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## Article

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## Article

# The Impact of Economic Freedom on Economic Growth? New European Dynamic Panel Evidence

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**Abstract:** This paper analyzes the impact of economic freedom along with traditional economic factors on economic growth for a panel of European countries. The growth of the gross domestic product was observed over a twenty-year time period on a sample of 43 developing and developed countries. Based on a robust dynamic panel setting, we conclude that increases in economic freedom as expressed by the Index of Economic Freedom/Heritage Foundation (but not its levels) are related to economic growth. The EU membership status either had no effect or it curbed the effect of the economic freedom on growth. We also find that the subprime economic crisis of 2008–2009 exerted a negative impact on the growth of European economies.

**Keywords:** economic freedom; economic growth; Europe; panel analysis; subprime crisis; system GMM

**JEL Classification:** O47; O52; C33

## 1. Introduction

Considering that modern economic growth theories highlighted economic freedom as an important factor of economic development and prosperity in a country (e.g., Justesen 2008; Kacprzyk 2016), we examine this potential relationship on a sample of European countries.

This research uses data from the Index of Economic Freedom of Heritage Foundation<sup>1</sup> in order to define and measure the impact of economic freedom on the total production of goods and services, expressed through the growth of gross domestic product (GDP). The Index of Economic Freedom comprises of equally-weighted ten categories that define the state of economic freedom.<sup>2</sup> More specifically, it considers the protection of property rights, corruption, fiscal burden, level of public spending, ease of doing business, working conditions, international openness in terms of trade, investment and financial flows and other aspects from the economic sphere of the selected countries, stated as the components of the Index of Economic Freedom.<sup>3</sup>

<sup>1</sup> <http://www.heritage.org/index/explore>.

<sup>2</sup> In 2017, the Heritage Foundation made some methodological changes, so the Index of Economic Freedom has had 12 components as opposed to the previous 10. The new component is “Judicial Effectiveness” belonging to the Rule of Law pillar and “Fiscal Health” as the new factor of the Government size pillar.

<sup>3</sup> It is worthwhile to state that we do not investigate the effects of the individual components of the Index of Economic Freedom on growth, while we acknowledge the possibility that positive and negative changes of the components could offset each other resulting in the constant composite index.

To understand the underpinnings of economic growth in the European area, this research (directly or indirectly) addresses the following questions:

- Can economic freedom contribute to economic growth in the European area?
- Is a certain level of economic freedom or its change responsible for the change in the total production of European countries?
- Is the relationship between economic freedom and economic growth dynamic and non-linear in nature?
- Is the relationship between economic freedom and economic growth sensitive to the E.U. membership status of countries in the sample?
- What is the impact of economic crisis on growth in the model?

The primary objective of the research is to determine the impact of economic freedom, while controlling for other traditional macroeconomic factors, on the growth of GDP on the sample of countries that are part of the European region. To the authors' best knowledge, none of the previous research work has considered such a large and heterogeneous European area sample that spanned 20 years of annual observations. Also, we analyze a multitude of potential explanatory variables from the literature in a robust and dynamic (system generalized method-of-moments—system GMM) panel setting. Finally, we empirically test the impact of E.U. membership status and economic crises episodes on growth.

The initial results from our linear panel regressions show that economic freedom, as well as certain traditional macroeconomic variables, have a positive impact on economic growth in the European countries. This statistically significant relationship is not observed when the change of economic freedom was used as a regressor. Such findings generally corroborate the recent works of [Dkhili and Dhiab \(2018\)](#) for a sample of Gulf Cooperation Council countries and [Bayar \(2016\)](#) for a smaller sample of transitional countries in Europe.

A more appropriate (system GMM) model specification that accounted for potential endogeneity and non-linear effects revealed a different picture. We found that levels of economic freedom have no effect on growth, while the first difference of the Index of Economic Freedom was statistically significant in a dynamic model. Also, lagged growth and gross capital formation had strong positive impacts on economic growth. Such evidence is in line with [Sturm and Haan \(2001\)](#) and, more recently, with [Pääkkönen \(2010\)](#) who also concluded that non-linearities are present in the growth model. Surprisingly, in contrast to other research by, for example, [Haydaroglu \(2016\)](#) we could not document the importance of foreign direct investments for growth.

The next Section provides an exhaustive review of the relevant literature and also explains how the current paper complements it. All variables are described along with the methodology in Section 3. Based on different model specifications, Sections 4 and 5 present the results and offer a related discussion. Section 6 concludes the paper.

## 2. Literature Review

Numerous studies have attempted to uncover the nature of the relationship between economic freedom and economic growth. Using a variety of econometric methods and different indicators of economic freedom, scholars attempted to answer the same question: does economic freedom lead to economic growth? Other studies have attempted to determine which segment of economic freedom contributes to growth. Two distinct schools of thought have emerged. First, the causal links between economic freedom and various economic indicators of growth and development were the focus of [Farr et al. \(1998\)](#), [Heckelman \(2000\)](#), [Dawson \(2003\)](#), [Vega-Gordillo and Alvarez-Arce \(2003\)](#), [Erdal \(2004\)](#), [Justesen \(2008\)](#), [Aixalá and Fabro \(2009\)](#), [Hristova \(2012\)](#), [Piątek et al. \(2013\)](#). In other studies, the focus was on the nature of the relationship between the degree of democracy, political, civil and economic freedom, and growth ([Farr et al. 1998](#); [Vega-Gordillo and Alvarez-Arce 2003](#); [Aixalá and Fabro 2009](#); [Peev and Mueller 2012](#); [Piątek et al. 2013](#)).

One of the first papers that explored the relationship between economic freedom and growth was [Islam \(1996\)](#), while the first study concerning the analysis of the link between different dimensions of economic freedom and economic growth was [Ayal and Karras \(1998\)](#). The evidence from these studies was mixed. Depending on the quantitative or econometric method the researchers used in their analyses, some of the results showed that no robust relationship exists, while others demonstrate the impact of certain aspects of economic freedom on economic growth.

[Akin et al. \(2014\)](#) explored the impact of economic freedom on economic growth for countries with different income levels. They carried out a panel analysis on a sample of 94 countries for the 2000–2010 time period. They concluded that in all countries, regardless of the level of income, the level of economic freedom has a positive, statistically significant relationship with economic growth. [Richard Cebula \(Cebula 2011, 2013; Cebula and Clark 2014; Cebula and Mixon 2012, 2014\)](#) studied the relationship between economic freedom and the state of economies of the 30 member states of the Organization for Economic Co-operation and Development (OECD), primarily covering the period from 2003 to 2007. Their panel analysis showed that economic freedom has a positive impact on GDP level/growth.

In some cases, different groups of countries and the criteria for grouping countries were involved in determining the impact of economic freedom on economic growth. In contrast to the current paper, the majority of other studies did not investigate the impact of economic freedom in the European area as a whole; instead, they concentrated on specific groups such as the countries of the EU and the European transitional countries ([Rajasalu 2003; Hall et al. 2011; Altay and Çelebioğlu 2011; Pérez-Moreno and Angulo-Guerrero 2016](#)). For the period from 1970 to 2007 and a sample of 35 EU countries, [Hall et al. \(2011\)](#) documented that EU membership has a small, positive impact on the level of economic freedom.

The transition period proved to be suitable for examining the impact of economic liberalization on economic flows. [Pääkkönen \(2010\)](#) explored how economic freedom affected GDP growth per worker on a panel sample of 25 transition countries that spanned the period from 1998 to 2005. [Bayar \(2016\)](#) also tackled the impact of economic freedom on economic growth in transition countries. Based on data from 1996 to 2012, for 11 such EU-member countries, [Bayar \(2016\)](#) confirmed the hypothesis that economic freedom and international exchange increase economic growth.

The specifics of Islamic countries and their reflection on the state of economic freedom and, indirectly, on the level of economic development of these countries were analyzed by [Peláez \(2009\)](#) and [Türedi \(2013\)](#). [Türedi \(2013\)](#) studied the impact of two dominant indicators of economic freedom on the level of GDP per capita on a sample of 12 Islamic countries (from 1995 to 2010) and found a positive and statistically significant relationship.

Using panel analysis, [Tiwari \(2011\)](#) studied the impact of certain components of economic freedom (foreign aid and foreign direct investment) on economic growth within 28 countries from the Asian continent in the period between 1998 and 2007. The evidence suggested that there was a positive relationship between fiscal as well as financial freedom and economic growth. Similar results were reported in [Haydaroglu \(2016\)](#) for Brazil, Russia, India, China and South Africa (BRICS). Further, [Karabegovic et al. \(2003\)](#) and [Bennett \(2016\)](#) observed that the level and growth of economic freedom positively affected GDP level and growth in 10 Canadian provinces and 50 American states over the period from 1994 to 1999 (and 1981 to 1997). Additional evidence on the positive impact of economic freedom on economic growth can be found in [Bayar and Aytemiz \(2015\)](#), [Bengoa and Sanchez-Robles \(2003\)](#), [N'Zue \(2010\)](#) and [Ahmadpour et al. \(2013\)](#).

Not many papers have questioned the relationship between economic freedom and growth. For instance, [De Haan et al. \(2006\)](#) rejected the robust level effect of economic freedom on growth. In the same vein, [Sturm and Haan \(2001\)](#) demonstrated that the change (level) of economic freedom is (not) related to growth. Furthermore, [Carlsson and Lundström \(2002\)](#) concluded that two factors of economic freedom (the size of government and freedom to trade with foreigners) have a statistically significantly negative effect on growth.

We position our paper in the above scholarly contributions that critically and robustly investigate the link between economic freedom and growth; yet, we bring three contributions to the literature. First, we rely on an extended and updated sample (1995–2014) that covers a multitude of countries (43). This allows us to compare the effects of economic freedom on growth in both the EU and non-EU countries. Second, we examine several alternative model specifications that include both linear and non-linear models. This approach results in robust stylized facts that concern the potential impacts of both economic freedom and its first difference on growth. Third, we are able to observe the impact of recent economic crises on growth. We present evidence in favor of the strong influence of the subprime mortgage crisis (2008–2009) on growth, but not that of the Russian ruble crisis (1998) and the Euro/Greek crisis (2010).

### 3. Methodology and Definitions of Variables

To analyze the impact of economic freedom on economic growth, we tested the following hypotheses:

**Hypothesis 1.**  $H_0$ : Economic freedom has a positive impact on economic growth in European countries.  $H_1$ : Economic freedom has a negative impact or has no impact on economic growth in European countries.

**Hypothesis 2.**  $H_0$ : The change of economic freedom has a positive impact on economic growth in European countries.  $H_1$ : The change of economic freedom has a negative impact or has no impact on economic growth in European countries.

The research included the following indicators: the Heritage Foundation's Index of Economic Freedom and other macroeconomic indicators (size of GDP, total investment, export of goods and services, inflation, etc.) observed on a sample of the developing and developed countries of Europe.<sup>4</sup> Our sample that ran from 1995 to 2014 included the countries of different levels of economic development, former socialist countries, countries in transition, those that terminated that process, and traditional capitalist countries. In other words, we considered member states of the EU, those at a varying level of the process of EU integration, and non-EU countries. Such a long and diverse sample represents our research contribution to the study of the impact of economic freedom on economic growth.

The degree of economic freedom was gauged based on the Heritage Foundation's Index of Economic Freedom. Economic growth as a dependent variable was measured by an annual increase in the GDP per capita for the observed countries of the European region.<sup>5</sup> Traditional macroeconomic indicators that will be introduced shortly were used as control variables. The data covered the time period between 1995 and 2014, which is the appropriate panel size for 43 countries. The least-squares dummy variable (LSDV) model was used to estimate the impact of the level (and the change in the level) of economic freedom, in the presence of control and dummy variables, on economic growth. The dependent variable was economic growth<sup>6</sup> (GROWTH) in European countries, while the independent variable was the Index of Economic Freedom (IEF) formulated by the Heritage

<sup>4</sup> The research covered the following 43 countries: Albania, Austria, Belgium, Belarus, Bosnia and Herzegovina, Bulgaria, Georgia, Greece, Denmark, Estonia, Iceland, Republic of Ireland, Italy, Armenia, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Macedonia, Malta, Moldova, Germany, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Serbia, Turkey, United Kingdom, Ukraine, Finland, France, the Netherlands, Croatia, Montenegro, Czech Republic, Switzerland, Sweden and Spain. The selected countries form a group of European countries based on a regional division of the world according to the Heritage Foundation criteria. The country data came from the World Bank (<http://data.worldbank.org/>).

<sup>5</sup> As motivated by other studies, we believe that GDP per capita growth is more important to utilize as a dependent variable. Specifically, for countries where the population growth is relatively low, the difference between GDP per capita growth and GDP growth is insignificant. However, given the differences in population growth across the countries in our sample, we feel that GDP per capita growth is a better measure of whether the population in a country is getting wealthier.

<sup>6</sup> The annual percentage growth rate of GDP per capita expressed in the local currency as the base currency.

Foundation.<sup>7</sup> The control variables in our model were selected based on data availability and other related studies as follows: the log level of GDP with 1995 as the base year (LGDP95), gross capital formation expressed as a percentage of GDP (GCF), foreign direct investment as a percentage of GDP (FDI), annual population growth rate (POP), market openness as a percentage of GDP (TR), public spending as a percentage of GDP (GOV), inflation (INF) and enrollment in secondary school (SEC). The dummy variables for 2008 and 2009 were included in the analysis due to the effect of the global economic crisis. The dummy variable (d\_EU) was also included to determine whether the country's membership in the EU affects economic growth.<sup>8</sup>

The initial panel regression was specified as follows:

$$GROWTH_{t,i} = \alpha + \gamma IEF_{t,i} + \beta_1 LGDP95_{t,i} + \beta_2 GCF_{t,i} + \beta_3 POP_{t,i} + \beta_4 SEC_{t,i} + \beta_5 GOV_{t,i} + \beta_6 FDI_{t,i} + \beta_7 TR_{t,i} + \beta_8 INF_{t,i} + \lambda d\_2008_t + \theta d\_2009_t + \phi d\_EU_i + u_{t,i}, \quad (1)$$

#### 4. Results and Discussion

Table 1 shows the summary statistics of all variables. The sample included annual data from 1995 to 2014 (a total of 20 years) for 43 countries of the European continent. Depending on the data availability, we had a range from 723 to 857 observations.

**Table 1.** Descriptive statistics of all variables.

Variable	Number of Observations	Arithmetic Mean	Standard Deviation	Minimum	Maximum
GROWTH	850	2.934064	5.346305	−14.55986	92.36075
IEF	829	64.39156	9.299356	29.4	82.6
LGDP95	840	3.933703	0.5873928	2.813008	4.764187
GCF	852	23.53795	5.266264	0.2986439	42
FDI	827	5.914168	12.13782	−58.97767	173.4499
POP	857	0.4361306	1.859249	−3.820174	13.33662
SEC	723	100.8752	16.24156	61.05265	165.5813
TR	852	96.05142	48.44614	−2.050396	374.1478
GOV	845	20.38286	8.896399	7.698666	86.11486
INF	818	8.895924	42.52022	−4.479938	1058.374

Notes: The variables are defined as follows: economic growth (GROWTH), the Index of Economic Freedom (IEF), the logarithm of GDP with 1995 as the base year (LGDP95), gross capital formation expressed as a percentage of GDP (GCF), foreign direct investment as a percentage of GDP (FDI), annual population growth rate (POP), market openness as a percentage of GDP (TR), public spending as a percentage of GDP (GOV), rate of inflation (INF) and enrollment in secondary school (SEC).

Before the panel regression was performed, we tested for multicollinearity in independent variables, i.e., between the control variables and the variable economic freedom (IEF). We calculated the variance inflation factor (VIF) to test whether IEF exhibits a strong linear relationship with other independent (control) variables. Table 2 shows that the VIF values did not exceed 4 and we can conclude that there is no significant multicollinearity present in the sample. In addition to testing for multicollinearity, we also test for heteroskedasticity by using the Breusch–Pagan (BP) test (Breusch and Pagan 1979). The BP statistics was calculated as 156.46 (df = 12,  $p$ -value =  $2.2 \times 10^{-16}$ ), which indicated the presence of heteroskedasticity. To mitigate the problem, we will use a robust covariance matrix in further analysis.

<sup>7</sup> The Index of Economic Freedom considers the rule of law, the limitation of government, the efficiency of regulation, and market openness. The index is calculated as the average of ten sub-indices of economic freedom.

<sup>8</sup> The data on the state of economic freedom were collected from the annual reports published by the Heritage Foundation in collaboration with the Wall Street Journal ([www.heritage.org](http://www.heritage.org)). The data on economic growth and macroeconomic indicators were taken from the World Data Bank database ([data.worldbank.org](http://data.worldbank.org)).



**Table 2.** Multicollinearity test (variance inflation factor (VIF) values).

Variable	IEF	LGDP95	GCF	FDI	POP	SEC	TR	GOV	INF
VIF	2.22	2.62	1.22	1.21	2.95	1.85	1.47	3.23	1.31

Next, we calculated the correlation matrix of all variables (Table 3). The *p*-values of the correlation coefficients are shown in the upper right triangle of the matrix, while the Pearson's correlation coefficients are displayed in the lower left triangle of the matrix. Statistically significant correlations at the 5 per cent significance level as well as the corresponding coefficients are located in shaded cells of Table 3. We can observe that the dependent variable (GROWTH) is statistically significantly, but negatively correlated (−0.1602) with the independent variable (IEF). The sign of the coefficient may look counterintuitive, but the subsequent panel regression analysis will reveal the nature of the relationship when the control variables are present.

**Table 3.** Correlation matrix between dependent, independent variable and control variables.

Variable	GROWTH	IEF	LGDP95	GCF	FDI	POP	SEC	TR	GOV	INF
GROWTH	1	0.000116	0	0	0.496126	0.896664	$2.19 \times 10^{-8}$	0.958664	0.607712	0.119976
IEF	−0.16015	1	0	0.454449	0.000609	$2.32 \times 10^{-7}$	0	$2.52 \times 10^{-14}$	0.059638	0
LGDP95	−0.36043	0.602544	1	$6.02 \times 10^{-11}$	0.128482	0.653733	0	0.00179	0.013949	$1.33 \times 10^{-15}$
GCF	0.4237	0.031282	−0.26865	1	0.393288	0.343975	0.000759	0.867454	0.299999	0.121667
FDI	0.028464	0.14264	0.063523	−0.0357	1	0.093681	0.741534	0	0.549578	0.249921
POP	−0.00543	0.213819	0.018763	0.03957	0.070034	1	0.410154	$1.62 \times 10^{-5}$	0	0.144867
SEC	−0.23093	0.437491	0.584269	−0.14016	0.013796	0.034442	1	0.453571	$7.71 \times 10^{-5}$	$4.11 \times 10^{-13}$
TR	−0.00217	0.310846	0.130084	−0.00698	0.386595	−0.17893	0.031343	1	$9.08 \times 10^{-10}$	0.009069
GOV	0.021471	0.078664	−0.10257	−0.04333	0.025027	0.758708	0.164235	−0.25205	1	0.001597
INF	0.064972	−0.41071	−0.32494	−0.06468	−0.0481	−0.06093	−0.2965	−0.10883	−0.13146	1

Notes: The *p*-values of the correlation coefficients are shown in the upper right triangle of the matrix, while the Pearson's correlation coefficients are displayed in the lower left triangle of the matrix. Statistically significant correlations at the 5 per cent significance level are located in shaded cells.

The results from the estimated LSDV model are presented in Table 4. The impact of the independent variable (IEF), independent control variables (LGDP95, GCF, FDI, POP, TR, GOV, INF) and dummy variables (d\_2008, d\_2009 and d\_EU) on the dependent variable (GROWTH) was examined.

**Table 4.** Results from the least squares dummy variable (LSDV) model.

Variable	Coefficient	Standard Error	<i>t</i> -Value	<i>p</i> -Value
Constant	3.46479	1.83904	1.884	0.06008
IEF	0.03688	0.022284	1.655041	0.098476
LGDP95	−1.89288	0.360887	−5.24508	$2.22 \times 10^{-7}$
GCF	0.258061	0.027376	9.426461	$1.10 \times 10^{-19}$
FDI	0.014378	0.009483	1.516179	0.130037
POP	−0.30819	0.126767	−2.43116	0.015363
SEC	−0.02326	0.010737	−2.16629	0.03071
TR	−0.00026	0.00308	−0.08332	0.933627
GOV	0.082246	0.029593	2.779245	0.005631
INF	−0.01295	0.015757	−0.82186	0.411504
d_2008	−2.5757	0.4875	−5.280	$1.85 \times 10^{-7}$
d_2009	−8.99358	0.501736	−17.9249	$3.83 \times 10^{-57}$
d_EU	−0.48121	0.306614	−1.56943	0.117111
F-test	87.72		$2.2 \times 10^{-16}$	
R <sup>2</sup>	0.6703			

Based on the F-test ( $F = 87.72$ ;  $p$ -value =  $2.2 \times 10^{-16}$ ) and the R<sup>2</sup> (0.6703), the model fit the data well. However, Table 3 suggests that the variable IEF was statistically significantly correlated with control variables (FDI, TR, INF) so we ran several variants of the current model by omitting some of

the control variables. As can be seen in Table 5, the final two model variations produced the  $R^2$  that exceeded 0.7. The F-tests were also statistically significant at the 1 per cent significance level.

**Table 5.** Models with omitted variables.

Statistic	Full Model	Without FDI	Without INF	Without TR	Without TR and INF	Without FDI, TR and INF
F-test	87.72	95.19	95.37	95.20	104.2	114.5
$R^2$	0.6703	0.6667	0.6679	0.6703	0.7139	0.7177

The estimates of the model from the last column of Table 5 are organized in Table 6. This (reduced) model has a better fit relative to the full model (Table 4):  $F = 114.5$  ( $p$ -value =  $2.2 \times 10^{-16}$ ) and the  $R^2$  is 0.7177. The impact of the dummy variables d\_2008 and d\_2009 that reflect the global economic crisis is statistically significant for both years which can be interpreted as a strong influence of the crisis on economic growth in European countries. Specifically, the effect of the crisis was more pronounced in 2009 than in 2008.

**Table 6.** Results from the reduced LSDV model.

Variable	Coefficient	Standard Error	t-Value	p-Value
Constant	3.05698	1.645	1.858	0.06363
IEF	0.043137	0.019724	2.18705	0.029138
LGDP95	−1.79384	0.35409	−5.06607	$5.47 \times 10^{-7}$
GCF	0.250871	0.025911	9.682112	$1.19 \times 10^{-20}$
POP	−0.29343	0.12449	−2.35704	0.018752
SEC	−0.02632	0.010259	−2.56509	0.010565
GOV	0.083163	0.028461	2.922016	0.003613
d_2008	−2.38626	0.48062	−4.965	$9.05 \times 10^{-7}$
d_2009	−8.99262	0.494143	−18.1984	$7.03 \times 10^{-59}$
d_EU	−0.35953	0.303487	−1.18468	0.236629
F-test	114.5		$2.2 \times 10^{-16}$	
R <sup>2</sup>	0.7177			

The effect of the dummy variable d\_EU was not statistically significant, but, if the dummy variable d\_EU was excluded from the model, the model's fit worsened ( $F = 80.05$ ;  $R^2 = 0.5247$ ). Hence, we did not exclude this predictor from the model. Also, it can be noted that investments or gross capital formation (GCF) involved one of the largest coefficients of the model and the future research should examine the impact of economic freedom on investments (and thus indirectly on economic growth) in more detail. In all, the results confirmed H0 of Hypothesis 1: Economic freedom has a positive impact on economic growth in European countries.

The presented findings of the positive impact of economic freedom on economic growth corroborate the contributions of [Islam \(1996\)](#), [Abdiweli and Crain \(2001\)](#), [Carlsson and Lundström \(2002\)](#), [Cole \(2003\)](#), [Bengoa and Sanchez-Robles \(2003\)](#), [Doucouliagos and Ulubasoglu \(2006\)](#), [Justesen \(2008\)](#), [Chu and Kong \(2009\)](#), [Aixalá and Fabro \(2009\)](#), [Ahmadpour et al. \(2013\)](#), [Türedi \(2013\)](#), [Akin et al. \(2014\)](#). Some authors have found that the level of economic freedom is not related to economic growth, but that the change of the level is ([Sturm and Haan 2001](#); [Wu 2011](#)). Therefore, in the remainder of the paper, we re-estimated our panel by using the annual change in the level of economic freedom as the dependent variable. The impact of the change of economic freedom index ( $\Delta$ IEF) on economic growth (GROWTH) was checked, along with the control variables (LGDP95, GCF, FDI, POP, TR, GOV, and INF) and a dummy variable (d\_EU). We also tested for multicollinearity with the VIF test and its results are presented in Table 7. Since the VIF statistic was relatively large for the GOV variable, we excluded it from further analysis.



**Table 7.** Multicollinearity test (VIF values).

Variable	$\Delta IEF$	LGDP95	GCF	FDI	POP	SEC	TR	GOV	INF
VIF	1.55	1.19	2.46	1.36	3.35	1.97	1.14	3.97	1.31

Table 8 presents our estimates from the LSDV panel model without the GOV variable. Clearly, the model fit the data well with  $F = 5.876$  ( $p\text{-value} = 6.614 \times 10^{-7}$ ) and  $R^2 = 0.7342$ . Variables that contributed statistically significantly to this model were the control variables LGDP95, GCF and FDI ( $p\text{-value} = 0.021$ ,  $p\text{-value} = 0.003$  and  $p\text{-value} = 0.004$ , respectively). The dummy variable  $d\_EU$  is not statistically significant in the model. We conclude that the null hypothesis ( $H_0$ ) of Hypothesis 2 can be rejected and that the alternative hypothesis ( $H_1$ ) holds: The change of economic freedom has a negative impact or has no impact on economic growth in European countries.

**Table 8.** Results from the LSDV model with change of economic freedom index ( $\Delta IEF$ ).

Variable	Coefficient	<i>t</i> -Value	<i>p</i> -Value
Constant	5.325	1.723	0.087
$\Delta IEF$	0.013	0.180	0.857
LGDP95	−1.496	−2.334	0.021
GCF	0.178	2.988	0.003
FDI	0.014	2.937	0.004
POP	0.276	1.589	0.114
SEC	−0.014	−1.076	0.284
TR	0.002	0.360	0.719
INF	−0.017	−0.606	0.546
$d\_EU$	0.181	0.346	0.731
F-test		5.876	$6.614 \times 10^{-7}$
$R^2$		0.7342	

## 5. Results from a Dynamic Model

Based on the referees' recommendations, we utilized a more robust and appropriate model setting in this section.<sup>9</sup> The following dynamic equation is estimated:

$$GROWTH_{t,i} = \alpha + \delta GROWTH_{t-1,i} + \gamma LIEF_{t,i} + \omega LIEF_{t,i} \times d\_EU_i + \beta_1 LGDP95_{t,i} + \beta_2 GCF_{t,i} + \beta_3 POP_{t,i} + \beta_4 SEC_{t,i} + \beta_5 GOV_{t,i} + \phi d\_EU_i + d_t + u_{t,i}, \quad (2)$$

where all the time series are denoted as defined previously, except for the *LIEF* regressor that represents the logarithm of *IEF* and  $d_t$  are yearly dummies. Two major additions to the setting of Table 6 are the lagged  $GROWTH_{t-1,i}$  term and the interaction term  $(LIEF_{t,i} \times d\_EU_i)$ .<sup>10</sup> To control for potential endogeneity, we estimated Equation (2) by using the Arellano–Bover (Arellano and Bover 1995)/Blundell–Bond (Blundell and Bond 1998) System GMM estimator.

Table 9 displays the estimates of the new model specification. First, in regards to the post-estimation diagnostics, it can be seen that the dynamic model specification passed all three statistical tests that are reported. The Wald test indicates that the model was well-specified. Then, the Hansen/Sargan test statistic was statistically insignificant, i.e., the instruments are valid. The following instruments were used: lags 2 to 10 were included for *GROWTH* and *LIEF*. For other variables, only their second and third lags were included. Following Roodman (2009), the instrument list was collapsed,

<sup>9</sup> We are tremendously grateful to the three anonymous referees for their insightful comments and suggestions.

<sup>10</sup> Before performing the estimations, we removed data outliers, where appropriate.

which mitigated the problem of overfitting bias in the presence of a large number of instruments.<sup>11</sup> Finally, from the Arellano–Bond test for second-order serial correlation, it can be concluded that the second-order autocorrelation in the idiosyncratic errors was statistically absent from the model, i.e., moment conditions of the System GMM estimator were valid.

**Table 9.** Results from the System GMM model with logarithm of economic freedom (LIEF).

Variable	Coefficient	z-Value	p-Value
Constant ( $\alpha$ )	14.065	0.71	0.475
$\delta$ ( $GROWTH_{t-1,i}$ )	0.207	3.89	0.000 *
$\gamma$ ( $LIEF_{t,i}$ )	−1.753	−0.40	0.690
$\omega$ ( $LIEF_{t,i} \times d\_EU_i$ )	−3.584	−0.52	0.601
$\beta_1$ ( $LGDP95_{t,i}$ )	−2.315	−1.48	0.138
$\beta_2$ ( $GCF_{t,i}$ )	0.296	3.10	0.002 *
$\beta_3$ ( $POP_{t,i}$ )	−1.136	−2.96	0.003 *
$\beta_4$ ( $SEC_{t,i}$ )	−0.026	−1.04	0.296
$\beta_5$ ( $GOV_{t,i}$ )	0.075	0.57	0.570
$d_t$ (2008)	−1.854	−1.42	0.156
$d_t$ (2009)	−7.964	−6.39	0.000 *
$\phi$ ( $d\_EU_i$ )	13.945	0.48	0.629
Wald test	1292.53		0.000 *
Hansen (Sargan) test	$\chi^2(5) = 3.11$ (5.24)		0.684 (0.387)
Arellano-Bond test ( $H_0$ : no autocorrelation)	order 2 (0.17)		order 2 (0.866)

Notes: \* indicates the significance at the 1% significance level. The “Wald test” tests the joint significance of the coefficients ( $H_0$ : all coefficients are zero), the “Hansen (Sargan) test” reports the test statistic for overidentifying restrictions ( $H_0$ : overidentifying restrictions are valid), while the “Arellano–Bond test” tests for zero autocorrelation in first-differenced errors ( $H_0$ : no autocorrelation).

Table 9 highlights the dynamic aspect of economic growth that does not appear to be linked to the economic freedom index in this model specification. Clearly, growth was well-explained by its lag ( $\delta$  is statistically significant at the 1% significance level), but the estimated coefficient on  $LIEF$  ( $\gamma$ ) was statistically insignificant. Also, gross capital formation expressed as a percentage of GDP ( $\beta_2$ ) and annual population growth rate ( $\beta_3$ ) were statistically significant in the estimated model. By focusing on the interaction variable, we tested the linear restriction that  $\gamma + \omega = 0$ . The test ( $p$ -value = 0.3833) showed the lack of significance of both effects (EU membership status and economic freedom) to positively impact growth. The effect of the 2008–2009 subprime mortgage crisis was still statistically important, if one makes a reasonable assumption that this crisis was the most substantial and dominant when compared to all other possible shocks (structural breaks) over the sample time period.<sup>12</sup>

Considering the apparent failure of economic freedom to explain growth in Equation (2), we turn to the following alternative model specification:

$$GROWTH_{t,i} = \alpha + \delta GROWTH_{t-1,i} + \gamma \Delta LIEF_{t,i} + \omega \Delta LIEF_{t,i} \times d\_EU_i + \beta_1 LGDP95_{t,i} + \beta_2 GCF_{t,i} + \beta_3 POP_{t,i} + \beta_4 SEC_{t,i} + \beta_5 GOV_{t,i} + \phi d\_EU_i + d_t + u_{t,i}, \quad (3)$$

Essentially, Equation (3) is similar to Equation (2), except for the addition of the first (log) difference of economic freedom ( $\Delta LIEF$ ) that is used instead of levels. Table 10 displays the new estimates and relevant test statistics. The following instruments were used: lags two to eight were included for  $GROWTH$  and  $\Delta LIEF$ . For other variables, only their second and third lags were included. To limit

<sup>11</sup> The results and test statistics are stable when the number of instruments is altered, unless the number of instruments (lags) becomes extremely large (>50).

<sup>12</sup> Brexit vote (2016) was not part of the sample, while dummy variables for 1998 (Russian ruble crisis) and 2010 (Euro crisis) were not statistically significant.

instrument proliferation, we “collapsed” instruments again. The striking result was that the coefficient ( $\gamma$ ) on the change in economic freedom was positive and statistically significant at the 10% significance level ( $p$ -value = 0.054). As in Table 9, the lagged growth was statistically significant, signifying the importance of dynamics in the model. The estimate on the interaction term was statistically insignificant, but, when we tested the linear restriction that  $\gamma + \omega = 0$ , the  $p$ -value of the test (0.4404) showed that the EU membership status potentially negatively influences the effect of the economic freedom on growth. All other estimates resembled Table 9, in the sense that gross capital formation expressed as a percentage of GDP ( $\beta_2$ ) and annual population growth rate ( $\beta_3$ ) remained statistically significant. Clearly, gross capital formation represented the most significant driver of economic growth of all control variables. Consequently, in future research, it would be valuable to understand the exact channels through which investments affect growth, i.e., whether growth is demand-driven or production-driven. Furthermore, the population growth regressor requires more care and discussion. Specifically, it was negative and statistically significant. In an economic environment of growing unemployment among young, educated population of the EU area, higher population growth would likely be detrimental to growth. However, given that our sample combined low-income and high-income countries, this conjecture would necessitate further investigation; as low (high) population growth in high (low)-income countries is known to create impediments to growth. Hence, it is probable that our sample is dominated by lower-income countries. Finally, the subprime mortgage crisis of 2008–09 negatively impacted economic growth in this model specification.<sup>13</sup> In conclusion, the dynamic model specifications presented in this section demonstrated the validity (rejection) of the null hypothesis of Hypothesis 2 (1). In other words, the first difference of economic freedom (but not its level) had a positive impact on economic growth in European countries.

**Table 10.** Results from the System GMM model with change in log of economic freedom ( $\Delta LIEF$ ).

Variable	Coefficient	z-Value	p-Value
Constant ( $\alpha$ )	8.493	0.98	0.326
$\delta$ ( $GROWTH_{t-1,i}$ )	0.208	4.12	0.000 *
$\gamma$ ( $\Delta LIEF_{t,i}$ )	5.825	1.93	0.054 ***
$\omega$ ( $\Delta LIEF_{t,i} \times d\_EU_i$ )	−1.115	−0.17	0.861
$\beta_1$ ( $LGDP95_{t,i}$ )	−2.315	−1.56	0.118
$\beta_2$ ( $GCF_{t,i}$ )	0.273	2.73	0.006 *
$\beta_3$ ( $POP_{t,i}$ )	−1.257	−4.00	0.000 *
$\beta_4$ ( $SEC_{t,i}$ )	−0.026	−1.04	0.298
$\beta_5$ ( $GOV_{t,i}$ )	0.063	0.45	0.653
$d_t$ (2008)	−2.027	−1.65	0.098 ***
$d_t$ (2009)	−8.248	−7.57	0.000 *
$\phi$ ( $d\_EU_i$ )	−0.915	−1.20	0.231
Wald test	1235.46		0.000 *
Hansen (Sargan) test	$\chi^2(1) = 2.38$ (2.20)		0.123 (0.138)
Arellano-Bond test ( $H_0$ : no autocorrelation)	order 2 (0.40)		order 2 (0.693)

Notes: \* and \*\*\* indicates the significance at the 1% and 10% significance level, respectively. The “Wald test” tests the joint significance of the coefficients ( $H_0$ : all coefficients are zero), the “Hansen (Sargan) test” reports the test statistic for overidentifying restrictions ( $H_0$ : overidentifying restrictions are valid), while the “Arellano–Bond test” tests for zero autocorrelation in first-differenced errors ( $H_0$ : no autocorrelation).

## 6. Conclusions

At times troubled by global economic crises and geopolitical frictions, when it is difficult to stimulate economic growth, this paper investigates whether economic freedom is a factor that can

<sup>13</sup> Contrary to some other papers (i.e., Haydaroglu 2016), we did not find foreign direct investments statistically important for growth in our dynamic model specifications. The estimated coefficient on FDI was positive, but statistically insignificant.

assist in such efforts. In particular, for a large panel of 43 European countries that include the EU and non-EU members, over a 20-year period, we formally test the impact of economic freedom (and its change) expressed by the Heritage Foundation's Index of economic freedom on the growth of an economy. The evidence from the initial linear panel model shows that economic freedom has a positive impact on economic growth, while the change of economic freedom does not show any statistically significant impact on growth. On the contrary, when we employ a more appropriate dynamic model setting, we document that it is the change (and not the levels) of economic freedom that is relevant for economic growth. We also find that the subprime economic crisis of 2008–2009 exerted a negative impact on the growth of European economies. The EU membership status was either irrelevant in our model specifications or it curbed the effect of the economic freedom on growth, which is consistent with the recent findings of [Andersen et al. \(2019\)](#).

In future research, it would be interesting to measure the individual impact of the sub-indices of The Index of Economic Freedom on economic growth. This would shed more light on present findings and could be (more) useful to policymakers in creating policies toward a free market economy and democracy ([Balding 2011](#)). Likewise, further research could test our main hypotheses on clusters of world countries, grouped based on their level of economic development or other criteria. A particular focus may be placed on emerging countries as [De Haan and Sturm \(2000\)](#) conjectured that the change of economic freedom has a more pronounced impact on growth in such countries. Also, it would be worthwhile to consider other indicators of economic freedom, such as the ones produced by the Fraser Institute and the Freedom House organization, in a comparative study. Finally, the interactions of economic freedom, economic growth and some of the control variables (e.g., gross capital formation) could be examined in a different methodological framework such as with bivariate VAR (VECM) methods, when higher frequency data become available.

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