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Economic Freedom and Innovation

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Abstract: ***This article emphasizes the influence of country-level economic freedoms on innovation. Using data on 139 countries, this paper examines the role of economic freedoms that influence a country's innovation level. The empirical findings confirm that property rights, freedom from corruption, fiscal freedom, business freedom, trade freedom, investment freedom, and financial freedom all influence a country's innovation level. The main goal is to emphasize the importance of economic freedoms in devising alternative policy recommendations for innovation-enhancing activities.***

Keywords: Innovation, Economic Freedoms

1. Introduction

Ever increasing economic integration and interdependence among countries starting in 1970's with the globalization phenomenon require broader and multidimensional perspective while examining the dynamics of increasing the economic performance and national welfare of countries and force us to address these issues with a global outlook. Gross domestic product which measures economic output as a total value of new products and services produced within a country's borders is mostly agreed upon as providing a measure for standard of living (Jabaily et al. 2003).

Increasing the number of inputs that go into the productive process and finding new means to obtain more output from the same number of inputs are essentially the only two ways to increase the output of the economy (Rosenberg, 2006) and consecutively the general prosperity of a country.

As stated above, increasing economic integration and interdependencies, liberalization of capital flows on global scale together with the fact that national economies becoming a part of economic blocks such as EU, NAFTA etc. and regulatory effects of these developments have led to explicit improvements in the institutional and macroeconomic structures of countries. Consequently, López-claros and Mata (2010) argues that as a result of significant improvements in institutional and macroeconomic frameworks, other determinants of productivity such as innovation and technology have become a focus of interest by gaining a vital role in the whole development process. Therefore economic output is increasingly becoming a function of knowledge and new knowledge instead of capital and labor.

Furthermore, according to Braunerhjelm (2010) economic development cannot be accounted for solely by the accumulation of factors of production such as knowledge, human capital, physical capital etc. but it necessitates innovation and entrepreneurship to emerge and transform these factors profitably. Kokkinou (2010) states that having a vital importance for the success of firms and long-term economic performance, innovation positively effects trade performance and competitiveness and enhances comparative advantages of countries, and by means of promoting the necessary investments for the new products and processes, innovation raises the standard of living.

The fact that modern capitalism derives its dynamism and competitiveness mostly from technological innovation has been identified early on by the economists who have analyzed capitalist production and social relations. Today the foundations of the theory of innovation lie in the relationship between the economic dynamism, productivity growth and innovation (Pappouinou, 2010).

Hence policymakers and academicians today have to tackle with an important question of which factors are vital and to what extent these factors affect the economic and social climate necessary for innovative activities to flourish in a country and how to design policy recommendations accordingly.

2. Background Literature and Hypothesis Development

The dependent variable in this study is Global Innovation Index (GII) Scores of world economies and is denoted by INV. GII score (The Global Innovation Index 2014 The Human Factor in Innovation) is an indicator of economies' innovation capabilities and results. For the purpose of this study, GII score is assessed at the country level in relation to various economic freedom components also quantified at the country level.

2.1 Background Literature

The Global Innovation Index 2014: The Human Factor In innovation gives the definition of innovation as: "An innovation is the implementation of a new or significantly improved product (good or service), a new process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations". The available literature emphasizes the idea of significant connections between innovation and various aspects of economic freedom. Historical experience provides ample evidence that we cannot attribute innovation to a specific sector since any industry can produce new knowledge regardless of being public or private. Innovation results from the cumulative interactions of economic actors.
Natalia and Julia (2014) analyzed complex indicators that affect and characterize innovative development of economic systems and they divided economic characteristics of

institutional environment into three categories: "Economic Liberties (free trade, investment, fiscal, financial freedom, free labor, freedom from corruption; Developed system of provision of contract rights, property, investors interests protection; Absence of administrative barriers in firm's registration and liquidation, licenses and permissions obtaining, taxes payment, various kinds of business activities control".

Due to the fact that in order for entrepreneurs to undertake innovative activities, these activities must serve the profit maximization goal of the firms. Therefore it seems necessary to remove obstacles to enable entrepreneurs successfully commercialize innovative activities and providing trade freedom will help create an environment suitable for innovative activities to take place.

Dipietro (2012) found connectivity to be statistically relevant to innovation and demonstrated that increasing connectivity between individuals within countries causes greater innovation within these countries, and that freedoms and democracy are positively related to innovation.

By observing the last fifty years of international experience Bhagwati (2010) concludes that those countries where domestic decision making in production, investment and innovation was extensively regulated and those with more domestically oriented perspective lagged behind while various kinds of economic freedoms, more engagement in market mechanisms by governments, and more open policies in foreign investment and trade helped countries in their quest for prosperity.

On the other hand existence of corruption in a country disrupts innovative activities by augmenting the uncertainty in the decision making processes of entrepreneurs, undermines private sector development, exacerbates entrepreneurs' financial and psychological burden by rendering bureaucratic mechanisms and investment climate increasingly ambiguous. The more prevalent the corruption is the more damaging gets its consequences. As a result, depending on the extent to which corruption prevails in a country, its' undermining effects cause entrepreneurs to reconsider their presence and tend to shift their operations and innovative activities to those countries where economic and social environment is more favorable (López-claros and Mata, 2010).

2.2 Hypotheses Development

Available literature emphasizes the positive connections between innovation and economic freedoms. Based on our discussion in the previous sections this study postulates on the idea that the level of innovativeness in a country as represented by INV (Innovation Index Score) is influenced by the following components of economic freedom: Property Rights, Freedom from Corruption, Fiscal Freedom, Business Freedom, Trade Freedom, Investment Freedom and Financial Freedom.

For measuring the dependent variable, INV, this study uses Global Innovation Index scores available from: The Global Innovation Index 2014: The Human Factor In innovation, Fontainebleau, Ithaca, and Geneva. The Global Innovation Index is the result of a collaboration between Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO) as co-publishers, and their Knowledge Partners.

For the various economic freedom components as independent variables this study uses the following seven variables that are available from the 2015 Index of Economic Freedom Promoting Economic Opportunity and Prosperity (The Heritage Foundation and The Wall Street Journal, 2014).

- **PR (Property Rights):** The property rights component is a measurement of the degree to which private property rights are protected by a country's laws and the degree to which these laws are enforced. Each country is graded between 0 and 100, with the grade 100 representing the highest property rights.
- **FFC (Freedom from Corruption):** this component is a measurement of the level of corruption in a country. FFC score is a number between 0 and 100, with the score of 0 representing very corrupt government and 100 representing very little corruption.
- **FF (Fiscal Freedom):** is a measure of the tax burden in a country. FF score is a number between 0 and 100. The higher the score the higher the tax burden.
- **BF (Business Freedom):** is a measure representing the overall burden of regulation. The business freedom score for each country is a number between 0 and 100, with 100 equaling the freest business environment.
- **TF (Trade Freedom):** measures market openness as the absence of tariff and non-tariff barriers that affect imports and exports of a country. TF score is a number between 0 and 100 with the score 100 representing the highest trade freedom.
- **IF (Investment Freedom):** is a measure of the individual and firm level resource mobility and the absence of constraints on the investment capital flows internally and across the country's borders. (IF is a number between 0 and 100 with 100 is an ideal freest investment environment).
- **FINF (Financial Freedom):** measures the banking efficiency and financial sector's independence from
- government control and interference. Overall score is on a scale of 0 to 100 with the ideal score of 100).

Therefore this study proposes the following research hypotheses:
H1: There is a positive relationship between country-level property rights and innovation.
H2: There is a positive association between country-level freedom from corruption and innovation.
H3: There is a negative relationship between country-level fiscal freedom and innovation.
H4: There is a positive relationship between country-level business freedom and innovation.
H5: There is a positive relationship between country-level trade freedom and innovation.
H6: There is a positive relationship between country-level

investment freedom and innovation.
H7: There is a positive relationship between country-level financial freedom and innovation.

Table 1: Descriptive Statistics of Variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
INV	139	37.28849	11.13432	17.6	64.8
PR	139	46.8705	24.06418	5	95
FFC	139	43.18705	21.62747	16	95
FF	139	77.8705	12.34612	39.6	99.9
BF	139	68.27842	15.04116	33.4	99.9
TF	139	77.00216	10.34621	33.4	90
IF	139	57.01439	21.92477	0	95
FINF	139	53.38129	17.63371	10	90

Table 2: Correlation Matrix

	INV	*PR*	*FFC*	*FF*	*BF*	*TF*	*IF*	*FINF*
INV	*1.0000*							
PR	*0.8599*	*1.0000*						
FFC	*0.8638*	*0.9375*	*1.0000*					
FF	*-0.4035*	*-0.3849*	*-0.4091*	*1.0000*				
BF	*0.7230*	*0.6925*	*0.7011*	*-0.2119*	*1.0000*			
TF	*0.6024*	*0.5161*	*0.4927*	*-0.0567*	*0.5226*	*1.0000*		
IF	*0.6116*	*0.6974*	*0.6112*	*-0.2639*	*0.5433*	*0.6468*	*1.0000*	
FINF	*0.6916*	*0.7253*	*0.6497*	*-0.1723*	*0.5852*	*0.6495*	*0.8088*	*1.0000*

3. Data and Methodology

Data for measuring the various aspects of economic freedom are drawn from the 2015 Index of Economic Freedom Report (2015) of the Heritage Foundation. Components of economic freedom are calculated from a number of sub-variables and scaled from 0 to 100.

The second dataset used for measuring the innovation levels of countries is drawn from the Global Innovation Index (2014): The Human Factor of Innovation. The Global Innovation Index relies on seven pillars. Each pillar is divided into three sub-pillars, and each sub-pillar is composed of three to five individual indicators. The score is between 0 and 100.

Table-1 shows the descriptive statistics of all the variables. Table-2 displays the correlation matrix. Due to the high correlation between most of the independent variables, the multivariable regression results are likely to lead to questionable interpretation. In this study, the statistical validity of the hypotheses developed in the previous section is examined by applying multivariable regression with robust standard errors and quantile regression method.

Quantile regression results give more extensive and detailed analysis of the effect of the independent variables on the dependent variable. By applying quantile regression this study analyzes the influence of independent variables on innovation at different levels of innovation.

4. Empirical Results

In this study, the statistical validity of the seven hypotheses analyzed empirically by conducting country-level multivariable regressions with robust standard errors and quantile regression method. Innovation Index Scores (INV) of 139 countries are regressed on the scores of the seven components of Economic Freedom Index. The robust standard errors are used in order to deal with the likely problem resulting from the high correlation between the independent variables. Durbin-Watson test for the first-order serial correlation is 2.094553. OLS and quantile regression results are provided in Table-3. Table-4 provides quantile regression graphs.

The multivariable regression results with the robust standard errors show that all the variables are statistically significant. The variables FFC, FF, BF, TF, IF are significant at less than 1% level. PR and FINF are significant at less than 5% level.

Table 3: Multivariable and Quantile Regression Results

	(OLS)	(Quantile 25^{th})	(Quantile 50^{th})	(Quantile 75^{th})
Variables	INV	INV	INV	INV
PR	0.141**	0.235***	0.110	0.172**
	(0.0596)	(0.0648)	(0.0713)	(0.0831)
FFC	0.164***	0.0507	0.190**	0.167*
	(0.0624)	(0.0667)	(0.0734)	(0.0856)
FF	-0.119***	-0.117***	-0.111**	-0.128**
	(0.0382)	(0.0435)	(0.0478)	(0.0558)
BF	0.115***	0.0820*	0.123**	0.0843
	(0.0403)	(0.0463)	(0.0509)	(0.0593)
TF	0.231***	0.276***	0.221***	0.290***
	(0.0769)	(0.0649)	(0.0713)	(0.0832)
IF	-0.0912***	-0.0938**	-0.0589	-0.0648
	(0.0335)	(0.0405)	(0.0445)	(0.0519)
FINF	0.0988**	0.132**	0.0719	-0.00116
	(0.0476)	(0.0517)	(0.0568)	(0.0663)
Constant	7.156	1.179	6.429	10.66*
	(4.700)	(4.981)	(5.476)	(6.388)
Observatios	139	139	139	139
R-squared	0.830			

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Dependent Variable: INV (Innovativeness Score)

Independent Variables: PR (Property Rights), FFC (Freedom from Corruption), FF (Fiscal Freedom), BF (Business Freedom), TF (Trade Freedom), IF (Investment Freedom), FINF (Financial Freedom)

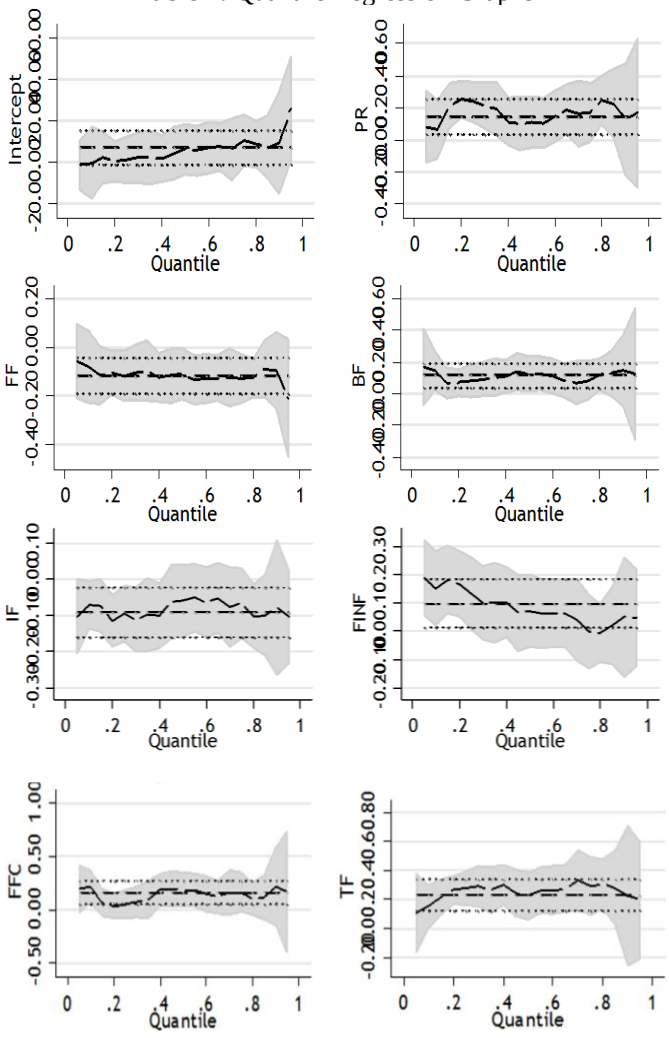
PR (Property Rights) is significant at less than 5% level and supports the hypothesis 1 which states that there is a positive relationship between country-level property rights and innovation level. PR is significant at less than 1% level for those with low innovation score (at the 25^{th} quantile).

FFC (Freedom from Corruption) is significant at less than 1% level and supports the hypothesis 2 which states that there is a positive association between freedom from corruption and innovation in a country.

FF (Fiscal Freedom) is significant at less than 1 % level and

supports the hypothesis 3 which states that fiscal freedom score in a country negatively affect innovation since high score represents high tax burden. Hypotheses 6 states that there is a positive relationship between country-level investment freedom and innovation. Empirical results do not support hypotheses 6 and show that there is a negative relationship between country-level investment freedom and innovation. BF (Business Freedom) is significant at less than 1% level and supports hypothesis 4: Country-level business freedom is positively associated with innovation level.

Table 4: Quantile Regression Graphs



5. Conclusion

This study attempts to examine the influence of various economic freedom components on innovation at the global level and at different levels of innovation by applying quantile regression method. The Global Innovation Index score of countries is considered as a fundamental factor for economic growth and prosperity. The empirical analysis in this study is based on two data sources: The Global Index Innovation Scores of 139 countries are derived from the 2014 Global Innovation Index Report published by Cornell University, INSEAD, and WIPO (2014), and the various components of economic freedom are derived from the 2015 Index of Economic Freedom report published by the Heritage Foundation. The empirical results confirm that property rights, freedom from corruption, fiscal freedom, business freedom, trade freedom, investment freedom, and financial freedom all influence a country's innovation level. The findings of this study emphasize the importance of economic freedoms in devising innovation policies.

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