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Economic Freedom and Growth: A Panel Cointegration Approach

Summary: This study uses three-country group panel data from 1993 to 2011 in examining the long-run effect of tax burdens (fiscal freedom index) and government regulations of business (business freedom index) on economic growth. The outcome of the panel cointegration approach suggests that the variables have a long-run relationship with economic growth. The study finds all the signs of the variables used to be consistent with theoretical expectations. Regarding the variables of interest, it is also found that the fiscal freedom has a positive and significant effect on economic growth for all three-country groups. In addition, the business freedom has a positive and significant effect for only two-country groups. The study finds that tax burdens and government regulations play an important role on economic growth for most countries in the sample. To harness economic growth prospects, the study offers recommendations for policy makers to consider.

Key words: Business freedom, Fiscal freedom, Tax burden, Economic growth, Panel cointegration.

JEL: E02, E44, F41, H10, P12.

A sustained increase in Gross Domestic Product (GDP) *per capita* is an indication of a rise in standard of living. As a result, economic growth has taken a center stage in development discourse. These discussions are normally associated with either free market or state intervention debates. These debates have existed for several decades in the development economics literature, albeit with no conclusive outcome. "Markets versus the State has long been one of the central themes of the development economics discourse. Broadly speaking, development strategies lie on a continuum, with more regulation of economic activity, less integration into the world economy, greater role for public provision of social services, more redistribution etc., at one end, and the opposite at the other end. A policy package, or development strategy, will reveal its orientation by where it lands on this stretch between statist and market-oriented approaches. Those who come down on the more statist end stress 'market failure', while those who come down on the market end stress 'government failure' " (Shantayanan Devarajan and Ravi Kanbur 2013, p. 1).

The Keynesian school of thought posits that the role of government in an economy is critical to achieving growth. In the light of government's role, certain indexes have been developed by experts to determine the extent of economic freedom in pursuing the economic growth agenda. Indeed, the Economic Freedom Index

is used to determine the extent to which members of a society are involved in economic direction and actions. In broader sense, a higher Economic Freedom Index suggests more economic direction and action by members of the society. For example, fiscal freedom and/or business freedom decisions can influence economic direction and action that can ultimately affect economic growth, all else held constant.

According to Claudia R. Williamson and Rachel L. Mathers (2011) several empirical studies have found a positive relation between economic freedom and growth. Such evidences can be found in Marta Bengoa and Blanca Sanchez-Robles (2003); Martin Paldam, Allan Würtz, and Tue Gorgens (2003); Jakop de Haan, Susanna Lundström, and Jan-Egbert Sturm (2006). Some of these studies have used either one or two indicators of economic freedom in their analysis. Following existing studies, we use two indicators to evaluate economic freedom's long-run impact on Gross Domestic Product *per capita* (a proxy for economic growth). A robustness check is also recommended by Fredrik Carlsson and Lundström (2001) for studies of this nature due to the sensitivity and fragility of model specification issues.

The contribution of this paper is primarily to apply Dynamic Ordinary Least Squares (DOLS) and Fully Modifies Ordinary Least Squares (FMOLS) to this dataset and evaluate the effect of two economic freedom indicators (fiscal and business) on economic growth. The core of our claim is, *ceteris paribus*, more economic freedom is associated with higher levels of economic growth. Thus, we investigate how fiscal freedom (tax burdens) and business freedom (government regulations of business) affect economic growth. The paper is organized as follows: Section 1 outlines the theoretical framework, Section 2 submits our data definitions, Section 3 presents the methodology, Section 4 discusses empirical results, and Section 5 presents the conclusion and policy suggestions.

1. The Theoretical Framework

1.1 Economic Growth Approaches

In development economics literature, several growth models are discussed and used for empirical estimations. This section discusses the literature on growth theory developments up until recent literature. The issue of economic growth has attracted increasing attention and has rigorously been discussed in literature during the past six decades. There are numerous theories that discuss the role of various factors in determining economic growth. Oded Galor (2005) has presented the unified growth theory, which seeks to reveal the underlying micro foundations that are consistent with the growth process over the entire history of the human species. It still stands however, that there is no single standardized unique theory on economic growth yet. Generally, two main aspects of economic growth theories can be distinguished. First, the neoclassical theory developed in the 50s by Robert M. Solow (1956) and Trevor W. Swan (1956). Secondly, the endogenous growth developed by Paul M. Romer (1993) and Robert E. Lucas (1988) in the 80s. Each growth theory places emphasis on a set of different factors as the main determinants of economic growth.

In broader sense, the neoclassical growth model popularly known as the Solow-Swan model developed in two separate articles made four assumptions: con-

stant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labor. It is generally acknowledged in literature that the neoclassical economists rejected the implicit assumption that allocative inefficiency due to market imperfections would always be larger than the inefficiency from government failures. Some economists have also argued against the neoclassical approach stressing that government intervention plays a vital role in the process of economic growth.

On the other hand, the new growth theories have passed beyond the limitations of the neoclassical approach. Galor and David N. Weil (2000), and additionally Galor (2005) have highlighted the views of Paul Romer and Robert Lucas as posited in their seminal studies on endogenous growth. They argue that Romer's model was based on technological progress driven endogenously by either the role of research and development investments or knowledge spillover that includes research and development externalities and learning by doing. Lucas' model was based on human capital accumulation. Here, human capital and innovation capacity plays a vital role in fostering economic growth (Panagiotis Artelaris, Paschalis Arvanitidis, and George Petrakos 2006; Klaus Prettner 2012).

Paul Romer and Robert Lucas' work activated research on the way technological spillovers affect economic growth. Three main factors that can be identified as the main sources of economic growth include new knowledge, public infrastructure and innovation (Petrakos, Arvanitidis, and Sotiris Pavleas 2007).

1.2 Government and Economic Growth

This section discusses the literature on the role of the government in the growth process. The discussion on the role of the government in the process of economic growth has originated in the 1950s. During this period, several theoretical models that were contributed to the literature pointed out that market imperfections justified government intervention. The main emphasis was on the existence and benefits of economies of scale and the external effects of production. There is a wealth of theoretical, as well as, empirical literature on the relationship between economic growth and government influences (Arusha Cooray 2009). This literature includes: Yousif Khalifa von Al-Yousif (2000); Stefan Folster and Magnus Henrekson (2001); Atul A. Dar and Sal AmirKhalkhali (2002); Jonas Agell, Henry Ohlsson, and Peter Skogman Thoursie (2006); Yasemin Özerkek and Sadullah Çelik (2010). These studies stressed the positive relationship between government size and economic growth in developed countries. Another study, Burak Günalp and Timur Han Gür (2002) re-estimated the growth model and found that government size influences economic growth positively in most of the Asian countries and affects economic growth negatively in most of the Latin American and African countries. Similarly, Yesim Kuştepeli (2005) stated that while the medium size of government affects economic growth positively, the relatively small size of government affects economic growth negatively in the European Union countries. According to Niloy Bose, M. Emranul Haque, and Denise R. Osborn (2007); Constantinos Alexiou (2009); Ahmad Jafari Samimi and Farzane Habibian (2010), government expenditure on

capital formation and productive activities has positive and significant effects on economic growth in transitional economies and developing countries.

On the other hand, John F. Cogan et al. (2010) stated that government outlays necessarily compete with private agents and interfere with natural market processes and prices by over-stimulating demand, potentially diverting resources through a "crowding-out" effect. Cogan and Taylor (2011); Hyunseung Oh and Ricardo Reis (2011) found that expanding government expenditures barely promote economic growth, and instead may cause damage to an economy, because of the crowding-out effect or the increase in taxes. Similar results were found by Sheng-Tung Chen and Chien-Chiang Lee (2005) when they adopted the non-linear approach (Armey Curve). Similarly, Diego Romero-Ávila and Rolf Strauch (2008); António Afonso and Davide Furceri (2010); Andreas Bergh and Martin Karlsson (2010) discussed how government consumption and direct or indirect taxation has distortionary taxation effects on private capital, and hence economic growth, although public investment has a positive effect in developed countries. Atrayee Ghosh Roy (2012) expressed that government consumption reduces economic growth while government investments enhance growth. Small government size supports private investment and increases growth through public goods. However, excessively expanding government size puts pressure on taxe revenues and leads to crowding-out effect with negative consequences on economic growth.

Government fiscal policy is another macroeconomic factor that has been known in endogenous growth literature (Guglielmo D'Amico, Giuseppe di Biase, and Raimondo Manca 2013). This literature widely acknowledges that tax burden may be an imprecise measure of tax policy. Heavy tax burdens are capable of retarding growth by decreasing the private capital accumulation (Artelaris, Arvanitidis, and Petrakos 2006). Historically, the importance attached to fiscal policy by the theory has led to several numbers of empirical studies examining the relationship between tax burden and economic growth. Alan J. Auerbach and James R. Hines Jr. (2001) defines the excess burden of taxation as the amount that is lost in excess of what the government collects. Many researchers, including Åsa Johansson et al. (2008); Organization for Economic Co-operation and Development (OECD 2009); Kanghua Zeng, Shan Li, and Qian Li (2013) investigate the relationship between taxation and economic growth. Because of this wide recognition, researchers (Steven Yamarik 2000; Marc Tomljanovich 2004) often omit discussions of this potential imprecision. Frida Widmalm (2001); Godson Ahiabor and Anthony Amoah (2013) have also found a significant negative effect of raising taxes on corporate income. Furthermore, small government size with less tax burden, which allows for greater discipline of market forces, fosters resource efficiency and mitigate the crowding-out effect (Dar and AmirKhalkhali 2002). Young Lee and Roger H. Gordon (2005) found that different tax rates have different effects in OECD countries. Conversely, Timothy Besley and Torsten Persson (2009) claimed that there is a positive relationship between tax revenue and growth because the collected taxes support economic activities in less developed countries. From the literature, we argue that the studies on government size and growth have shown inconclusive results and needs further investigation.

1.3 Government, Economic Freedom and Growth

This section discusses the literature that relates economic freedom as an indicator to determine the extent of government's influence on businesses and its impact on economic growth. Recently, indicators of institutional systems have been used as fundamental determinants of economic growth. For example, the effect of corruption, public bureaucracy, legal system, civil and political rights, democracy and economic freedom on economic growth has been analyzed in numerous researches. The Economic Freedom Index has been commonly used as an explanatory variable in the endogenous growth model. The basic definition of economic freedom is freedom of business entry, i.e. freedom to start a business, as well as freedom of business exit, i.e. freedom to close your business (Veselin Vukotić 2008). There have been three different definitions and measurements of economic freedom using different variables. There are three different indices of economic freedom reported by three institutions, namely: The Heritage Foundation (THF), Fraser Institute and Freedom House. Several authors that include but are not limited to De Haan and Sturm (2000); Jac C. Heckelman (2000); Heckelman and Michael D. Stroup (2000); Abdiweli M. Ali and Mark W. Crain (2001); Sturm and De Haan (2001); Hans Pitlik (2002); Niclas Berggren (2003); John W. Dawson (2003); James D. Gwartney, Randall G. Holcombe, and Robert A. Lawson (2004); Chris Doucouliagos and Mehmet Ali Ulubasoglu (2006, 2008); Williamson and Mathers (2011); Ari Aisen and Francisco J. Veiga (2013) have found a positive relationship between the Economic Freedom Index and economic growth. Richard J. Cebula (2011) investigated respectively the effect of ten forms of THF Index of Economic Freedom on economic growth. Hatem Derbel, Rami Abdelkafi, and Ali Chkir (2011) showed the positive effect of economic freedom on economic growth, but this does not imply the need for a total disengagement of the government in the economy.

In literature, a positive relation between economic freedom and economic growth has been found by many studies and a number of empirical studies suggest that economic freedom may be essential in clarifying cross-country differences in economic performance (e.g. Heckelman 2000; Lundström 2003; Rode Martin, Bodo Knoll and Pitlik 2013). Although many of them used different economic freedom indices, sometimes one or two of the indices, they found similar results that show a positive relation between economic freedom and growth.

In this study, we test the hypothesis that, *ceteris paribus* more economic freedom is associated with higher levels of economic growth. Using two indicators from the Index of Economic Freedom, this study analyses the effects of tax burden and government regulation of business on economic growth. Our analysis includes countries ranked in the Index of Economic Freedom rather than from a list of developed and developing countries.

2. Data Definition

Data on selected indicators that measure economic freedom as an explanatory variable and other traditional growth variables are used in this study. These indicators are selected on the basis of economic theories and empirical literature. Also, World

Bank (2013)[1] and Economic Freedom Index (Freedom House 2013[2]; The Heritage Foundation 2013) datasets are used.

In 1995, THF and the Wall Street Journal created an Index of Economic Freedom based on Adam Smith's economic theory. This study of Economic Freedom Index presented a method by which economic freedom could be rated and ranked. Adam Smith's publication on "The Wealth of Nations" in 1776 emphasizes that protecting the liberty of individuals to pursue their own economic interest results in greater prosperity for the larger society (THF 2008, p. 1). The Index covers 10 freedom components – from property rights to entrepreneurship in 185 countries. These components are grouped into four broad categories of economic freedom: Rule of Law (property rights, freedom from corruption); Limited Government (fiscal freedom, government spending); Regulatory Efficiency (business freedom, labor freedom, monetary freedom); and Open Markets (trade freedom, investment freedom, and financial freedom) (THF 2013).

Our analysis uses two of these components as variables: fiscal freedom and business freedom. The first variable concerns tax burden and tax rates and the second concerns the efficiency of government regulation of business. The first variable, *fiscal freedom* is a measure of freedom from the burden of government from the revenue side. It includes freedom from both the tax burden in the sense of the top income tax rate and the total amount of tax revenue as a percentage of a nation's GDP. The second variable, *business freedom*, indicates the efficiency of government regulations of business, without any government interference that constrains the individual's right and ability to freely conduct entrepreneurial activities, such as starting and operating a business firm (THF 2013).

Index of Economic Freedom is a weighted summation of the values given to each individual element and is graded by using a scale from 0 to 100, where 100 represents the maximum freedom (THF 2013).

This study uses the Economic Freedom Index by country rankings. Based on this, three different models have been created for three country groups. Group 1 (mostly free countries) ranges from 79.9 to 70; group 2 (moderately free countries) ranges from 69.9 to 60; group 3 (mostly un-free countries) ranges from 59.9 to 50 in the value of index. Country rankings, index value of fiscal freedom and business freedom, average values for 2013 is presented in Appendix 4.

[1] **World Bank.** 2013. World Development Indicators Database. http://data.worldbank.org/data-catalog/world-development-indicators (accessed March 15, 2014).

[2] **Freedom House.** 2013. Freedom in the World 2013. https://freedomhouse.org/report/freedom-world/freedom-world-2013?gclid=CIe2o7bbh9ACFWsW0wodYI0AyA (accessed on March 15, 2014).

Table 1 Data Definitions and Sources

Variables	Definitions and sources
GDPPC	Gross domestic product per capita (constant 2000 US$). Source: World Bank (2013).
Labor	Labor force, total (% of the population). Source: World Bank (2013).
GCF	Gross capital formation (% of GDP). Source: World Bank (2013).
Fiscal	Fiscal freedom is a measure of the tax burden imposed by government. Source: THF (2013).
Business	Business freedom is a quantitative measure of the ability to start, operate, and close a business. Source: THF (2013).

Notes: Refer to Appendix 1 for detailed table on the variables used in this study.

Source: Authors' compilation.

3. Brief Methodology

The Cobb-Douglas production function is used to represent an input-output relationship. The following standard function has been used for this study:

$$Y = L^{\alpha} K^{\beta}, \tag{1}$$

where: Y = output, L = labor input, K = capital input; α and β are the output elasticity of labor and capital.

For this study, the production function in Equation (1) is modified to yield:

$$lnRGDPPC_{i,t} = \alpha_1 + \alpha_2 Labor_{i,t} + \alpha_3 GCF_{i,t} + \alpha_4 Fiscal_{i,t} + \alpha_5 Business_{i,t} + \varepsilon_{i,t}. \tag{2}$$

From Equation (2), given country (i) and time (t): $lnRGDPPC_{i,t}$ = natural log of real GDP *per capita*; *Labor* = labor force, total percentage of the population; *GCF* = gross capital formation as a percentage of GDP; *Fiscal* = fiscal freedom; *Business* = business freedom; ε = error term.

The panel data technique is used to estimate the equations considering their advantages over cross-section and time series in using all the information that is not detectable in pure cross-sections or in pure time series (Badi H. Baltagi and Chihwa Kao 2000).

In this study, the panel data (cross-section time series) has been created for 24 mostly free, 38 moderately free and 43 mostly un-free countries between 1993 and 2011.

4. Empirical Results and Discussion

The empirical results of this study are presented in three sub-sections. In Sub-section 4.1, since panel macroeconomic time series data are prone to non-stationarity which makes results spurious, we test and establish the presence or otherwise of unit root in the model. This is meant to evaluate the order of integration. The second sub-section (4.2) uses several panel cointegration tests that include Peter Pedroni (Engle-Granger based) test, Kao (Engle-Granger based) and Fisher (combined Johansen) to establish

cointegration. The last sub-section (4.3) uses the DOLS and FMOLS to determine long-run relationship amongst the variables. These sections are individually discussed as follows:

4.1 Panel Unit Root Test

The various empirical works in the literature on panel root test suggest several standard methods that are based on different assumptions with theoretical intuitions. Authors not limited to Jörg Breitung (2000); Kaddour Hadri (2000); In Choi (2001); Andrew Levin, Chien-Fu Lin, and Chia-Shang James Chu (2002) (LLC); Kyung So Im, M. Hashem Pesaran, and Yongcheol Shin (2003) (IPS); Josep Lluis Carrion-i-Silvestre, Tomas del Barrio, and Enrigue Lopez-Bazo (2005) have considered autoregressive specifications. In broader sense, homogeneous autoregressive unit root under alternative hypothesis is assumed by the likes of Breitung (2002), Levin, Lin, and Chu (2002) whereas heterogeneous autoregressive unit root under alternative hypothesis is also assumed by Im, Pesaran, and Shin (2003). In addition, G. S. Maddala and Shaowen Wu (1999), Choi (2001) use a non-parametric Fisher statistic that generally seeks to compare unit root tests. Tests such as LLC and Breitung assume a common unit root process whereas IPS, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) assume an individual unit root process. Furthermore, the common unit root process presumes that the autocorrelation coefficients of the tested variables across cross-sections are identical while for the individual unit root process the autocorrelation coefficients vary across cross-sections.

In avoiding possible biases in dynamic models that could occur as a result of different levels of economic status or development in each country panelled, Nicholas Apergis and James E. Payne (2009) reiterates the perspective of Im, Pesaran, and Shin (2003). They suggest averaging the ADF unit root tests while considering different orders of serial correlation. This study adopts four panel unit root tests under the assumption of common and individual unit root processes respectively. This choice is relevant firstly because of robustness of results and secondly, panel unit root tests are argued in the literature to have a higher predictive power relative to individual time series unit root tests. These tests are conducted on both levels and first differences for all variables in the model. All time series involved contain unit roots according to the LLC test. LLC test in first difference show that for most of these series, their first differences are stationary except for GCF variable. However, panel unit roots tests for IPS, ADF and PP support the hypothesis of a unit root in all variables across countries, as well as the hypothesis of zero order integration in first differences. Thus, following the traditional null hypothesis of stationarity, the results consistently accept stationarity at first difference and rejects stationarity at levels. This indicates that all series are I(1) (see results presented in Appendix 2, 3, and 4).

4.2 Panel Cointegration

Testing for cointegration is a prerequisite for determining the existence of a long-run relationship between the dependent variable and the independent variables. Due to the various degrees of strength in the test techniques, this sub-section uses panel cointegration technique following Peter Pedroni's (2004), Kao's (1999); Soren

Johansen's ([Fisher] 1988) panel cointegration tests respectively. Pedroni and Kao's panel cointegration tests follow the Engle-Granger (Robert F. Engle and Clive W. J. Granger 1987) residuals of the long-run static regression, with Fisher following the multivariate framework or combined test of Johansen. The study employs panel data spanning from 1993 to 2011 for three country groupings namely mostly free countries, moderately free countries and mostly un-free countries. In all 24 mostly free countries, 38 moderately free countries and 43 mostly un-free countries are used in the study. The panel cointegration test in each case as earlier mentioned is as follows:

For mostly un-free countries, results from the Pedroni test (Appendix 5) reject no cointegration for Panel v-stat and Group PP-stat. However, it failed to reject the null hypothesis for Panel rho-stat, Panel PP-stat, Panel ADF-stat, Group rho-stat and Group ADF-stat. On the contrary, results from the Fisher's test which is computed based on *p*-values from Johansen's maximum likelihood cointegration approach rejected the null hypothesis. Kao's residual test confirms the results by Fisher. Therefore, both Fisher and Kao's tests as displayed in Appendix 6 and 7 reject the null hypothesis and accept the alternative of cointegration.

In the case of mostly moderately free countries, results from the Pedroni test reject no cointegration for Panel v-stat, Panel PP-stat and Group PP-stat. However, it failed to reject the null hypothesis for Panel rho-stat, Panel ADF-stat, Group rho-stat and Group ADF-stat. Here, possible doubts due to the inconclusiveness of the results are cleared by results from the Fisher and Kao's tests. These tests as displayed in Appendix 6 and 7 reject the null hypothesis and accept the alternative of cointegration.

With mostly free countries, results from the Pedroni test reject no cointegration for Panel v-stat and Panel PP-stat. However, it failed to reject the null hypothesis for Panel rho-stat, Group PP-stat, Panel ADF-stat, Group rho-stat and Group ADF-stat. As in the case of the mostly un-free countries, the uncertainty of the conclusion is relaxed by the introduction of the Fisher's and Kao's residual tests which reject the null hypothesis and accept the alternative of cointegration (see Appendix 6 and 7).

In sum, the panel cointegration test results provided in the study rejects the null hypothesis of no cointegration and accepts that variables share a long-run cointegrating relationship.

4.3 Long-Run Results

Following the tests conducted on the model, it is evident that the variables are stationary and cointegrated (see Appendix 2-7). Given this, a Panel DOLS and Panel FMOLS are estimated. Results from any of these two long-run estimations are argued by Anindya Banerjee (1999) to be asymptotically equivalent for more than sixty observations. Given that this study passes the number of observation criterion, we expect the results to be asymptotically equivalent to authenticate the robustness of the results. These estimation procedures also provide the long-run equilibrium relationship between the dependent variable (*lnRGDPPC*) and the independent variables (*Fiscal*, *Business*, *Labor* and *GCF*). These results that are in elasticity estimates are discussed as per the various categorizations of the countries under study.

Summary of DOLS and FMOLS long-run estimates are reported in (Appendix 8 and 9).

4.3.1 Mostly Un-Free Countries

The long run equilibrium results are enshrined in the *ceteris paribus* assumption. The results as estimated with the DOLS for mostly un-free countries suggest that output elasticity of gross capital formation is positive with a small magnitude. Thus a 1% change gross capital formation is expected to increase economic growth by 0.000572%, albeit insignificant. This result is also confirmed by the FMOLS (if rounded off to 0.001%). The impotency of this variable in the model for mostly un-free countries could be attributed to low level of capital accumulation growth. The labor ratio variable in the model is highly significant and positive with quite a small magnitude, showing that 1% change in labor force is expected to increase economic growth by 0.002008%. The robustness of this result is authenticated by the FMOLS result (if rounded off to 0.002%). Again, elasticity coefficient of 0.002556% that is highly significant at 1% indicates that Fiscal Index has a significantly positive impact on economic growth. Therefore the economies of the mostly un-free countries are expected to grow by approximately 0.003% if the Fiscal Index changes by 1%. The robustness of the results is verified by the results as provided by FMOLS. Lastly, Business Index was also positive and statistically significant in explaining long-run changes in economic growth. Thus, a 1% change in Business Index is expected to change economic growth by 0.002046%. This result has again been verified by the FMOLS results. All the variables met the *a priori* expectations in terms of signs and significance levels save GCF that met only the sign. This is confirmed by the FMOLS results that also suggest that all the variables are significant except GCF. This suggests that un-free countries' spending on capital formation does not significantly affect their economic growth rates.

4.3.2 Moderately Free Countries

The estimates are based on the assumption of *ceteris paribus*, and are provided also by DOLS for the moderately free countries. These results deviated marginally from the results of the mostly un-free countries. Here, the output elasticity of gross capital formation is positive and statistically significant, although with a small magnitude. This reveals that a 1% change GCF is expected to increase economic growth by 0.005093% (0.01% rounded off). This result is statistically consistent with the results as displayed by FMOLS. As in the case of the mostly un-free countries, a change in labor force is expected to impact on economic growth by 0.016600% (0.02% app.). This is also observed to be positive and statistically significant. This result is buttressed by the FMOLS results (0.02% app.).

It turns out again that Fiscal Index is positive and statistically significant. It explains that a 1% change in Fiscal Index yields an expected change in economic growth by 0.005192% (0.01% app.). The result provided by the FMOLS of 0.01% (app.) confirms the robustness of the results. Unlike the case of the mostly free countries where Business Index is highly significant, it is observed to be insignificant although it had

the right sign as expected *a priori*. The insignificant nature of the variable could be explained by inefficiency in enforcement of government regulations that does not challenge the private sector to start and operate business. It can be inferred that except Business Index, all the variables are positive and highly significant in explaining economic growth *per capita* among the moderately free countries.

4.3.3 Mostly Free Countries

The results as shown by the DOLS for mostly free countries reveal an anticipated long-run positive and statistically significant relationship between all the explanatory variables and economic growth, *ceteris paribus*. Regarding the FMOLS results, all the results followed the results of the DOLS except the elasticity coefficient of GCF, which is positive with a small magnitude and marginally insignificant.

Generally, the results as presented by the DOLS and discussed earlier under each country category reveal the relevance of GCF in increasing economic growth for moderately free and mostly free countries respectively. This result is consistent with theoretical expectations. However, it is not a statistically significant variable in the case of mostly un-free countries. The reason for this is explained by the fact that mostly un-free countries' GCF values are very low (Gwartney and Lawson 2007, p. 20) as a result of their relatively low levels of capital accumulation growth. This can cause insignificant effect on economic growth in the model. Labor force and Fiscal indices are regarded as highly important variables in enhancing economic growth for all country categories as economics literature describes. Regarding the magnitude of coefficients, Business Index has a higher impact on economic growth than Fiscal Index in mostly free countries, unlike the other two country groups. This result is consistent with the index values of business and fiscal freedom variables for mostly free countries. Conversely, the Fiscal Index has a higher impact on economic growth than Business Index in mostly un-free and moderately free countries. This result is also consistent with the index values of Business and Fiscal indices. This is additionally attributed to the fact that the index value of fiscal freedom variable is also higher than the index value of business freedom variable for these two country groups. However, Business Index's effect is not significant on economic growth in moderately free countries. This could be attributed to ineffective enforcement of government regulations. The weaknesses in enforcement of government regulations by appropriate institutions in moderately free countries do not encourage the start up and operation of business. In all, the results discussed to a very large extent are seen to be robust as confirmed by the FMOLS results.

5. Conclusion

Economic growth determinants are likely to remain a contentious area of debate. Substantial literary evidence and the widespread perception that economic freedom indices play an important role in countries' economic growth decisions in recent development, is critical in promoting growth and development. In this paper, the long-run effects of Fiscal and Business freedom indices on economic growth in mostly free, moderately free, and mostly un-free countries were investigated. The main re-

sults of this study suggest that with fairly smaller elasticity coefficients, Fiscal Index and Labor are crucial in explaining the long-run changes in economic growth *per capita* for all the country groups/categories (mostly free, moderately free and un-free). In addition, Business Index is also crucial in explaining long-run changes in economic growth *per capita* for only two country groups (mostly free and un-free). Lastly, gross capital formation is very important in explaining the long-run changes in economic growth *per capita* for only moderately free countries.

It is important to indicate that studies such as Henrik Hansen and Finn Tarp (2001) have argued the premature introduction of certain policy indices in aid allocation. On the contrary, this study encourages the introduction of certain policy indices such as the economic freedom indices that include but it is not limited to Fiscal and Business indices respectively in long-run economic growth models. Our conclusion is in line with the study by Justice Tei Mensah et al. (2016) where they concluded that governance and fiscal reforms are the key drivers of economic growth.

The empirical results of this paper provide policy makers with a more informed understanding of the role economic freedom indices and economic growth nexus play in policy decisions. In mostly free countries, policy makers are encouraged to focus on increasing business freedom for higher economic growth rates. In moderately free and mostly un-free countries, policy makers are also encouraged to focus on increasing fiscal freedom for higher economic growth rates. Thus, a lesser tax burden on business activities is suggested to promote economic growth in these two country groups. In sum, the study suggests the inclusion of economic freedom indices in economic growth models.

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Appendix 1 Data Definitions and Sources

Variables	Definitions and sources
GDP PC *lnGDPPC*	GDP per capita (constant 2000 US$); GDP per capita is GDP divided by midyear population. This variable is transformed by authors into a logarithmic form. Source: World Bank (2013).
Labor *Labor*	Labor force, total (% of the population). Source: World Bank (2013).
GCF *GCF*	Gross capital formation (% of GDP); Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Source: World Bank (2013).
Fiscal freedom *Fiscal*	Fiscal freedom is a measure of the tax burden imposed by government. It includes both the direct tax burden in terms of the top tax rates on individual and corporate incomes and the overall amount of tax revenue as a percentage of GDP. Source: THF (2013).
Business freedom *Business*	Business freedom is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process. Source: THF (2013).

Source: Authors' estimation.

Appendix 2 Unit Root Test Results

Mostly free countries Variables/Tests		***lnGDPPC***	***GCF***	***Labor***	***Business***	***Fiscal***
Null: Unit root (assumes common unit root process)						
$LLC_{t\text{-}stat}$	**Level**	-1.2099	-4.53139	-2.6291	0.74085	-7.6986
	Prob	(0.1132)	(0.0000)	(0.0043)	(0.7706)	(0.0000)
	1.diff.	-7.79037	-7.56846	-2.9468	-6.7528	-7.6841
	Prob	(0.0000)	(0.0000)	(0.0016)	(0.0000)	(0.0000)
Null: Unit root (assumes individual unit root process)						
	Level	1.26358	-2.28497	-0.5597	0.47450	-3.6048
$IPS_{W\text{-}stat}$	**Prob**	(0.8968)	(0.0112)	(0.2878)	(0.6824)	(0.0002)
	1.diff.	-5.42180	-6.69881	-4.4048	-4.9812	-7.1525
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ADF	**Level**	41.3385	67.1855	72.7936	35.3587	94.4118
	Prob	(0.7406)	(0.0351)	(0.0120)	(0.9123)	(0.0001)
	1.diff.	111.826	127.967	98.4821	103.981	136.021
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
PP	**Level**	22.7526	57.6380	91.6648	62.8031	66.4777
	Prob	(0.9993)	(0.1607)	(0.0001)	(0.0742)	(0.0398)
	1.diff.	160.824	259.008	203.969	231.602	298.711
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: The null hypothesis is rejected with 5% significance. LLC and IPS tests are used to compute lag length by using AIC. Exogenous variables: individual effects, individual linear trends, Newey-West automatic bandwidth selection and Bartlett kernel.

Source: Authors' compilation.

Appendix 3 Unit Root Test Results

Moderately free countries Variables/Tests		*lnGDPPC*	*GCF*	*Labor*	*Business*	*Fiscal*
Null: Unit root (assumes common unit root process)						
$LLC_{t\text{-}stat}$	**Level**	-1.1409	-1.6620	-1.0948	1.8225	-1.9000
	Prob	(0.1269)	(0.0482)	(0.1368)	(0.9658)	(0.0287)
	1.diff.	-9.1517	-11.202	-6.6296	-8.7084	-8.4481
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Null: Unit root (assumes individual unit root process)						
	Level	4.35140	-1.6318	3.24494	0.82256	1.01342
$IPS_{W\text{-}stat}$	**Prob**	(1.0000)	(0.0514)	(0.9994)	(0.7946)	(0.8446)
	1.diff.	-6.6672	-10.580	-8.0231	-10.110	-10.927
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ADF	**Level**	46.1088	93.2754	44.1761	63.3177	62.7780
	Prob	(0.9973)	(0.0869)	(0.9987)	(0.8502)	(0.8615)
	1.diff.	175.865	255.856	205.057	242.01	267.025
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
PP	**Level**	69.3297	100.335	50.3031	114.18	85.4815
	Prob	(0.6926)	(0.0323)	(0.9899)	(0.003)	(0.2140)
	1.diff.	262.430	515.933	610.932	744.895	574.687
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: The null hypothesis is rejected with 5% significance. LLC and IPS tests are used to compute lag length by using AIC. Exogenous variables: individual effects, individual linear trends, Newey-West automatic bandwidth selection and Bartlett kernel.

Source: Authors' compilation.

Appendix 4 Unit Root Test Results

Mostly un-free countries Variables/Tests		*lnGDPPC*	*GCF*	*Labor*	*Business*	*Fiscal*
Null: Unit root (assumes common unit root process)						
$LLC_{t\text{-}stat}$	**Level**	-0.38666	-2.7301	-0.7935	-3.92089	-9.1109
	Prob	(0.3495)	(0.0032)	(0.2137)	(0.0000)	(0.0000)
	1.diff.	-3.36528	-1.0921	-4.95691	-3.8158	-5.2790
	Prob	(0.0004)	(0.1374)	(0.0000)	(0.0001)	(0.0000)
Null: Unit root (assumes individual unit root process)						
	Level	5.24465	-1.68512	-0.0302	-0.3329	0.15731
$IPS_{W\text{-}stat}$	**Prob**	(1.0000)	(0.0460)	(0.4879)	0.3696	(0.5625)
	1.diff.	-7.46151	-7.82871	2.0479	-5.6339	-6.9006
	Prob	(0.0000)	(0.0000)	(0.0203)	(0.0000)	(0.0000)
ADF	**Level**	61.2475	105.605	97.1496	85.9161	80.3445
	Prob	(0.9800)	(0.0743)	(0.1932)	0.4823	(0.6517)
	1.diff.	208.156	212.810	120.138	163.536	191.567
	Prob	(0.0000)	(0.0000)	(0.0089)	(0.0000)	(0.0000)
PP	**Level**	33.5219	122.475	110.205	70.4376	138.746
	Prob	(1.0000)	(0.0060)	(0.0404)	0.8879	(0.0003)
	1.diff.	493.331	522.918	219.281	355.384	494.497
	Prob	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Notes: The null hypothesis is rejected with 5% significance. LLC and IPS tests are used to compute lag length by using AIC. Exogenous variables: individual effects, individual linear trends, Newey-West automatic bandwidth selection and Bartlett kernel. (Results provided by LLC, IPS, ADF and PP in the mostly un-free countries confirmed stationarity among all series at first difference. However, LLC for GCF was stationary at second difference).

Source: Authors' compilation.

Appendix 5 Pedroni Residual Cointegration Test Results

Model	Mostly un-free countries		Moderately free countries		Mostly free countries	
	Stat	Weighted	Stat	Weighted	Stat	Weighted
Panel v-	2.3219**	3.83700***	10.9920***	6.416***	16.8610***	8.4350***
Panel rho-	4.5062	4.43850	4.2674	6.416	3.1313	4.1191
Panel PP-	-0.8383	-2.66700***	-2.6840***	-0.213	-2.5030***	-0.1354
Panel ADF-	0.5170	0.92081	2.1314	2.661	0.3624	0.4991
Group rho-	6.6541		7.0418		5.4392	
Group PP-	-3.2720***		-3.1770***		-0.3057	
Group ADF-	1.0225		1.6868		1.8701	

Source: Authors' compilation.

Appendix 6 Johansen Fisher Panel Cointegration Test Results – Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)

Model	Mostly un-free countries		Moderately free countries		Mostly free countries	
Hypothesized No. of CE(s)	Fisher St* (trace) Prob.	Fisher St* (max-eigen) Prob.	Fisher St* (trace) Prob.	Fisher St* (max-eigen) Prob.	Fisher St* (trace) Prob.	Fisher St* (max -eigen) Prob.
None	**1711.** (0.0000)	**1159.** (0.0000)	**1564.** (0.0000)	**1088.** (0.0000)	**968.0** (0.0000)	**690.3** (0.0000)
At most 1	**889.7** (0.0000)	**571.7** (0.0000)	**771.4** (0.0000)	**513.9** (0.0000)	**484.5** (0.0000)	**265.6** (0.0000)
At most 2	**433.3** (0.0000)	**301.3** (0.0000)	**356.7** (0.0000)	**233.8** (0.0000)	**273.4** (0.0000)	**179.3** (0.0000)
At most 3	**226.4** (0.0000)	**177.3** (0.0000)	**203.7** (0.0000)	**148.4** (0.0000)	**150.5** (0.0000)	**110.4** (0.0000)
At most 4	**183.6** (0.0000)	**183.6** (0.0000)	**182.6** (0.0000)	**182.6** (0.0000)	**130.0** (0.0000)	**130.0** (0.0000)

Notes: * Probabilities are computed using asymptotic Chi-square distribution.

Source: Authors' compilation.

Appendix 7 Kao Residual Cointegration Test Results*

MODELS	Mostly un-free countries	Moderately free countries	Mostly free countries
	t-statistic Prob.	*t*-statistic Prob.	*t*-statistic Prob.
ADF	**-2.167860** (0.0151)	**-2.087926** (0.0184)	**-2.028036** (0.0213)
Residual variance	0.000564	0.000328	0.000273
HAC variance	0.000985	0.000594	0.000446
	Augmented Dickey-Fuller test equation		
D(RESID)	**Coefficient Std. error**	***t*-stat**	**Coefficient Std. error**	***t*-stat**	**Coef. Std. error**	***t*-stat**
RESID(-1)	**-0.101***** (0.0131)	-7.676	**-0.131***** (0.0190)	-6.92	**-0.135***** (0.021)	-6.23
D(RESID(-1))	**0.3409** *** (0.030)	11.012	**0.09242**** (0.038)	2.411	**0.183***** (0.046)	3.99

Notes: * Newey-West automatic bandwidth selection and Bartlett kernel.

Source: Authors' compilation.

Appendix 8 Summary of DOLS Long-Run Estimates

MODELS DOLS	Mostly un-free countries	Moderately free countries	Mostly free countries
lnGDPPC	**Coefficient** **Std. error**	**Coefficient** **Std. error**	**Coefficient** **Std. error**
GCF	**0.000572** (0.000774)	**0.005093***** (0.000744)	**0.002678**** (0.001205)
LABOR	**0.024923***** (0.002008)	**0.016600***** (0.001757)	**0.008657**** (0.003439)
FISCAL	**0.002556***** (0.000587)	**0.005192***** (0.001092)	**0.002661***** (0.000588)
BUSINESS	**0.002046***** (0.000600)	**0.000353** (0.001575)	**0.002937***** (0.000482)

Notes: ***, **, * implies 1%, 5% and 10% significance levels.

Source: Authors' compilation.

Appendix 9 Summary of FMOLS Long-Run Estimates

MODELS FMOLS	Mostly un-free countries	Moderately free countries	Mostly free countries
lnGDPPC	**Coefficient** **Std. error**	**Coefficient** **Std. error**	**Coefficient** **Std. error**
GCF	**0.001025** (0.000764)	**0.005424***** (0.000747)	**0.001667** (0.001072)
Labor	**0.025137***** (0.002171)	**0.016622***** (0.001806)	**0.013883***** (0.002425)
Fiscal	**0.003264***** (0.000604)	**0.005723***** (0.000572)	**0.003909***** (0.000629)
Business	**0.001318***** (0.000591)	**0.000233** (0.000467)	**0.002466***** (0.000466)

Notes: ***, **, * implies 1%, 5% and 10% significance levels.

Source: Authors' compilation.

Appendix 10 Components and Averages of Economic Freedom Index

2011	Mostly free		2011	Moderately free		2011	Mostly un-free	
	Fiscal freedom	Business freedom		Fiscal freedom	Business freedom		Fiscal freedom	Business freedom
Austria	51	73	Albania	92	81	Azerbaijan	85	69
Bahrain	99	75	Armenia	88	87	Bangladesh	72	68
Botswana	79	69	Barbados	74	74	Belize	82	72
Canada	79	91	Belgium	45	91	Benin	76	45
Chile	77	70	Bulgaria	94	73	Bosnia&Her	83	54
Czech Rep.	82	65	Colombia	76	90	Brazil	70	53
Denmark	39	98	Costa Rica	82	58	Burkina Faso	81	61
Estonia	79	78	Croatia	75	63	Cambodia	90	39
Finland	66	94	El Salvad.	85	61	Cameroon	69	46
Georgia	88	90	France	53	84	China	70	48
Germany	61	92	Ghana	86	61	Dominican	83	53
Iceland	72	91	Guatemala	79	50	Egypt, Arab	85	63
Ireland	73	83	Hungary	79	79	Fiji	78	65
Japan	69	81	Israel	60	66	Gabon	74	56
Jordan	93	69	Italy	55	76	Greece	66	77
Lithuania	92	77	Kazakhst.	93	71	Guinea	69	46
Luxembourg	65	74	Latvia	84	75	Guyana	67	66
Norway	51	92	Madagasc.	90	63	Honduras	85	61
Korea Rep.	73	93	Malaysia	85	79	India	78	37
Sweden	39	93	Malta	61	61	Indonesia	83	50
Bahamas	97	71	Mexico	81	81	Kenya	77	58
Netherlands	52	83	Namibia	66	68	Kyrgyz Rep.	94	73
UK	57	94	Panama	86	72	Lebanon	90	50
US	69	90	Paraguay	95.9	59	Malawi	78	41
			Peru	79	72	Mali	69	50
			Poland	76	64	Mauritania	80	43
			Portugal	61	82	Moldova	87	69
			Romania	87	70	Morocco	71	76
			S.Arabia	99	68	Mozambique	76	63
			Slovak Rep.	84	71	Nepal	85	57
			Slovenia	65	80	Nicaragua	78	51
			S. Africa	70	74	Pakistan	80	70
			Spain	53	80	Russian Fed.	86	69
			Sri Lanka	84	77	Senegal	65	56
			Thailand	78	73	Swaziland	74	66
			Turkey	77	68	Tajikistan	92	61
			Uganda	80	48	Tanzania	79	48
			Uruguay	84	73	Philippines	79	53
						Gambia, The	75	59
						Tunisia	74	82
						Vietnam	75	63
						Yemen Rep.	91	61
						Zambia	72	60
Average V.	**71**	**83**		**77**	**72**		**78**	**58**

Source: THF (2013).