901 (0.3221)	-1.0516 (0.2930)
GFCF $\nRightarrow$ GDP	14.0818	8.4118 (0.0000)*	0.8497 (0.3955)
GDP $\nRightarrow$ GFCF	15.6958	10.0917 (0.0000)*	1.1857 (0.2358)
FDI $\nRightarrow$ GDP	4.0020	7.6537 (0.0000)*	6.0872 (0.0000)*
GDP $\nRightarrow$ FDI	2.4531	3.7047 (0.0002)*	2.8257 (0.0047)*
HC $\nRightarrow$ GDP	18.9783	13.5083 (0.0000)*	1.8690 (0.0616)**
GDP $\nRightarrow$ HC	28.5712	23.4929 (0.0000)*	3.8659 (0.0001)*

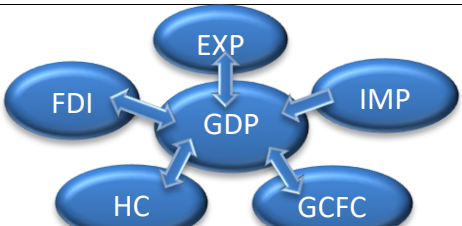
Note : "\*", \*\* and \*\*\* indicates the granger causality at %1, 5% and 10% significance level respectively".

( $\nRightarrow$ ) refers "does not Granger-cause"

Dumitrescu & Hurlin (2012) Granger Panel Causality Test Results, which are seen in Table 5, indicated that:

- EXP is the granger cause of GDP
- GDP is the granger cause of EXP.
- IMP is the granger-cause of GDP
- GDP is not the granger-cause of IMP
- GFCF is the granger-cause of GDP
- GDP is the granger-cause of GFCF
- FDI is the granger cause of GDP
- GDP is the granger cause of FDI
- HC is the granger-cause of GDP
- GDP is the granger-cause of HC

As a result, there is bi-directional causality between EXP and GDP; GFCF and GDP; FDI and GDP, HC and GDP and unidirectional causality from IMP to GDP. The outcomes of the short-term analysis are presented in Table 6.

**Table 6: Short-Term Relationships**


Variable	The direction of The Causality	Variable
GDP	↔	EXP
GDP	←	IMP
GDP	↔	GCFC
GDP	↔	FDI
GDP	↔	HC

#### 4.3.4. Long-Term Analysis

Despite of a permanent shocks that affect the system, it is possible a long-term equilibrium relationship between the variables. The existence of these relationships is analysed by using cointegration tests. In the panel cointegration tests, the appropriate method is determined according to the existence of correlation between the units and homogeneity of the parameters. As Pesaran CD-Test indicated a correlation between the units and Swamy S Test indicated that parameters are heterogonous, to test the long-term relationships, PDOLS Estimator the second-generation method, which considers the heterogeneity and correlation. However, before implementing PDOLS Estimator, Westerlund Panel Cointegration test will be conducted to show whether a long-term relationship exist, or not.

**Table 7: Westerlund ECM Panel Co-integration Test**

Statistics	Value	Z-value	P-value	Robust p-value
$G_t$	-2.818	-2.941	0.002	0.020*
$G_a$	-6.935	1.492	0.932	0.080**
$P_t$	-9.148	-2.619	0.004	0.030*
$P_a$	-7.275	-0.573	0.283	0.040*

Notes: "\*\* and \* indicate cointegration at the significance level of 5% and 10% respectively".

Table 7 includes  $G_t$ ,  $G_a$ ,  $P_t$  and  $P_a$  the test statistics, Z statistics, probability values (P-value) and robust p-values. The lag-length is determined as 0.46 according to average Akaike information criterion. The null hypothesis, which represents "H0: no cointegration" is tested. Robust p-values are the results should be take into consideration for heterogeneous panel cointegration. When these results are examined, robust p-values of  $G_t$ ,  $P_t$  and  $P_a$  are less than 0.05 and  $G_a$  is less then 0.10. Therefore, the "H0 hypothesis is rejected" and It was concluded that there is a co-integration between the series.

Since a long-term relationship between the series was confirmed, to get further detail in long-term relationships, PDOLS Estimator Test was implemented and the outcomes are displayed in Table 9.

**Table 8: PDOLS Estimator Outcomes**

Variables	Beta	t-stat
EXP	.3922	2.06e+13
IMP	.1073	5.05e+12
GFCF	.3735	3.51e+13
FDI	-1.35e-11	-9.86e+12
HC	.5436	2.26e+12

Note: "t-statistic table value ( $\alpha = 0.05$ ) is 1,96."

According to the results seen in Table 8, the EXP, IMP, GFCF, FDI and HC variables are significant because the absolute values of calculated t-statistics at 95% the confidence level are greater than 1.96 which is the t-statistic table value. Accordingly, the long-term relationship between the variable are presented in Table 9.

**Table 9: Summary of Long-Term Outcomes**

(1) a 1% raise in EXP boosts the GDP by 0.39	a 1% ↑ in EXP	⇒	a 0.39% ↑ in GDP
(2) a 1% raise in IMP boosts GDP by 0.11%	a 1% ↑ in IMP	⇒	a 0.11% ↑ in GDP
(3) a 1% raise in GFCF boosts GDP by 0.37%	a 1% ↑ in GFCF	⇒	a 0.37% ↑ in GDP
(4) a 1% raise in FDI reduces GDP by 1.35%	a 1% ↑ in FDI	⇒	a 1.35 % ↓ in GDP
(5) a 1% raise in HC boosts GDP by 0.54%	a 1% ↑ in HC	⇒	a 0.54% ↑ in GDP

## 5. CONCLUSION

When the literature is examined, it is seen that that there is no congruity on the effect of trade liberalization on economic growth. Hence, the hypotheses on the theoretical level in the sense of the connection between trade liberalization and economic growth differs depending on the period examined, country, foreign trade policies and the empirical methods employed. In general, however, the existence of a mutual and the same directional causality between trade liberalization and economic growth has been determined. In most cases, conclusions have been reached in accordance with endogenous growth theories that say that trade liberalisation has a positive effect on economic growth.

In this study, the long-term and the short-term relationships between economic growth and trade liberalization for 13 transition countries in Europe was examined. The dataset includes 312 observations from 1995 to 2016 for the variables of gross domestic product (GDP), export (EXP), import (IMP), gross fixed capital formation (GFCF), foreign direct investment (FDI) and human capital (HC).

Primarily, the functional, the statistical and the VAR models were established, the significances of the variables, model, and the coefficients were revealed by implementing PLS Method. Before examining the long-term relationships and the short-term causality between the series, (i) the correlation between the units tested with the help of Pesaran CD-Test; (ii) the stationaries of the series investigated via Pesaran (2007) Unit Root Test; (iii) the homogeneity of the parameters were tested by implementing Swamy S Test. It is concluded that units are correlated and the model is heterogeneous. Therefore, to test the short-term causality Dumitrescu & Hurlin (2012) Granger Panel Causality Test, which takes into account the heterogeneity was preferred, and to test long-term relationships PDOLS Heterogeneous Estimator was employed.

Dumitrescu & Hurlin (2012) Granger Panel Causality Test Results revealed a bidirectional causality between (a) EXP and GDP, (b) GFCF and GDP, (c) FDI and GDP, (d) HC and GDP, and a unidirectional causality from IMP to GDP.

Westerlund ECM Panel Co-integration test results confirmed long-term relationships. Then, PDOLS Estimator revealed that (1) a 1% raise in EXP boosts GDP by 0.39, (2) a 1% raise in IMP boosts GDP by 0.11% (3) a 1% raise in GFCF boosts GDP by 0.37% (4) a 1% raise in FDI reduces GDP by 1.35%, (5) a 1% raise in HC boosts GDP by 0.54% in the long-term.

The results of both the short-term and the long-term shows that the trade liberalization has a positive influence on economic growth mutually between EXP, IMP and GDP as it is argued by the feed-back hypothesis.

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## ASSOCIATION BETWEEN CORPORATE GOVERNANCE AND FRAUD DETECTION: EVIDENCE FROM BORSA ISTANBUL

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### ABSTRACT

**Purpose-** Corporate Governance establishes valuable pillars in order to guard shareholders' interests by the use of firm governance devices. It is evidently a philosophy rather than a palliative solution. However, while there is some evidence to prove that corporate governance enhances corporate performance and fraud detection; such hypotheses has not been tested within Borsa Istanbul. The aim of this paper is to make an attempt to investigate whether there is an association between corporate governance practices and detecting fraud.

**Methodology-** A logistics regression model is constructed with non-financial data. The analysis contains categorical dependent data which needs a binary response model. 134 firms from manufacturing industry of Borsa Istanbul construct the data set.

**Findings-** No evidence found about the impacts on selected corporate governance activities on the risk of financial statement frauds.

**Conclusion-** Although it was assumed that corporate governance applications have an effect to lessen the manipulations on financials at the beginning of the study, test results are not sufficient to prove the relationship. Nevertheless, existence of such practices are good messages of companies about their attitudes toward fraud.

**Keywords:** Corporate governance, Fraud, Borsa Istanbul, Corporate governance index

**JEL Codes:** M14, M40, M42

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### 1. INTRODUCTION

Corporate governance is defined as "a set of mechanisms through which outside investors protect themselves against expropriation by the insiders" (LaPorta, Lopez-De-Silanes, and Shleifer, 1999). In 1992 Cadbury Code, Sir Adrian Cadbury stated, "Corporate governance is holding the balance between economic and social goals and between individual and communal goals." The purpose of this philosophy is to align the interests of individuals, corporations, and the society on an enhanced ground. One of the main incentives is to discourage fraud and mismanagement. However, some firms are structured to emphasize the board of directors' ability to monitor and control management while other firms are not (Dorata and Petra, 2011). The introduction of other stakeholders raises the question of where exactly the shareholders' interests rank in terms of directors' priorities (Handley-Schachler *et al.*, 2007). In 1996, Shleifer and Vishny conducted a survey about theoretical structure on corporate governance. They conclude that U.K. and U.S. have governance systems characterized by strong legal protection for investors. They state that all successful governance models are characterized by protecting the investors efficiently. Corporate governance relies more in large investors and banks to monitor managers in Continental Europe and Japan. Legal protection for investors is weaker (Bouheni, Ammi, and Levy, 2016). Although there is some common ground, philosophy of corporate governance varies from country to country due to the national conditions.

Farber (2005) conducted research on corporate governance and stock price performances on fraud-detected firms. 87 firms that have fraud and manipulating activities on their financial statements were included in the study. They resulted that fraud detected firms have poor governance, and have few proportionate of outside board members. They have less Audit Committee meetings and fewer financial experts on that committee. A smaller percentage of the fraud-detected firms are audited by the Big 4 audit firms, and a higher percentage of CEOs who are also chairmen of the board of directors are observed

compared to other firms within the sampling period (Xue, 2008). After improving their governance within three years, they achieved similar corporate governance characteristics as the control firms. Additionally, investors appreciate corporate governance improvements because fraud detected firms that made changes achieved better stock performance. Moreover, Kaya and Aslan (2013) state that there is an association between companies that are compliant with corporate governance and corporate performance.

Gillian and Starks examined the relationship between corporate governance and ownership structure in 2003, and they found that institutional investors are more powerful. Brown and Caylor (2004) stated in their study that better governed firms are more profitable, less risky, more valuable, and pay out more of their cash to shareholders compared to other firms.

After corporate scandals and collapses, Accounting Industry Reform Act 2002 passed the Sarbanes-Oxley (SOX) Act in US. Companies registered on the US Securities and Exchange Commission (SEC) are subject to SOX Act. Ceteris paribus, SOX has had substantially positive impact on establishing a more transparent reporting environment due to numerous improvements. Since the establishment of SOX, audit committees do hire auditors, companies must disclose off-balance sheet transactions and must have codes of ethics, financial expert must reside on audit committee, whistle blower are better protected, higher penalties for white-collar crime have been put in action, and CEOs and CFOs must now certify financial reports (Donaldson, 2007). The Organization for Economic Co-operation and Development (OECD) also works on the issue, and OECD principles of corporate governance were published in 1991 and updated in 2004. According to OECD, there is no single corporate governance model that can be applied to all countries; there are main principles that state common characteristics essential for good governance. OECD principles are organized under six headings which are ensuring the basis for an effective corporate governance framework, the rights of shareholders, equitable treatment of all shareholders, the role of shareholders in corporate governance, disclosure and the responsibility of the board of directors.

Capital Markets Board of Turkey issued Corporate Governance Principles of Turkey in 2003. Principles of Turkey consist of four sub-sections; shareholders, disclosure and transparency, stakeholders and board of directors sections (CMB, 2003a).

In the literature review part of this paper, corporate governance principles are discussed in details with the concepts of financial fraud and corporate governance index. Data selection process is defined; the methodology and the hypotheses are explained in the following part. The paper is finalized with the discussions about the findings, and conclusion part includes an overview about the limitations of this study in Turkey.

## **2. LITERATURE REVIEW**

### **2.1. Corporate Governance Index**

BIST Corporate Governance Index (*XKURY*) includes the companies that apply Corporate Governance Principles. This index aims to measure the price and return performances of the companies on Borsa Istanbul (except companies in Watchlist Companies Market and List C). Corporate governance ratings should be minimum 7 over 10 as a whole and minimum of 6.5 for each main section. The rating institutions that are in the list of CMB rating agencies determine the corporate governance rating based on their assessment of the company's compliance with the corporate governance principles (Borsa Istanbul, February 2016).

Corporate Governance Index was first calculated on 31.08.2007 with the initial value of 48,082.17. Ratings of companies included in BIST Corporate Governance Index are announced under the company disclosures part on the Public Disclosure Platform (PDP).

### **2.2. Corporate Governance Principles**

There are four main principles of corporate governance. Investors, and all other stakeholders can use Corporate Governance Index and Public Disclosure Platform as the main source for measuring the key figures.

Equality establishes the equal treatment of share and stakeholders by the management in all activities of the company. The aim at equality concept is to prevent all possible conflicts of interest (CMB, 2003a). Transparency aims to disclose financial and non-financial information of the company to the public in a timely, accurate, complete, clear, construable manner. The information should be able to reach at low cost easily. Transparency does not mean announcing the trade secrets of the company with undisclosed information (CMB, 2003a). Accountability is accounting the company as a corporate body to the shareholders. This is the obligation of the board of directors. The company should be controlled effectively, and the Board should bear the accounting responsibility for both company itself and its shareholders (Akdemir, 2010). Responsibility defines the conformity of all operations performed on behalf of the company with the legislation, articles of association and in-house regulations together with the audit (CMB, 2003a).

### 2.3. Misstatements in Financials, and Fraud

Association of Certified Fraud Examiners (ACFE) defines fraud from the Black's Law Dictionary (2004) as, "A *knowing misrepresentation of the truth or concealment of a material fact to induce another to act to his or her detriment*". Thus, fraud includes any intentional or deliberate act to deprive another of property or money by guile, deception, or other unfair means.

Firms can make some intentional mistakes when preparing their financial statements in order to show their performance more successful. The aims of fraudulent financial statements can be listed as;

- To show the firm (more) profitable.
- To show the firm is in less debt, or debt is properly managed.
- To show the firm's working capital is feasible for operating successfully.
- To show the firm's asset management is successful.
- To postpone the bankruptcy of the company and/or show as if it is not in failure.
- To attract stakeholders (banks and/or credit institutions for credibility, shareholders for equity continuity, governmental institutions for reliability).

### 3. DATA AND METHODOLOGY

The aim at this study is to set a logistics regression model to detect the fraudulent financial statement risk of Borsa Istanbul firms with variables of corporate governance implications. The main purpose is to investigate whether corporate governance practices (applied or not applied by firms) have an effect on the fraudulent representations.

The relationship between dependent and independent variables is indicated with logistics regression, because the analysis contains categorical dependent data which needs a binary response model (Wooldridge, 2012). The logistic function is represented as below;

$$\text{Prob}(y = 1) = \frac{\exp(b_1x_1 + b_2x_2 + \dots + b_nx_n)}{1 + \exp(b_1x_1 + b_2x_2 + \dots + b_nx_n)} \quad (1)$$

The dependent variable of the model is selected as "**Fraudulent Financial Statement**" and is displayed with "FFS". This representation is same as in Spathis' studies (2002). The aim is to find the prediction probability of fraudulent financial statement risk via a logistics regression constructed with non-financial variables. FFS is a categorical dependent, and have values of "1" for fraudulent financial statement observations, and "0" for non-fraudulent financial statement observations. Another approach for interpreting the variable can be "1" for the firms that have high risk of fraudulent activities, and "0" for the firms that have no or less risk of fraud in their financials.

Independent variables of this study are selected after investigation of prior studies, also considering Turkish business environment and corporate governance applications. According to literature review, 19 out of 31 studies (61%) worked with logit analysis as algorithm of their model.

The variables about firms' corporate governance practice:

**Ethics Code (Code of Ethics):** Corporate governance principles require employees and professionals to be act in ethical behaviors. Code of Ethics should be announced in the organization in order to guide people about their business manners. All personnel should also be aware towards the codes, and be responsible to communicate and report non-compliance with Code of Ethics, and illegal actions (Mandaci, and Kahyaoğlu, 2012). Policy violations damage and hazard the corporate governance practices of the firm. Firms in this study are classified into two groups for this variable; "0" for the firms that have no Code of Ethics; and "1" for the firms that have.

**Existence in corporate governance index:** The purpose of BIST Corporate Governance Index (*XKURY*) is to measure the price and return performances of companies in Borsa Istanbul. This index requires that all companies included applying the corporate governance principles (transparency, equality, accountability, and responsibility) properly, and gives ratings to them based on their application performance. The expectation is that the firms listed in the corporate governance index are applying the corporate governance principles more effectively, so fraudulent financial statement risk decreases compared to firms that are not listed in the index. Firms in this study are classified into two groups for this variable; "0" for the firms that do not be listed in BIST Corporate Governance Index (*XKURY*); and "1" for the firms that are listed.

**Independent auditor rotation:** Carcello and Neal (2000) suggest that hiring external auditors who are more independent is associated with the audit committee's effectiveness. Auditors with greater industry expertise are preferred by the firms to achieve more efficient audit functions (Abbott and Parker 2000). In the mandatory type of independent auditor rotation, calculations are made considering ten (10) years retrospectively, and if an auditor audits a firm seven (7) years in total, rotation is made for three years and gives a break for the auditing relationship between parties according to Turkish Commercial Law, no. 6102. Firms can also change their independent auditors discretionally. There are many reasons to cancel,

or not to renew the contract with the audit company and/or the auditor. A dissatisfaction of service received, expertise capabilities, and financial issues are some example reasons. On the other hand, a firm publishing falsified financial statements, or committing a fraud tends to change its auditor in order to benefit from new relationship (The new auditor is in the recognition step of the audit commitment, and the firm). They do not want to generate close and long-term relations between auditors. Such kind of firms has higher possibility of switching the auditors frequently. Thus, independent auditor rotation can be a red flag for fraudulent activity. The expectation is that a company doing audit contracts rotation, bears more risk of fraudulent financial statement. Firms in this study are classified into two groups for this variable; “0” for the firms that have no independent auditor rotation for the stated year; and “1” for the firms that have the rotation. Table 1 summarizes the variable characteristics as below:

**Table 1: Summary of Variables Used in the Study**

Type of data	variable	acronyms	measurement	dependent / independent variable
Non-financial	fraudulent financial statements	FFS	categorical	dependent variable
Non-financial	ethics code	EC	categorical	independent variable
Non-financial	existence in corporate governance index	ECGI	categorical	independent variable
Non-financial	independent auditor rotation	IAR	categorical	independent variable

The research was conducted on the publicly available stock companies that are listed in Borsa Istanbul (formerly known as Istanbul Stock Exchange) for five years period from 2010 to 2014. All other industries except manufacturing industry have insufficient number of firms for a study of regression analysis. The number of firms available for sampling was 134 from manufacturing industry. With five years period, we obtained 670 (134 x 5) observations set.

In data collection process, relevant financial information was obtained from financial statements of the companies that are announced at “Public Disclosure Platform”. Corporate Governance Compliance Reports and the company websites were other sources for investigating the variable of “ethics code” existence. Moreover, weekly Capital Markets Board Bulletins was reviewed for fraud announcements, tax penalties news, and other related issues about firms.

In the first step for classifying the firms into two, (“1” for the companies that have a risk of publishing fraudulent financial statement, and “0” for the companies that have no/less risk of fraud in their financials) all “material event disclosures” about the companies in the sample set have been read and documented from Public Disclosure Platform. The auditors’ reports and their decisions were other sources in the classification.

Every company was classified based on following criteria;

- Is there a fraud announcement made by the company or by a regulator?
- Is there an error announcement of the company about their financial statements?
- Does the company have a penalty for this period?
- Is there any court proceeding, and if yes, what is the content?
- Is there any material event disclosure requested by Borsa Istanbul about stock price movements?
- Are there any important events indicating fraud or misappropriation?

The classification resulted that 71 firms out of 134 (52.99%) were classified as “1” which means bearing the risk of publishing fraudulent financial statements, and 63 firms out of 134 (47.01%) were classified as “0” which means there is no sign for a fraudulent activity based on determined criteria.

### 3.1. Hypotheses Development

Corporate governance index is the measure of the four main principles; disclosure and transparency, equality, responsibility, and accountability. Independency is also an important milestone for corporate governance. Code of Ethics and the rotation of independent auditors is the requirement of corporate governance practices. The purpose is to investigate effect of the application of these basic principles on prevention from fraudulent financial statements.

The expectation is that the application of corporate governance principles decreases the risk of fraud in companies, thus the risk of fraudulent financial statements.

Hypothesis: Corporate governance practices and FFS have a negative relationship.

- Hypothesis a: Existence of an ethics code and FFS have a negative relationship.
- Hypothesis b: Existence in corporate governance index and FFS has a negative relationship.

- Hypothesis c: Increase in independent auditor rotation is a signal for the possibility of fraud in the financial statements.

#### 4. FINDINGS AND DISCUSSIONS

EViews 9 SV package is the software used for the calculations of this study. A logistics regression was conducted with 670 observations from 134 companies.

$$\text{Prob (FFS = 1)} = \Pi ((b_0 + b_1 (\text{EC}) + b_2 (\text{ECGI}) + b_3 (\text{IAR})) \quad (2)$$

Where:

FFS = False Financial Statements

$\Pi$  = cumulative distribution fit of a logistic random variable

EC = Ethics code

ECGI = Existence in corporate governance index

IAR = Independent auditor rotation

In this model, independent variables EC, ECGI, and IAR are dummy variables, which were coded as “1” for the existence cases, and “0” for the reverse. Table 2 summarizes the descriptive statistics of the variables:

**Table 2: Summary of Descriptive Statistics**

	Mean	Median	Std.Dev.	Skewness	Kurtosis
FRAUD	0.53	1	0.5	-0.12	1.01
EC	0.75	1	0.43	-1.18	2.39
ECGI	0.12	0	0.32	2.35	6.51
IAR	0.19	0	0.4	1.55	3.39

Table 3 reports the results for the stepwise logistic regression for model.

**Table 3: Output of Logit Analysis**

Variable	Coefficient	Std. Error	z-Statistic	Prob.
EC	-0.265	0.209	-1.265	0.206
ECGI	-0.01	0.247	-0.039	0.969
IAR	0.168	0.213	0.791	0.429
C	1.52	0.373	4.073	0

McFadden R-squared	0.092
S.D. dependent var	0.5
Mean dependent var	0.529
LR statistic	85.247
Prob(LR statistic)	0

The overall test result of the relationship between fraud and corporate governance necessities was significant although none of the independent variables were resulted significant with p values > 0.05 at 95% confidence level.

In linear regression, adjusted R-squared gives the researchers an opinion about the explanatory power of the model. It indicates how well data fits a line with R-squared. However, it cannot determine whether the predictions are prejudiced and coefficients are biased (Frost, 2013). In logistic regression, there is no linear relationship between dependent and independent variables, so revised version of R-squared is calculated instead of basic adjusted R-squared. Such R-squared ratios are generally called “pseudo-R squared”. Cox and Snell R Squared (1989), Nagelkerke R Squared (1991), McFadden R-squared (1974), and Tjur (2009) are the ones that used in binary regression models (Allison, 2013). As a rule of thumb, R-Squared results are expected to be higher. Although, prediction ability of the model is measured with R-squared percentages

in linear regressions, pseudo-R squared results are not primary indicators in logistics regression interpretations. Eviews package calculates McFadden R-squared for logistic regression models as pseudo-R squared. In our test results, a low percentage (0.092%) is calculated. This means the explanatory power of the model is low. However, this result cannot demonstrate that the model has no prediction ability, since R squared percentage is not a critical indicator in logistic regression.

In the light of these findings, hypotheses can be evaluated as shown in Table 4. Independent variables ethics code (EC), existence in corporate governance index (ECGI), and independent auditor rotation (IAR) were tested in order to find the effect of corporate governance practices on fraudulent financial statements, and resulted as insignificant.

**Table 4: Summary of Findings**

Main Hypothesis	Sub-Hypothesis	Independent Variables Used for Testing	Findings
H: Corporate governance practices and FFS have a negative relationship.	Ha: Existence of an ethics code and FFS have a negative relationship.	Ethics code	Not supported
H: Corporate governance practices and FFS have a negative relationship.	Hb: Existence in corporate governance index and FFS has a negative relationship.	Existence in corporate governance index	Not supported
H: Corporate governance practices and FFS have a negative relationship.	Hc: Increase in independent auditor rotation is a signal for the possibility of fraud in the financial statements.	Independent auditor rotation	Not supported

To summarize, there is no evidence found about the impacts on selected corporate governance activities on the risk of financial statement frauds.

## 5. CONCLUSION

This study focuses on the association between corporate governance and fraud. In the agenda of Turkish firms, corporate governance receives a great deal of importance. Turkish government places special emphasis on these issues, and takes actions to regulate the practice of corporate governance practices via introducing new laws. Turkish firms are mostly family-owned companies, and the most important problem they face is sustainability of the organizations from generation to generation. Properly applied corporate governance principles lead to a sustainable and successful business life.

The time interval selected for the study is between 2010 and 2014. 134 companies and 670 observations are included in this 5-year period. Firm selection, classification and data collection processes were followed carefully and in detail.

After the classification step, 71 firms out of 134 (52.99%) were classified as “1”, which means bearing the risk of publishing fraudulent financial statements, and 63 firms out of 134 (47.01%) were classified as “0”, which means there is no sign of a fraudulent activity based on determined criteria.

Anticipation prior to the conducted study was to discover relationship between corporate governance practices and fraud. It was assumed that corporate governance practices have an effect to lessen manipulation on financials. If so, the existence of these practices would be the indicators of less risk in publishing fraudulent financial statements. However, findings are not sufficient to prove the relationship. Nevertheless, the existence of code of ethics or being listed in corporate governance index is a good message about the companies' attitude toward fraud.

Especially in Turkey, total awareness on fraud and its consequences are relatively new notions with their different dynamics compared to other countries. Due to cultural and organic structure of Turkey, fraud detection is a tough job. Turn to prosecution when detecting a fraud or manipulation is an out of favor action according to Turkish custom. Thus, many fraud cases are accepted as undiscovered, and are not announced to public. As a Type I error, a company involved in fraudulent action could be classified as non-fraud in data selection process (Kirkos *et al.*, 2007).

Years from 2010 to 2014 are selected in order to minimize the missing data risk in this study. Further research can investigate different and more recent time intervals. The expectation is that the corporate governance principles will settle in time, and prospective benefits will be more visible. Thus, new studies with same or different samples with the data after 2014 can be conducted in order to observe the improvement, and/or comparing the results with this study.

As a limitation, only the manufacturing industry has been selected from Borsa Istanbul companies in this study. Companies operating in other industries within BIST or Turkish companies that are not traded in stock exchange can be selected for further studies.

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## INVESTIGATION WITH PANEL DATA ANALYSIS OF THE EFFECT ON ECONOMIC GROWTH OF EMPLOYMENT IN AGRICULTURE AND INDUSTRIAL SECTOR: EXAMPLE OF SOME OECD COUNTRIES (1993-2017)

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### ABSTRACT

**Purpose-** Economic growth is one of the biggest indicators of the strength of a country. Countries provide economic growth by generating resources with their advanced technology. In this study, for some OECD countries (Germany, Belgium, Canada and Turkey) was investigated effect on the economic growth of the employment in the agriculture and industrial sector using panel data analysis. In the study, annual data were used from the years 1993-2017.

**Methodology-** The data were taken from the official web address of the World Bank. Firstly, the data to be used in the model were examined by "unit root tests" to determine whether these series are stationary. According to the results of the unit root test applied to the levels of the variables, it was seen that the series were not stationary but contained unit root. For this reason, the primary differences of the series were taken and found to be stationary. Then the co-integration test was performed.

**Findings-** The results of the cointegration tests performed indicate that there is a cointegration and there is a long-term relationship between the variables. In the study, classical, fixed effect and random effective regression models were used. The Hausman test was applied to determine the correct regression to be used, resulting in the appropriate model being the random effect model.

**Conclusion-** After the Hausmann test, the most appropriate model was obtained as a random effect model.

**Keywords:** Economic growth, employment, panel data analysis, agriculture, industry.

**JEL Codes:** C00, C01, C23

## TARIM VE SANAYİ SEKTÖRÜNDE İSTİHDAMIN EKONOMİK BÜYÜME ÜZERİNDEKİ ETKİSİ: BAZI OECD ÜLKELERİ ÖRNEĞİ (1993-2017)

### ÖZET

**Amaç-** İktisadi büyüme bir ülkenin gücünü gösteren en büyük göstergelerden biridir. Ülkeler ekonomik büyümeyi, sahip oldukları kaynakları çağın gelişmiş teknolojisile üretime geçirerek sağlarlar. Bu çalışmada, bazı OECD ülkeleri (Almanya, Belçika, Kanada ve Türkiye) için tarım ve sanayi sektöründe istihdamın ekonomik büyüme üzerindeki etkisi panel veri analizi kullanılarak incelendi. Çalışmada, 1993-2017 yılları arası yıllık veriler kullanıldı.

**Yöntem-** Veriler Dünya Bankasının (Worldbank) resmi web adresinden alındı. İlk olarak, modelde kullanılacak olan verilerin "birim kök testleri" yapılarak bu serilerin durağan olup olmadığı incelendi. Değişkenlerin seviyelerine uygulanan birim kök test sonuçlarına göre, serilerin durağan olmadığı ancak birim kök içerdikleri görüldü.

**Bulgular-** Bu nedenle serilerin birincil farkları alınarak durağan olduğu belirlendi. Daha sonra eş-bütünleşme testi gerçekleştirildi. Yapılan eş-bütünleşme testleri sonucu eş-bütünleşmenin var olduğu ve bu sonuç doğrultusunda değişkenler arasında uzun dönem ilişkinin varlığı tespit edildi. Çalışmada klasik, sabit etki ve rassal etkili regresyon modelleri kullanıldı

**Sonuç-** Kullanılacak doğru regresyonun tespiti için Hausman testi uygulanarak, uygun modelin rassal etkili model olduğu sonucuna varıldı.

**Anahtar Kelimeler:** Ekonomik büyüme, İstihdam, Panel veri analizi, Tarım, Endüstri.

**JEL Kodları:** C00, C01, C23



## 1. GİRİŞ

Ekonomi politikasının en önemli amaçlarından biri, ekonomik büyümenin gerçekleşmesidir. Bu doğrultuda, üretim olanaklarının dışı doğru büyümesi şeklinde tanımlanan iktisadi büyümenin gerçekleştirilmesi toplum refah seviyesinin artması için önemli bir ön koşuldur. Günümüzde birçok ülkenin kapalı ekonomiden vazgeçtiği, yeni ve açık ekonomi anlayışları benimsediği görülmektedir. Bu anlayışı benimseyen ülkelerin dış ticaretin artış gösterdiği ve bu yolla istihdamın sağlandığı görülmektedir (Karaçor ve Saraç, 2011). Sanayi; kelime kökeni Arapça dilinden gelmekte olup hammaddeleri işlemek, enerji kaynaklarını yaratmak için kullanılan yöntemlerin ve araçların bütünü şeklinde tanımlanabilir. Yeni teknolojileri uygulamadaki tavırları ve yasal durumları ne olursa olsun büyük, küçük ve orta ölçekli işletmelerin gerçekleştirdikleri her türlü iktisadi etkinlik, sanayi olarak değerlendirilir. Gerek sektörel denge açısından ve gerekse uzun dönemde yatırım, istihdam ve katma değer yaratması bakımından sanayi sektörünün genel ekonomi içinde önemli yer tuttuğu açıktır. Ekonomide kalıcı istikrar için tarım, sanayi ve hizmet sektörleri arasında belirli bir denge olmalıdır (Korkmaz, E. 2016).

Gayrisafi yurt içi hasıla (GSYİH), bir ülkenin iktisadi büyüklüğünü gösteren önemli ölçütlerden biridir. GSYİH, Gayrisafi Milli Hasıla (GSMH)'dan farklı olarak, bir ülke sınırları içerisinde belli bir dönem içinde, üretilen tüm nihai mal ve hizmetlerin para birimi cinsinden karşılığıdır. İktisadi büyüme ve sanayileşme arasındaki ilişki iktisadi anlamda önem arz eden bir çalışma alanıdır. Neoklasik iktisatçıların kabul gördüğü Kaldor anlayışı "sanayiye büyümenin motoru olarak görmek" sanayi sektöründe sermayenin veya yatırımların önemli bir kazanç sağladığı önemini belirtmektedir. Sanayi sektöründe meydana gelen bir artış ekonomiyi olumlu yönde etkileyip büyümeyi hızlandırmaktadır. Kaldor'un yanısıra Verdoorn Kanunu, sanayi sektöründeki üretim artışının bu sektördeki verimliliği daha hızlı bir şekilde büyümesine neden olacağını savunmaktadır (Terzi ve Oltulular, 2004).

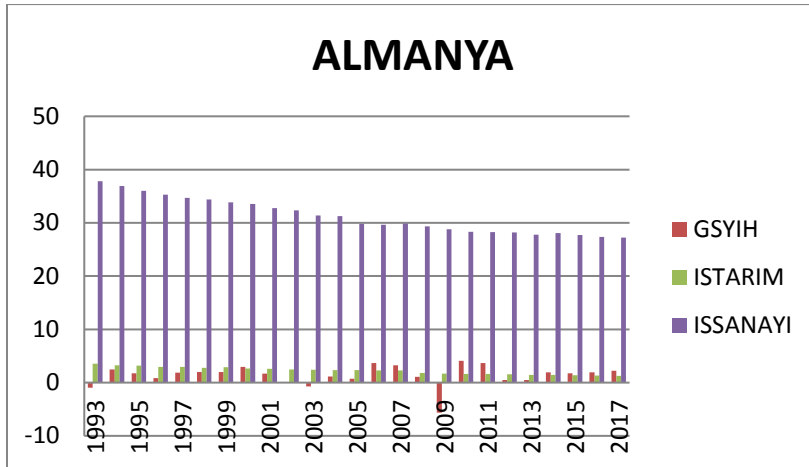
Ülkelerin sürekli bir gelişim içinde olması ve gelişmenin doğurduğu gerekliliklerden dolayı ekonominin baş sektörü olan tarım sektörü, zamanla değerini kaybederek gelişmiş ülkelerde gerileme göstermiştir. Bu süreç, gelişmekte olan ülkelerde de aynı şekilde devam etmektedir. Sektörün bu şekilde gerilemesinden kaynaklı olarak bu alanda olan istihdam da gün geçtikçe kan kaybetmektedir. Gelişmekte olan ülkelerde kırsal bölgelerde geçimini sağlayan insanlar halen bu sektörde direnme göstermektedirler. Ülkelerin kalkınmasında tarım önemli fonksiyonlara sahiptir. Bu fonksiyonlar; beslenme için şart olan gıda maddeleri üretiminin sağlanması, sanayi ürünlerine talebin artırılması, sanayi üretimi için ihtiyaç duyulan hammadde, sermaye ve emeğin sağlanması, ekonominin döviz gereksiniminin giderilmesi v.b. olarak sıralanabilir. Bu fonksiyonlardan kaynaklı olarak tarımın büyük önem taşıdığı açık bir şekilde görülmektedir (Doğan, 2009).

İstihdam kavramı, iki anlamda tanımlanmaktadır. Birincisi, geniş anlamda mal ve hizmet üretmek için üretim etkenlerinin üretim süresi boyunca kullanılmasını kapsar. İkincisi, dar anlamda sadece emek etkeninin mal ve hizmet üretmek için üretim sürecinde kullanılmasını içermektedir. Bundan dolayı bir ekonomide emek etkeninin istihdamı düşük ise, söz konusu ekonomide işsizlik sorunu meydana gelmektedir (Uysal, 2007: 55).

Türkiye'de 1980'lerin sonunda sanayinin GSYİH içindeki payı %34 oranında iken, bugün %27'ye gerilediği görülmektedir. Sanayi sektörünün GSYİH içindeki payının azalması ekonomide gerileme ve yoksullaşma anlamına gelmez. İlerleme gösteren ülkelerde hizmet sektörünün ekonomideki payı daha yüksektir. Fakat sanayide üretim endeksinin sürekli düşüş yaşaması ekonomik durgunluğa neden olabilir (Korkmaz, 2016). Ayrıca sanayi sektöründe var olan istihdamın artışı bu sektörün ilerleme gücünü gösteren önemli unsurlardan biridir. Aşağıda 1993-2017 yılları arası bazı OECD ülkelerine (Almanya, Belçika, Kanada ve Türkiye) ait ekonomik büyüme, tarım ve sanayi sektöründe olan istihdam verileri grafikler halinde verilmiştir.

Almanya, ekonomik büyüme gücü olarak dünya ülkeleri arasında üçüncü sırada, sanayi ve teknoloji üretimi sektöründe ise dünyanın ilk dört ülkesi içinde yer almaktadır. Sanayinin GSYİH içindeki payı %30 oranındadır. Tarım alanında organik tarımı destekleyen teşvikler oluşturan Almanya tüketiminin büyük oranını kendi üretiminden karşılamaktadır. Tarımındaki GSYİH içindeki payı düşük olmasına rağmen, tarım alanında dışı bağımlılığı düşük orandadır. Aşağıda yer alan grafikte 1993-2017 yılları arasında Almanya'ya ait ekonomik büyüme, tarım alanında istihdam ve sanayi alanında istihdamın yıllara göre oranları verilmiştir.

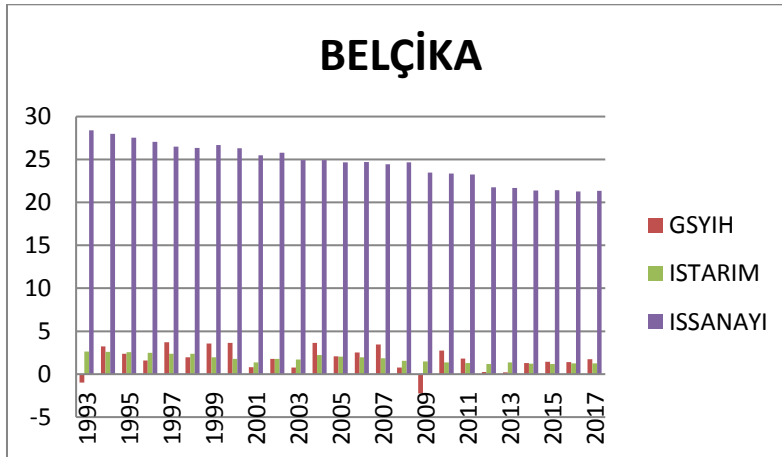
Grafik 1: 1993-2017 Almanya GSYİH, İSTARIM ve İSSANAYİ Verileri



Grafik-1 incelendiğinde; Almanya’da istihdamın büyük oranda sanayi sektöründe olduğu görülmektedir. Tarım alanında istihdamın ise düşük oranda olduğu görülmektedir. Almanya iktisadi büyüme olarak dalgalı dönemler yaşamıştır. 1990 yılında meydana gelen ve yaklaşık 7 ay süren Körfez savaşından dolayı küresel savaşın etkileri devam etmiştir. Almanya’da 1993 yılında bu savaşın etkisi gayet net görülmektedir. Daha sonra 2008 ve 2009 yıllarında meydana gelen küresel krizden etkilenen tüm dünya ülkeleri gibi Almanya’da etkilenmiştir. Grafik-1’de Almanya için bu küresel etkinin sonucu açık bir şekilde görülmektedir.

Belçika, 19.yy’da endüstri devrimine katılan ilk kıta ülkesidir. Bulunduğu konum gereği Avrupa’nın birçok ülkesine sınırı bulunmaktadır. Bundan dolayı Avrupa’nın alt yapı ve ulaşım olarak gelişmiş ülkelerinden biridir. Belçika da hizmet sektörü olarak gelişmiş bir ülkedir. Teknolojik olarak gelişmiş bir ülke olan Belçika sanayi sektöründe de gelişmişlik göstermektedir. Topraklarının %44’ü tarıma elverişli olmasına rağmen %27.2’sini kullanmaktadır. Genellikle şeker pancarı, patates ve buğday üretimi ülkede yaygın durumdadır. Aşağıda yer alan grafikte 1993-2017 yılları arasında Belçika’ya ait ekonomik büyüme, tarım alanında istihdam ve sanayi alanında istihdamın yıllara göre oranları verilmiştir.

Grafik 2: 1993-2017 Belçika GSYİH, İSTARIM ve İSSANAYİ Verileri

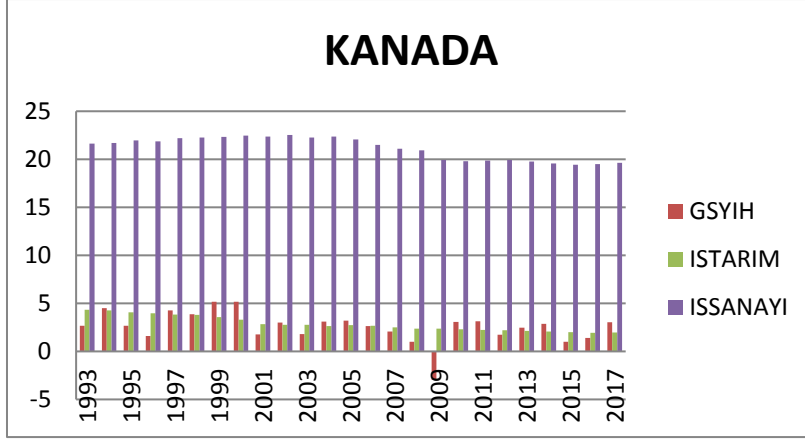


Grafik-2 incelendiğinde; Belçika’da istihdamın büyük oranda sanayi sektöründe olduğu ve tarım alanında istihdamın ise düşük oranda olduğu görülmektedir. Belçika için ekonomik büyüme diğer dünya ülkelerinde olduğu gibi dalgalı süreçler yaşamıştır. Özellikle 1990 yılında meydana gelen Körfez savaşından dolayı küresel savaşın etkileri burada da devam etmiştir. 1993 yılında bu savaşın etkisi gayet net görülmektedir. Daha sonra 2008 ve 2009 yıllarında meydana gelen küresel krizden etkilenen tüm dünya ülkeleri gibi Belçika’da etkilenmiştir. Grafik-2’de bu küresel etkinin sonucu açıktır.

OECD ve G8 ülkesi olan Kanada dünyanın gelişmiş ülkeleri arasında yer almaktadır. Büyük bir ekonomik güce sahip Kuzey Amerika ülkesi olan Kanada da karma ekonomik modelini kullanmaktadır. Maden ve hizmet sektöründe ilerleme gösteren bir ülkedir. Ormanlık ve ham petrol sektöründe büyük bir güce sahip olan ülke, sert ikliminden kaynaklı tarım alanının çok az

kısmını kullanmaktadır. Tarım alanının %7'sinin kullanabilen Kanada buna rağmen buğday ihracatı yapan bir ülkedir. Aşağıda yer alan grafikte 1993-2017 yılları arasında Kanada'ya ait ekonomik büyüme, tarım alanında istihdam ve sanayi alanında istihdamın yıllara göre oranları verilmiştir.

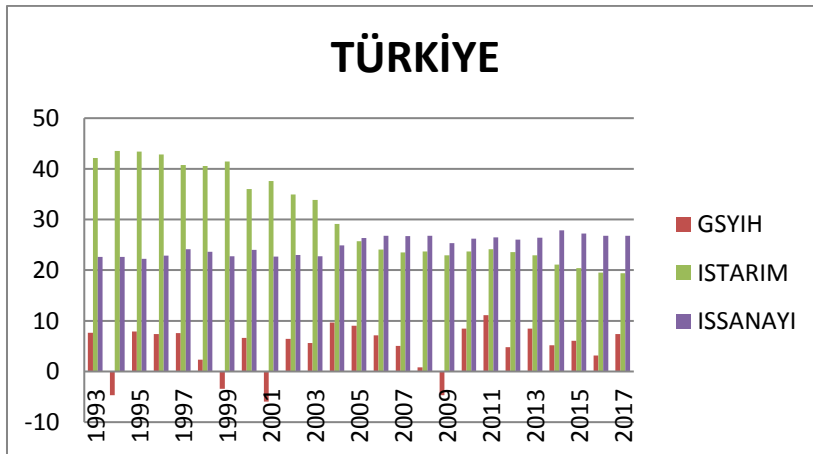
**Grafik 3: 1993-2017 Belçika GSYİH, İSTARIM ve İSSANAYİ Verileri**



Grafik-3 incelendiğinde; Kanada'da istihdamın büyük oranda sanayi sektöründe olduğu ve tarım alanında istihdamın ise düşük oranda olduğu görülmektedir. Kanada da genel olarak ekonomik büyümede dalgalı süreçlerle büyüme yaşayan ülkelerdendir. Kanada, 1993 krizinden diğer OECD ülkeleri içinde en az etkilenen ülkelerden biridir. Daha sonra 2008 ve 2009 yıllarında meydana gelen küresel krizden etkilenen tüm dünya ülkeleri gibi Kanada'da etkilenmiştir. Grafik-3'te bu küresel etkinin sonucu gayet net bir şekilde görülmektedir.

Türkiye gelişmekte olan ülkeler arasında yer alan bir ülkedir. Tarım alanlarının %36'sını kullanan Türkiye, son zamanlarda tarım alanında ithal ürünler kullanmaya başlamıştır. Bundan dolayı üretim oranlarında düşüşler yaşamaktadır. Çeşitli iklim türlerinin olmasından kaynaklı birçok ürününün yetiştiği bir ülke olan Türkiye, bu anlamda bir tarım ülkesi olarak adlandırılmaktadır. Gelişmekte olan bir ülke konumundaki Türkiye, son zamanlarda gelişmiş olan ülkeler statüsüne çıkmak için sanayi sektöründe ilerleme göstermektedir. Aşağıda yer alan grafikte 1993-2017 yılları arasında Türkiye'ye ait ekonomik büyüme, tarım alanında istihdam ve sanayi alanında istihdamın yıllara göre oranları verilmiştir.

**Grafik 4: 1993-2017 Türkiye GSYİH, İSTARIM ve İSSANAYİ Verileri**



Grafik-4 incelendiğinde; Türkiye'de son zamanlarda istihdamın sanayi sektörüne yöneldiği ve tarım alanında istihdamın ise, gittikçe düşüşe geçtiği görülmektedir. Türkiye iktisadi büyümede dalgalanmaların en çok olduğu ülkelerden biridir. Aynı Kanada gibi, Türkiye de 1993 krizinden en az etkilenen ülkelerden biri olmasına rağmen sonraki yaşanan süreçlerde ekonomik büyüme olarak olumsuzluklar yaşadığı Grafik-4'te net bir şekilde görülmektedir. Özellikle 1994, 1999, 2001 ve 2009 yıllarında yaşanan gerek iç gerek dış krizlerden olumsuz etkilenen OECD ülkelerinden biri de Türkiye'dir. Bu krizin olumsuz etkileri Grafik-4 dikkate alındığında net bir şekilde görülmektedir.

## 2. KAVRAMSAL ÇERÇEVE VE LİTERATÜR

Literatür incelendiğinde genel olarak ekonomik büyüme ile tarım ve sanayi sektöründe üretim arasındaki ilişki analizi yapıldığı görülmektedir. Bunun yanısıra istihdam genel olarak ele alınmış ve iktisadi büyüme ile bu bağlamda ilişki analizi yapılmıştır. Yapılan çoğu araştırma sonucu ekonomik büyüme ile tarım ve sanayi sektöründe üretim arasında pozitif yönlü bir ilişkinin olduğu görülmüştür. Aynı biçimde istihdam ve ekonomik büyüme arsasında da pozitif bir ilişkinin mevcut olduğu literatürde yer almıştır.

Ekonomik büyüme; refah seviyesinin toplum olarak artması, yaşam standartlarının iyileşmesi olarak tanımlanmaktadır. Literatürde, ekonomik büyüme; GSMH’da ortaya çıkan sürekli artıştan kişi başına düşen milli gelirin artması olarak açıklanmaktadır. Ekonomik büyümenin ölçülmesinde; kişi başına düşen milli gelirden uzun bir dönemde gerçekleşen yıllık değişimi ifade eden “ortalama büyüme hızı” kavramı kullanılmaktadır (Ünsal, 2007: 11). Joseph Schumpeter tarafından yapılan ve literatürde yaygın bir biçimde kullanılan söz konusu tanıma göre; Ekonomik büyüme kısa dönemli statik olarak değil, tam tersi uzun dönemli dinamik bir olgudur tanımı yapılmaktadır (Taban, 2008: 1).

İstihdamı iki temel faktör belirler. Bunlar yurtiçi mal ve hizmet talebidir. Ayrıca ithalat ve ihracat, istihdamı etkileyen diğer faktörlerdendir. Ekonomik büyümenin var olduğu ülkelerde istihdamın da yüksek olduğu görülmektedir. İstihdamı etkileyen diğer faktörler; teknoloji, iş gücü maliyeti ve kapasite kullanımı şeklinde sıralanabilir (Akyıldız, 2006:63). GSMH, var olan istihdam oranına ve istihdama katılan işgücünün verimliliğine bağlı gelişim göstermektedir. Öte yandan istihdamda yer alan beşeri sermayeden kaynaklı ekonomik büyüme, istihdamdan etkilenmektedir. İstihdamın insanda meydana getirdiği yetenek ve bilgiden kaynaklı artan beşeri sermaye iktisadi büyümeyi pozitif yönde etkilemektedir (Parasız, 2008:11). Bazı görüşler, istihdamın iktisadi büyümeyi kısa dönemde daha çok etkilediğini, uzun dönemde ise teknolojik ilerleme ile bunun meydana geldiğini belirtmektedir (Ülgener, 1991:50). İstihdamın ekonomik büyüme üzerindeki etkisi analiz edilirken, iktisadi büyümenin iç pazara mı yoksa dış pazara mı yönlendiği, büyümede emeğin mi yoksa sermayenin mi daha yoğun olduğu, iktisadi büyümenin sektördeki hızının ne olduğu büyük önem arz etmektedir (Yılmaz Göktaş, 2005:64).

İnsanoğlunun var oluşundan günümüze tarımsal üretim önemli bir yer tutmuştur. Hayatın sürdürülmesi zorunlu olan gıda ihtiyacımızı içeren tarımsal üretim son derece önemlidir. İnsanoğluna sağladığı bu faydalardan dolayı tarımsal üretim aynı zamanda ekonomik kalkınmayı da bu şekilde sağlamaktadır (Boz, 2004:139). Yaşamın devamını sağlamak için beslenme en önemli şarttır. Beslenmeyi sağlayan gıda ürünleri üreten tarım sektörü bundan dolayı büyük önem taşır. Bu kadar önemli bir konuma sahip olan tarım üretiminin oluşabilmesi için önemli kaynaklar sağlanmalı ve destekleme politikaları izlenmelidir. Globalleşen dünyada, gelişmiş ve gelişmekte olan ülkeler tarım üretiminde dışa bağımlılığı düşürüp kendi üretimleri ile ihtiyaçlarını karşılamak istemektedirler. Bunda dolayı birçok ülke bu konuda destekleme programları yapıp gıda alanında güvenliğini sağlamak istemektedirler (Acar, 2006: 23). Tüketilen toplam tarımsal üretim ile üretilen tarımsal üretim arasındaki farka pazarlanabilir fazla adı verilir. Ekonomik büyümeyi sağlayabilmek için pazarlanabilir fazlanın artırılması gerekmektedir (Thirlwall, 2003: 191). Tarım sadece tarım alanında çalışan iş gücünü değil aynı zamanda bu sektörün dışında çalışan diğer tüm iş gücüne gerekli gıdayı sağlamaktadır. Tarım dışı alanlarda çalışan iş gücünün beslenmesi önemli bir noktadır. Rostow kalkınma aşamaları yaklaşımlarında, ekonomik kalkınmanın temel aşamasını tarımsal devrim olarak görmektedir (Rostow, 1980: 25). Tarımın ekonomik büyüme de etkisi şu şekilde tanımlanabilir. Tarım eğer milli gelir içinde büyük bir paya sahip ise ve bu sektörün gelişimi hızlı ise, tarımın iktisadi büyümeye etkisi o kadar büyüktür. Tam tersi olarak ne kadar küçük ise iktisadi büyüme de o kadar küçüktür (Kazgan, 1966: 251). Gelişim gösteren ülkeler sanayi alanında yatırımlar yapmaktadırlar. Bu ülkeler kurdukları sanayilerde genellikle tarımdan sağladıkları ham maddeleri işlemektedirler. Örneğin salça üretimi için domates, kumaş üretimi için pamuk ile yün, ayakkabı üretimi için deri gibi ürünler tarım sektöründen temin edilmektedir. Bu örnekler sanayi sektörü için tarımın önemini göstermektedir (Boz, 2004: 141). İktisadi büyümenin meydana gelebilmesi için zorunlu olan yatırım ürünlerinin ithal edilmesi büyük oranla tarım ürünlerinin ihracatı ile gerçekleşebilir (Thirlwall, 2003: 194). Gelişmekte olan ülkelerin sahip oldukları doğal ve tarımsal kaynaklar ekonomik büyüme için büyük avantaj sağlamaktadır. Eğer gelişmekte olan bir ülke yer altı kaynaklarına sahip değilse, yapacağı sanayi üretiminde sermaye ve ara mal ithalatını yapmak için tarımsal ihracat yapmalıdır (Gillis vd., 1987: 482).

Kaldor, sanayideki büyümenin sadece sanayi sektörünü değil aynı zamanda yaratacağı iş olanakları ile diğer sektörlerinde verimliliğini ve gelişimini sağlamaktadır. Bundan dolayı Kaldor, sanayi sektöründeki büyümeyi iktisadi büyümenin motoru olarak görmektedir (Choi, 1983: 148-150). Kaldor ihracat alanında meydana gelecek olan büyümenin hızı ile ekonomik anlamda düşük verimliliğe sahip olan alanlardan sanayi sektörüne iş gücü aktarımı olacağını ve bundan dolayı verimlilik bakımından artışın olacağını savunmaktadır (Şimşek,1995:150). Sanayi sektörü ve sanayi üretimi arasındaki ilişki iktisat alanında en dikkat çeken konulardan biri olmuştur. İkinci dünya savaşı sonrasında ülkelerin savaşın yıkıntılarından sıyrılıp toparlanması ve endüstriyel toplum, diğer bir deyişle modern toplum haline dönüşme amacı, ilgili alanda yapılan çalışmalara ivme kazandırmıştır. İkinci dünya savaşı sonrasında az gelişmiş ülkeler hızlı bir şekilde büyüme ve kalkınmalarını sanayileşmeye bağlamıştır (Arısoy, 2013: 143). Verdom yasasında sanayi üretiminde meydana gelen 1 birimlik artış sağladığı ölçek ekonomisi sayesinde işgücü verimliliğine olumlu katkı sağlayacaktır. Verdom yasası endüstri içindeki artan getirinin varlığının temel argümanı bir ülkedeki endüstriyel büyümenin üretim maliyetlerinde düşüş sağlayarak verimliliği artıracaklarını

savunmuştur. Buradan yola çıkarak sanayi sektöründe artan getiri sayesinde işgücü verimliliği ve sanayi üretimi arasında pozitif bir ilişki olduğu savunulmuştur (Ener ve Arıca, 2011).

### 3. PANEL VERİ REGRESYON MODELLERİNİN TAHMİNİ

Panel kelimesi Flemenkçe kökenli bir kelime olup dikdörtgen şeklindeki tahta anlamını içermektedir (Kunst, 2011: 1). İktisadi çalışmalar yapılırken çeşitli veriler kullanılmaktadır. Kullanılan verinin türüne uygun modeller kullanılarak veriler incelenebilir. Örneğin zaman serisi verileri farklı, yatay kesit verileri ile farklı çalışmalar yapılmaktadır (Pazarlıoğlu ve Gürler, 2007: 3).

Panel veri kullanılan çalışmalarda genellikle üç gaye vardır. İlk gaye birimler arası değişkenliği veya her bir birimin zaman içinde değişkenliğini belirlemektir. Bundan dolayı, hem belli değişkenliklerin genişliğini hem de bu değişkenliklerin ilerleyişini izleyebiliriz. İkinci gaye, bu değişkenlikleri diğer bazı değişkenler açısından açıklayabilmektir. Bu değişkenler cinsiyet gibi zamanla değişmeyeceği gibi, psikolojik olarak zamanla değişebilen sürekli yani sabit olmayan türden olabilir. Üçüncü gaye ise her bir birimin ilgili değişken bakımından kestirimini yapmaktır (Hsiao, 2003:89).

Gözlemler her dönem gözlenebilmişse 'dengeli' panel, bazı dönemler gözlenebilmişse 'dengesiz' panel olarak ifade edilmektedir (Dougherty, 2006: 409). Doğrusal panel veri modeli aşağıdaki (1) numaralı denklemde ifade edilmektedir.

$$Y_{it} = \beta_0 + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \dots + \beta_{kit}X_{kit} + \varepsilon_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T. \quad (1)$$

Bu modelde  $N$  yatay kesit birimlerini,  $T$  süreci temsil etmektedir (Pazarlıoğlu ve Gürler, 2007: 3). Burada  $Y$  bağımlı değişken,  $X$  bağımsız değişken  $k$  adettir (Tüzüntürk, 2007: 3). Ayrıca, en küçük kareler (EKK) varsayımlarından olan hata teriminin ortalaması sıfır, varyansının ise sabit olduğu kabul edilmektedir. Kısaca;  $E(\varepsilon_{it}) = 0$  ve  $Var(\varepsilon_{it}) = \sigma_\varepsilon^2$  şeklinde ifade edilir.

#### 3.1. Panel Birim Kök ve Eş-bütünleşme Testleri

Panel veri analizi, zaman serisi ve kesitlerin bir araya getirilerek oluşturulmasından dolayı zaman serisi özelliklerini ve zaman serilerinde görülen sorunları da içermektedir. Zaman serisi verileri gibi değişkenlerin de birim köke sahip olup olmadığı, aynı seviyede birim kök içeren değişkenler arasında eş-bütünleşme olup olmadığı analiz edilmelidir. Bunun nedeni, durağan olmayan verilerin sahte regresyon içerdiği ve dolayısıyla sağlıklı sonuçlara neden olmaktadır. Bundan dolayı panel birim kök testleri ve panel eş-bütünleşme testleri uygulanır (Altunkaynak, 2007:15). İm, Pesaran ve Shin, panel birim kök testinde Dickey Fuller (ADF) test istatistiğini paneldeki her bir birim için ADF hesaplayarak, ADF'lerin ortalama test istatistiğine bakmaktadır. Panel birim kök testinin uygulanması için  $N$  yatay kesit ve  $T$  zaman serisi olmak üzere,  $y_{it}$  birinci dereceden otoregresif süreç:

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \varepsilon_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T \quad (2)$$

olarak tanımlanmaktadır. Kurulan hipotezler;

$$H_0: \beta_i = 0, \text{ bütün } i \text{ değerleri için,}$$

$$H_1: \beta_i < 0 \quad i = 1, 2, \dots, N_1, \quad \beta_i = 0, \quad i = N_1 + 1, N_1 + 2, \dots, N$$

şeklinde olup  $H_0$  hipotezinin ret edilmemesi panel birim kökün olduğunu, alternatif hipotezin ret edilmemesi ise panel birim kökün olmadığı anlamına gelmektedir. İm, Pesaran ve Shin, "birim kök mevcut değildir" hipotezini  $t$ -bar istatistiği ile incelemektedir (Choi, 2001:260).

Panel verilerde uygulanan eş-bütünleşme testi, " $H_0$ : eş-bütünleşme mevcut değildir" şeklindeki yokluk hipotezini analiz eder. Pedroni eş-bütünleşme testinde birinci adım, hipotezde ön görülen eş-bütünleşme regresyonundan hata terimlerini elde etmektedir. Genel olarak,  $t = 1, \dots, T$ ;  $i = 1, \dots, N$  ve  $m = 1, \dots, M$  olmak üzere eş-bütünleşme modeli aşağıda yere alan model şeklinde yazılır.

$$y_{i,t} = \alpha_i + \delta_{it} + \beta_{1t}x_{1i,t} + \beta_{2t}x_{2i,t} + \dots + \beta_{mt}x_{mi,t} + \varepsilon_{i,t} \quad (3)$$

Burada (3) eşitliğinde;  $T$  zaman genişliğini,  $N$  paneldeki birey sayısını,  $M$  değişken sayısını gösterir. Panelin  $N$  tane farklı bireyi olduğundan, her biri  $M$  değişkene sahip  $N$  farklı denklemin olduğu kabul edilebilir. Eğim katsayıları olan  $\beta_{1i}, \beta_{2i}, \dots, \beta_{Mi}$ , panelin bireyleri süresince değişmesine olanak sağlamaktadır.  $\alpha_i$ , bireye özel sabit ya da bireyler boyunca değişimine olanak sağlayan verilerin sabit etki değişkenidir. Ayrıca bazı uygulamalar, paneldeki özel zaman akımını kullanmayı tercih edebilir. Bu durum  $\delta_{it}$  ile gösterilir. Aynı zamanda  $\alpha_i$ 'nin göz ardı edilerek kullanımı yaygındır (Altunkaynak, 2007: 26). Panel veri analizinde uygulanan iki temel test vardır. Bunlar; Sabit Etki Modeli (Fixed Effect Model= FEM) ve Rassal Etki Modeli (Random Effect Model = REM).

### 3.2. Sabit Etki Modeli

Eğim katsayılarının sabit olduğu kabul edilen Sabit Etki Modelinde bireyler, hane halkları, şirketler gibi birimler arasındaki değişikliğin sabit terimdeki değişiklikler ile açıklanabileceği varsayılmaktadır. Bu modelde sabit etki, gruba özgü sabit terim olarak ifade edilir. Sabit etki, burada birimlerin (bireylerin, hane halklarının, şirketlerin v.b) göre değişim gösterebileceği ancak zamana göre sabit kalacağını belirtmektedir (Greene, 2003: 285).

Sabit Etki Modeli, birimlerin kendi içindeki değişikliklerin sabit terimdeki değişiklikler yardımıyla ulaşılabileceğini kabul etmektedir. Bundan dolayı panel veri modeli, EKK Kukla Değişken Modeli (Least Square Dummy Variable = LSDV) olarak tanımlanan yöntem ile tahmin edilmektedir. (1) numaralı panel veri modeli ele alındığında;

$$\beta_{0it} = \beta_{0i}, \quad \beta_{1it} = \beta_1, \quad \beta_{2it} = \beta_2, \quad \beta_{kit} = \beta_k, \quad (4)$$

şeklinde olduğu varsayılmaktadır. Burada dikkat edilecek olursa, sadece sabit parametreler değişmektedir. Sabit terimin zaman içinde değişmediğini buna karşın yatay kesit durumunda farklılıklar gösterdiği açıktır. Yani, zaman genişliği sabit tarafından korunmasına rağmen bireyler arasındaki davranışların farklılıklar gösterdiğini belirtmektedir. (1) numaralı panel veri modeli yeniden göz önüne alındığında;

$$Y_{it} = \beta_{0i} + \beta_{1it}X_{1it} + \beta_{2it}X_{2it} + \dots + \beta_{kit}X_{kit} + \varepsilon_{it} \quad (5)$$

şeklinde yazılır. Bu model  $\beta_{0i}$  ifadesine göre yeniden yazılırsa;

$$Y_{it} = \beta_{01}D_{1i} + \beta_{02}D_{2i} + \dots + \beta_{0N}D_{Ni} + \beta_{2it}X_{2it} + \dots + \beta_{kit}X_{kit} + \varepsilon_{it} \quad (6)$$

$$Y_{it} = \sum_{j=1}^N \beta_{0j}D_{ji} + \sum_{k=1}^K \beta_k X_{kt} + \varepsilon_{it} \quad (7)$$

$$D_{1i} = \begin{cases} 1, & i = 1 \\ 0, & \text{aksi durumda} \end{cases}, \dots, D_{1N} = \begin{cases} 1, & i = N \\ 0, & \text{aksi durumda} \end{cases}$$

(Pazarlıoğlu ve Gürler, 2007: 4)

Bu modelde (5-7),  $K$  tane açıklayıcı değişken ve  $N$  tane yatay kesit birimi mevcuttur. Burada önemli olan sabit etkiler modeline birim etkileri eklerken, gölge değişkeni tuzağına düşmemek için de birim sayısından  $(N - 1)$  gölge değişken kullanılmalıdır. Öte yandan  $N$  sayıda gölge değişken kullanılacaksa da modele sabit terim alınmamalıdır (Tatoğlu, 2012: 81).

### 3.3. Rassal Etki Modeli

Rassal etki modeli, gözlenemeyen bireysel etkileri ile bağımsız değişkenler arasında ilişki kurmasına imkân sağlamaktadır. Bu halde regresyon modelimizde sabit etki modelinde birimler arasındaki farklılıklar ve parametrik değişimler tamamen doğru olarak modellenmektedir. Şayet bireysel etki modelinde yer alan bağımsız değişkenler arasında tam bir ilişki yok ise, birimlere has sabit terimlerin, birimlere göre rassal olarak dağıldığını kabul eden rassal etki modelinin kullanılması doğru olur (Greene, 2003: 293).

Birimler arası zamanla ortaya çıkan farklılıklar, rassal etki modelinde hata teriminin bir parçası olarak varsayılmaktadır. Asıl hedef, sabit etki modellerinde meydana gelen serbestlik derecesini büyük oranda düşürmektir. Bunun sebebi rassal etki modelinin önemli olan birimlere ya da birime ve zamana özgü hat bileşenlerin bulunmasıdır. Öte yandan rassal etki modeli, hem örneklemdaki birimler ve zamana göre ortaya çıkan farklılıkları hem de örneklem dışında oluşan etkileri dikkate almaktadır (Pazarlıoğlu ve Güler, 2007: 5).

Yukarıda belirtilen sabit ve rassal etki modellerinden hangisinin panel analizi için uygun olduğu test etmek için Hausman testi kullanılmaktadır.

### 3.4. Hausman testi

Birim ya da birim ve zaman farklılıklarını oluşturan katsayıların, yani rassal etki modelinin hata terimi bileşenlerinin modeldeki bağımsız değişkenlerden bir ilişkiye sahip olmadığı hipotezinin geçerliliği, Hausman test istatistiği ile analiz edilebilmektedir (Pazarlıoğlu ve Güler, 2007: 5). Hausman test istatistiği rassal ve sabit etki modellerinden hangisinin tercih edileceği konusunda yardımcı olur. Hausman testine ait hipotezleri aşağıda verildiği gibidir.

$$H_0 = \text{Rassal etkiler mevcuttur}$$

$$H_1 = \text{Rassal etkiler mevcut değildir}$$

(Çakır ve Küçükkaplan, 2012: 78-79).

Hausman Test istatistiği  $k$  serbestlik dereceli ki-kare dağılımı göstermektedir (Pazarlıoğlu ve Gürler, 2007). Test istatistiğinin değeri kritik değeri olan  $p$  değerimizden küçük olduğunda  $H_0$  hipotezi kabul görür. Bu halde rassal etki modeli tercih edilir.

Eğer test istatistiğinin değeri kritik değeri olan  $p$  değerinden büyük olması durumunda  $H_0$  hipotezi kabul görmez. Bu durumda sabit etki modeli tercih edilir (Çakır ve Küçükkaplan, 2012).

#### 4. VERİ SETİ VE EKONOMETRİK METODOLOJİ

Uygulama için 1993-2017 verileri Dünya Bankası (Worldbank) resmi web adresinden oran olarak alınmıştır. Verilerin durağanlığı, panel veri birim kök testleri ile analiz edilmiştir. Durağan olmayan verilerle yapılacak olan tahminin yanlış sonuçlar vereceği için, durağanlık zaman serileri için önemli bir kavramdır. Veriler durağan hale getirildikten sonra panel veri analizi aşamaları yapıldı. Tarım ve sanayi sektöründe istihdamın iktisadi büyüme üzerindeki etkisini analiz etmek için OECD ülkelerinden (1993-2017 yılları arasında bu alanda en büyük gelişmeyi sağladığı düşünülen üç ülke ile Türkiye arasında bir kıyaslama tercihidir bu ülkeler seçilmiştir)Almanya, Belçika, Kanada ve Türkiye ülkeleri seçilmiştir. Modelde kullanılan değişkenlerin kısaltmaları aşağıda yer aldığı gibidir.

GSYİH= Gayrisafi Yurtiçi Hasıla (İktisadi Büyüme)

İSTARIM= Tarım sektöründe istihdam

İSSANAYİ= Sanayi sektöründe istihdam

Modelde GSYİH bağımlı değişken, İSTARIM ve İSSANAYİ bağımsız değişkenlerdir. Değişkenler arasındaki ilişkiyi analiz etmek için aşağıdaki panel veri modeli kullanılmıştır.

$$GSYİH_{it} = \beta_{0it} + \beta_{it}İSTARIM_{it} + \beta_{it}İSSANAYİ_{it} + \varepsilon_{it} \quad (8)$$

Burada (8) denkleminde  $i = 1, .4$  ülkeyi,  $t = 1993, \dots, 2017$  zaman aralığını temsil etmektedir. Model kurulduktan sonra yapılan panel veri analiz sonuçları aşağıda başlıklar halinde verilmiştir.

#### 5. UYGULAMA VE BULGULAR

##### 5.1. Panel Birim Kök Tablosu

Zaman serilerinde durağanlık, varyansın zamana bağlı olarak bir değişimin olmadığını ifade eder (İşleyen ve ark., 2017). Zaman serisi verileri kullanılan çalışmalarda serilerin durağan olmaları önemlidir. Zaman serileri analizinde, durağan olmayan seriler kullanıldığında, kullanılacak modelin sonuçları gerçekçi olmamakta ve durağan olmayan serilerin kullanılması modele tabi tutulan değişkenler arasında sahte ilişkiye neden olmaktadır. Bir değişkenin durağan olup olmadığını veya durağanlık derecesini belirlemek için kullanılan en genel analiz birim kök testidir (Gujarati, 2004). Ekonometrik çalışmalarda, birim kök testleri büyük önem taşır ve birçok alanda kullanılır. Aşağıda panel birim kök testleri ve sonuçları verilmiştir.

**Tablo 1: Panel Birim Kök Test Sonuçları**

GSYİH	I(0)		I(1)	
	t-istatistik	p-olasılık	t istatistik	p olasılık
Levin, Lin&Chu	-4.314	0.000	-7.584	0.000
Im,Peseron and Shin W- stat	-3.848	0.001	-6.450	0.000
ADF Fisher Ki-kare	29.705	0.002	48.676	0.000
PP Fisher Ki-kare	24.502	0.001	62.175	0.000
Breitung t-stat	-3.949	0.000	-3.707	0.000

İSTARIM	I(0)		I(1)	
	t istatistik	p olasılık	t istatistik	p olasılık
Levin, Lin&Chu	-0.58147	0.2805	-6.91539	0.0000
Im,Peseron and Shin W- stat	1.62556	0.9480	-7.57782	0.0000
ADF Fisher Ki-kare	2.34938	0.9684	59.0868	0.0000
PP Fisher Ki-kare	2.30193	0.9703	58.8246	0.0000
Breitung t-stat	-1.36308	0.0864	-5.60409	0.0000

İSSANAYİ	I(0)		I(1)	
	t istatistik	p olasılık	t istatistik	p olasılık
Levin, Lin&Chu	-1.68012	0.0465	-9.52834	0.0000
Im,Peseron and Shin W- stat	1.11158	0.8668	-7.95334	0.0000

ADF Fisher Ki-kare	5.17217	0.7390	62.2425	0.0000
PP Fisher Ki-kare	8.74944	0.3639	62.4544	0.0000
Breitung t-stat	0.45534	0.6756	-6.95226	0.0000

Tablo-1’de değişkenlerin durağanlık durumu verilmiştir. Panel birim kök testleri için; Levin, Lin&Chu, Im,Peseron and Shin W-stat, ADF Fisher Ki-kare, PP Fisher Ki-kare ve Breitung t-stat testleri kullanılmıştır. Verilerle işlem yapabilmek için durağan olmaları gerekmektedir. Karşılaştırmalı birim kök testlerin kullanılması, sonuçların daha sağlıklı analiz edilmesini sağlayacağı için, bu beş panel birim kök testi kullanılmıştır. Tablo-1 analiz edildiğinde; GSYİH’nın düzey seviyede durağan olduğu tüm birim kök testlerinin olasılık değerlerinde görülmektedir. İSTARIM ve İSSANAYI’nın ise düzey seviyede birim köke sahip olduğu, yani durağan olmadığı görülmüştür. Birinci farkları alındığında olasılık değerleri, kritik değer olan 0.05’ten küçük olduğundan, bu değişkenlerin birinci seviyeden durağan oldukları görülmüştür.

Modeldeki değişkenlerin durağanlıkları analiz edildikten sonra durağan olan değişkenler, panel eş-bütünleşme testleri ile incelenerek sonuçları aşağıdaki tabloda verilmiştir.

### 5.2. Panel Eş-Bütünleşme Tablosu

Eş-bütünleşme analizi, uzun dönem serilerinde fark alındığında oluşan bilgi kaybını gidermekte ve çözümü için büyük bir kolaylık sağlamaktadır. Değişkenler arasında uzun dönem ilişkinin mevcut olup olmadığını incelemek için, eş-bütünleşme testleri kullanılmaktadır. Aşağıda panel eş-bütünleşme test sonuçları verilmiştir.

**Tablo 2: Panel Eş-Bütünleşme Test Sonuçları**

Pedroni Eş-bütünleşme Testi	Test İstatistiği	p olasılık değeri
Panel v-İstatistiği	0.301181	0.3816
Panel rho-İstatistiği	-2.469375	0.0068
Panel PP-İstatistiği	-5.943152	0.0000
Panel ADF-İstatistiği	-4.823415	0.0000
Group rho-İstatistiği	-2.575134	0.0050
Group PP-İstatistiği	-8.444296	0.0000
Group ADF-İstatistiği	-3.945352	0.0000

Kao Eş-Bütünleşme Testi	Test İstatistiği	p olasılık değeri
ADF	-3.165569	0.0008
Atıklar varyans	1.088586	
HAC varyans	0.169667	

Johansen- Fisher Eş-Bütünleşme Testi	Test İstatistiği	p olasılık değeri
Yok	61.79	0.0000
En fazla 1	18.67	0.0167
En fazla 2	21.90	0.0051

Panel veri analizi için Tablo-2’de yer alan, Pedroni Eş-bütünleşme testi, Kao Eş-bütünleşme testi ve Johansen-Fisher Eş-bütünleşme testleri kullanılmıştır. Test sonuçları analiz edildiğinde; Pedroni Eş-bütünleşme testinde yer alan Panel v-İstatistiği dışında diğer tüm testlerinde eş-bütünleşme olduğu görülmektedir. Bu sonucu, tüm testler için p olasılık değerlerinin kritik değer olan 0.05’ten küçük olmasından görmekteyiz. Bundan dolayı, değişkenler arasında uzun dönemli bir ilişkinin mevcut olduğu görülmektedir. Değişkenler arasında uzun dönemli bir ilişkinin olduğu tespit edildikten sonra durağan verilerle modelin tahminine geçilmiştir.

### 5.3. Panel Veri Analizi Klasik Modelin Tahmin Sonuçları

Neo-klasik büyüme teorilerinin temel öngörüsü ülkelerin çıktılarındaki artış oranının zaman içerisinde birbirine yakınsayacağıdır. Bu sonuç, kişi başına düşük gelirli ülkelerin yüksek gelirli ülkelere göre daha hızlı büyüyecekleri öngörüsü nedeniyle ortaya atılmıştır. Bu da temelde iki varsayma dayanır. Bunlardan birincisi, teknolojik değişimin dışsal olduğu ve ikincisi ise, ülkeler arasında sabit olduğu varsayımdır.



**Tablo 3: Panel Klasik Model Test Sonuçları**

Değişkenler	Katsayı değeri	t istatistik değeri	p olasılık değeri
SABİT	0.055085	0.624385	0.5343
DİSTARIM	0.073585	3.152002	0.0023
DISSANAYİ	0.094440	2.826340	0.0061
$R^2$	0.689578		
D-W değeri	2.34		
F İstatistik	8.655238		
F olasılık	0.000419		

Bağımlı değişken: GSYİH

Tablo 3’de panel veri analizinde klasik model sonuçları görülmektedir. Tablo-3, tahmin sonuçları yüzde beş anlam düzeyinde analiz edildiğinde, tarım ve sanayi alanında istihdamın istatistiksel açıdan anlamlı olduğu görülmektedir. Modelin determinasyon katsayısı yaklaşık yüzde altmış sekiz (0.68) olarak hesaplanmıştır. Bu da gelir değişkeninin tüketimde oluşan değişimlerin yaklaşık olarak altmış sekizini açıkladığı anlamına gelmektedir. Bu modelde, tarım alanındaki istihdamda meydana gelen bir birimlik artış GSYİH’da 0.07 birimlik pozitif bir artışa neden olmaktadır. Aynı şekilde, sanayi alanındaki istihdamda meydana gelen bir birimlik artış GSYİH’da 0.09 birimlik pozitif bir artışa neden olmaktadır. Aynı şekilde F-olasılık değeri, modelin bir bütün olarak anlamlı olduğunu göstermektedir.

Klasik model analizi yapıldıktan sonra Panel veri analizi için sabit etki ve rassal etki modellerin tahmini yapılmıştır ve bu sonuçlar aşağıdaki tabloda verilmiştir.

#### 5.4. Panel Veri Analizi Sabit Etkili Modelin Tahmin Sonuçları

Sabit etkiler modeli her bir yatay kesit birimi için farklı bir sabit değer meydana getirmektedir. Sabit etkiler modelinde  $\beta$  ile gösterilen eğim katsayılarının değişmediği, fakat sabit katsayıların sadece kesit verileri arasında veya sadece zaman verileri arasında veya her iki veri içinde değişme söz konusu olduğunda başvurulan bir yöntemdir. Yani panel veri setinde kesitler arasında fark olduğunda, zamana bağlı bir farklılaşma yoksa bu regresyon modeli tek yönlü ve kesite bağlı sabit etkiler modeli olarak isimlendirilir. Değişim sadece zamana bağlı olarak meydana geliyorsa, bu tür modeller tek yönlü zamana bağlı sabit etkiler modeli olarak isimlendirilir. Eğer panel verilerde hem zamana ve hem de kesite göre bir farklılaşma varsa, bu modellere çift yönlü sabit etkiler modeli denir. Ancak panel veri analizlerinde çoğunlukla zaman etkisinden çok kesit etkisi araştırıldığından panel veri modelleri genellikle tek yönlü modellerdir (Hsiao, 2002:30).

**Tablo 4: Sabit Etkili Model Test Sonuçları**

Değişkenler	Katsayı değeri	t istatistik değeri	p olasılık değeri
SABİT	0.067086	0.767359	0.4454
DİSTARIM	0.064705	3.161815	0.0023
DISSANAYİ	0.08112	3.508148	0.0008
$R^2$	0.620020		
D-W değeri	2.469620		
F İstatistik	4.484704		
F olasılık	0.001313		

Tablo-4’te yatay kesit verileri ile ağırlıklandırılarak, White Cross Section ile değişen varyans sorununu göz önüne alacak şekilde sabit etki modeli tahmini yapılmıştır. Tahmin sonuçları yüzde beş anlam seviyesinde analiz edildiğinde, tarım ve sanayi alanında istihdamın istatistiksel olarak anlamlı olduğu görülmektedir. Modelin determinasyon katsayısı yaklaşık yüzde altmış iki (0.62) dir. Bu durum, gelir değişkeninin tüketimde oluşturduğu değişimlerin yaklaşık altmış ikisini açıkladığı anlamına gelmektedir. Bu modelde, tarım alanındaki istihdamda meydana gelen bir birimlik artış GSYİH’da 0.06 birimlik pozitif bir artışa neden olmaktadır. Aynı şekilde, sanayi alanındaki istihdamda meydana gelen bir birimlik artış GSYİH’da 0.08 birimlik pozitif bir artışa neden olmaktadır.

#### 5.5. Panel Veri Analizi Rassal Etkili Modelin Tahmin Sonuçları

Rassal etkili (random effects) modeller, kesitlere ve zamana bağlı bir şekilde oluşan değişiklikler modele hata teriminin bir bileşeni olarak dahil edilmeleri halinde kullanılabilen bir modeldir. Rassal etkili modellerin sabit etkili modellere göre daha elverişli olmasının sebebi, bu modellerde serbestlik derecesi kaybının ortadan kalkmış olmasıdır. Bunun yanında rassal etkiler modeli, modele örneklem dışındaki etkilerin de dahil edilmesine imkan sağlamaktadırlar.

**Tablo 5: Rassal Etkili Model Test Sonuçları**

Değişkenler	Katsayı değeri	t istatistik değeri	p olasılık değeri
SABİT	0.055085	0.631568	0.5296
DİSTARIM	0.053585	3.188264	0.0021
DISSANAYİ	0.079444	2.858856	0.0055
$R^2$ değeri	0.589578		
D-W değeri	2.340062		
F İstatistik değeri	8.655238		
F olasılık değeri	0.000419		

Tablo-5'te yatay kesit verileri ile ağırlıklandırılmış ve White Cross Section ile değişen varyans problemini gözönüne alan rassal etki modeli tahmini yapılmıştır. Tahmin sonuçları yüzde beş anlam seviyesinde analiz edildiğinde, tarım ve sanayi alanında istihdamın istatistiki olarak oldukça anlamlı olduğu görülmektedir. Modelin belirlilik katsayısı yaklaşık olarak yüzde elli sekiz (0.58) olarak bulunmuştur. Yani bağımsız değişkenler, bağımlı değişken olan GSYİH'daki değişimlerin yaklaşık yüzde elli sekizini açıklamaktadır. Bu modelde, tarım alanındaki istihdamda meydana gelen bir birimlik artış GSYİH'da 0.05 birimlik pozitif bir artışa neden olmaktadır. Aynı şekilde, sanayi alanındaki istihdamda meydana gelen bir birimlik artış GSYİH'da 0.07 birimlik pozitif bir artışa neden olmaktadır.

Yapılan analiz sonuçlarına göre, panel veri modelleri olan Sabit Etki Modeli ve Rassal Etki Modelinde verilerimiz gayet uyumlu olduğu görülmektedir. Bu durumda Hausman test istatistiği, rassal etki ya da sabit etki modelinden hangisinin tercih edilmesi gerektiği konusunda yardımcı olacaktır.

### 5.6. Hausmann Test Sonuçları

Panel veri modelinin tahmininde havuzlanmış (pooled) regresyon sabit etkiler (fixed effects) ve rastsal etkiler (random effects) olmak üzere üç yaklaşım vardır. Eğer ihmal edilmiş sabit etkilerden ve rastsal etkilerden yatay kesit değişkenlerinin bağımsız olduğu kesin ise pooled regresyonu kullanmak daha doğru sonuçlar verecektir. Bunun için de öncelikle Breusch-Pagan (B-P) testinin yapılması gerekecektir. B-P testi ile birim etkilerinin varyansının sıfır olması durumunda rastsal etkili modelin havuz modeline dönüşeceği boş hipotezi sınanmaktadır. Modelin OLS (pooled-havuzlanmış) regresyon ile tahmin edilemediği durumda, analizde rastsal etkiler mi yoksa sabit etkiler yaklaşımının mı kullanılacağı ile ilgili karar vermek için Hausman testi kullanılır.

**Tablo 6: Hausmann Test Sonuçları**

Test özeti	Ki kare	ki-kare. d.f.	p-olasılık değeri
Yatay-kesit rastsal	4.491078	2	0.1059

Tablo-6 analiz edildiğinde, yokluk hipotezi rassal etki şeklinde olan Hausman test istatistiğini yüzde beş anlam düzeyinde analiz edildiğinde yokluk hipotezini kabul etmektedir. Yani Hausman test istatistiği, sabit etki modelini değil, rassal etki modelini kullanılması gerektiğini ifade etmektedir. Bu yüzden en uygun modelin rassal etki modeli olduğu gerçeğine ulaşılmaktadır. p-olasılık değerinin yüzde beş değer olan kritik değerden yüksek olması bu sonucu verir.

## 6. SONUÇ VE DEĞERLENDİRME

Hükümetlerin istihdamı destekleyecek projeler ile ekonomiyi nasıl pozitif yönde etkileyebileceği gelişmiş ülkelerde açık şekilde görülmektedir. Özellikle tarım ve sanayi alanında oluşan gelişimin ülkelerin ekonomik olarak büyük bir güce sahip olduklarını göstermektedir. Bu alanda oluşacak istihdamın ülkedeki işsizlik oranını düşürmekle birlikte ekonomik kalkınmaya da büyük etki yapmaktadır.

Bu çalışmada, dört OECD ülkesi için tarım sanayi sektöründe istihdamın iktisadi büyüme üzerindeki etkisi panel veri analizi kullanılarak incelendi. 1993-2017 yıllarını içeren yıllık verilere, önce panel birim kök testleri yapıldı. Testlere göre, büyüme oranı düzey seviyede durağan iken, tarım ve sanayi sektöründe istihdamın ise birinci farkı alındığında durağanlaşmaktadır. Veriler aynı seviyede durağan hale getirildikten sonra değişkenler arasında ilişki olup olmadığını belirlemek için, önce panel eş-bütünleşme testleri uygulandı. Bu analizin sonucunda tarım ve sanayi sektöründe istihdam ile iktisadi büyümenin uzun dönemde eş-bütünleşik olduğu sonucu elde edildi. Ayrıca modelin uzun dönem katsayı sonuçlarına göre, tarım sektöründe istihdamın % 1 artması, iktisadi büyümeyi % 0.07 olumlu etkilemektedir. Aynı şekilde sanayi sektöründe istihdamın % 1 artması, ekonomik büyümeyi % 0.09 pozitif yönde etkilemektedir. Modelde yer alan verilerin istikrarlı olması, daha güvenilir yorumlar yapılmasına olanak tanımaktadır. Daha sonra panel veri analizinde sabit ve rassal etki testleri yapıldı. Test sonuçları klasik test modelindeki gibi olumlu sonuçlar verdi. Son olarak, sabit veya rassal etki modellerinden hangisinin panel analizi

için uygun olduğunu analiz etmek için Hausman testi uygulandı. Hausman test sonuçlarına göre panel veri analizi için uygun testin rassal etki modeli olduğu sonucuna varıldı.

Elde edilen bulgulara göre, tarım ve sanayi sektöründe istihdamın artması bu alanın üretim konusunda ilerlediğini ve bunun da ekonomik büyümeyi olumlu etkilediği görülmektedir. Tarımın ham madde ve yaşamın sürdürülebilir olması için büyük öneme sahip olduğu gerçeği ve bu sektörde meydana gelen istihdamın ülkeye ekonomik kalkınmada pozitif etki yaptığı, yapılan analizler sonucu görülebilir. Özellikle tarım ülkesi olan Türkiye için büyük önem arz eden tarımın son zamanlarda kan kaybediyor olması, tarım ürünlerinin ithal edilmesine sebep olmaktadır. Bu durumun önüne geçilmesi için;

- İthalat temelli politikaların yerine yerli ürün üretim destekli politikalar üretilmesi,
- Üreticide ucuz olan ürünün tüketiciye pahalı bir şekilde yansımaya neden olan araçları denetleyecek politikalar üretilmesi,
- İklim değişikliğine uygun politikalarla çeşitli ürünlerin üretilmesinin sağlanması,
- Üreticiye teşvik programları sunulması gerekmektedir.

Bu tür yapılandırmalarla ülkede tarımın tekrar canlanacağı ve ekonomik büyümenin daha olumlu ilerleyeceği düşünülmektedir.

Dünya ülkelerinin artık teknoloji ve sanayi olarak mücadele ettikleri gerçektir. Bu alanda ilerleme kat eden ülkelerin ekonomik olarak da güçlü oldukları ve üretici ülkeler sınıfında oldukları görülmektedir. Türkiye'nin bu rekabet içinde yer edinebilmesi için, sanayi ve teknoloji alanında ilerleme sağlaması gerekmektedir. Bu ilerlemeyi sanayi alanında yatırımlara teşvik programları çıkararak ve teknolojik üretime yönelerek sağlayabiliriz. Bu bağlamda, teknolojik eğitimler verilmeli ve üretici bir gençlik yetiştirilmelidir. Türkiye'de mevcut işgücünün eğitim seviyesi bir aşama ilerletildiğinde istihdam sorunu çözülebilecek duruma gelir. Böylelikle sanayi sektöründe istihdamın artırılmasının büyük ölçüde sektörün ihtiyaçlarını karşılayacak düzeyde nitelikli işgücü yetiştirilebilmesine bağlı olduğu durumu ortaya çıkar.

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