

## **Economic Freedom, TFP and Growth: Comparative Analysis of GCC and East Asian Newly Industrialized Economies (NIEs)**

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### **Abstract**

This study tests empirically the contribution of economic freedom in explaining the observed gap in GDP per worker between GCC countries and East Asian NIEs. It uses both «Fraser Institute» and «Heritage Foundation» indexes in their aggregated and disaggregated forms and finds robust evidence that lower economic freedom in GCC region is a major source behind its low productivity compared to East Asian NIEs, over the last five decades. The bulk of this effect transmits through Total Factors Productivity. Indeed, depending on the index used, economic freedom, alone, explains between 55 and 65 percent of the observed TFP differential and between 68 and 72 percent GDP per worker differential across these two regions. Such result clearly appeals GCC's governments to further free their economic institutions.

**Keywords:** Economic Freedom, TFP, GDP per worker, GCC, East Asian NIEs.

**JEL Classification:** O1, O43, O57

### **Introduction**

Since the founding works of North Douglas and Williamson in the 90's, it is now well established in the "New Institutional Economics and Development literature" that, institutions are the fundamental cause of economic growth and development differences across countries. Together, the legal, administrative, political and economic organizations that underpin every society form what one can call an "enabling environment" for the creation of wealth. When they fail, trust is eroded and economies can become damaged. This study focuses on "economic freedom" as a proxy of the quality of economic policies and institutions and aims to assess its contribution in explaining the spectacular economic development gap which is observed between some East Asian countries namely, the Newly Industrialized Economies (NIEs, hereafter), (i.e., Singapore, Hong-Kong and South Korea) and the other developing countries worldwide during the last five decades. More precisely, the study compares these Asian NIEs to the countries of the Gulf Cooperation Council (GCC) and aims at bringing answers to the following questions: i) How and to what extent do economic freedom explain differences in productivity between countries of the two regions? ii) Of all the economic freedom differences that exist, which ones really matter?

This study comes within the so-called today “*New Institutional Economics and Development Literature*”. As underlined by Acemoglu and Robinson (2008), the main determinants of differences in prosperity across countries are differences in economic institutions. Economic institutions matter for economic growth because they shape the incentives of key economic actors in a society. In particular, they influence investments in physical and human capital, technology and the organization of production. Therefore, solving the problem of development will entail reforming these institutions.

Two economic freedom indexes have now become available in the literature and are used in this study to test whether economic institutions quality matters in explaining the GCC/NIEs development gap. Both indexes -performed by the «Fraser Institute» and the «Heritage Foundation/Wall Street Journal »- provide international estimates of the degrees of economic freedom in its various aspects such as freedom in international trade and capital flows, property rights protection, stability of the monetary system, financial and labor markets deregulation, public sector size,...etc.<sup>1</sup> The study also relies on the hypothesis that Total Factors Productivity (TFP) is an important channel of the effects of economic freedom to GDP per worker as it has been proved by several well-known studies including Solow (1957), Hall and Jones (1999), and more recently, Caselli (2005) and Jorgenson and Vu (2010).<sup>2</sup> Therefore, this study also analyses TFP determinants by focusing on economic freedom.

This study differs in many respects from the existing ones -which we review below- on economic freedom and economic development relationship. First of all, it is the first -in our knowledge- to address this issue in the context of GCC/Asian NIEs comparison. Second, it tests the hypothesis of TFP as a crucial channel through which the effects of economic freedom may transmit to GDP per worker. Third, it bases on economic freedom indexes compiled by two distinct international institutes, so that robustness of the obtained results to the change of indicators is tested. Fourth, it uses also economic freedom in its disaggregated form to capture which specific types of economic freedom really matter in explaining differences in economic development across countries of the GCC and the Asian NIEs. Finally, it deals econometrically with reverse causality issue due to the endogeneity feature of economic freedom phenomenon.

This study is organized as follows. The first section presents a critical review on the existing literature on the issue of the contribution of economic freedom to economic growth and development. The second section provides an overview of economic freedom situation in both GCC and East Asian regions. Then, it conducts an econometric exercise aiming at assessing the effects of economic freedom and its various components on TFP and GDP per worker in these regions. Finally, in the third section, the endogeneity feature of economic freedom is addressed in the estimation exercise.

<sup>1</sup> More details on the exact definitions of these indexes and their components as well as the way of their computations can be found at [www.fraserinstitute.org/economic-freedom](http://www.fraserinstitute.org/economic-freedom) and at [www.heritage.org/index](http://www.heritage.org/index).

<sup>2</sup> Some other studies as Inklaar and Timmer (2013) found that although TFP gaps are important determinant of the disparities in development and growth, these gaps come out only as the second contributor factor to these disparities, behind physical and human capital accumulation.

## I. Economic freedom, economic growth and development: a critical literature review

The literature on economic freedom comes within an increasing strand of literature showing how crucial is the institutional environment, particularly the economic one, in explaining why economies grow or stagnate. For instance, Hall and Jones (1999) tested the hypothesis along which, the primary determinant of differences in economic performance is differences in “social infrastructures”. “Social infrastructure” is defined as being the institutions and government policies that provide incentives for individuals and firms. They encourage either productive activities such as the accumulation of skills, the production of new goods and new techniques, or predatory behaviors such as rent-seeking, corruption and theft. The authors find that differences in “social infrastructure” cause large differences in capital accumulation, educational attainment, and productivity.

Studies that used economic freedom as an indicator of the quality of economic institutions are yet increasing in number. As defined by Gwartney et al. (1996), economic freedom measures the extent to which rightly acquired property is protected and individuals are free to engage in voluntary transactions. With the publication and easy availability of data on economic freedom from the “Fraser Institute” and the “Heritage Foundation/The Wall Street Journal”, the relationship between economic freedom and economic growth and development has received a lot of attention from empirical researchers in recent years.

These studies tend to converge in showing the importance of economic freedom for growth and development, but still raise some issues. For instance, De Haan and Sturm (2000) and De Haan, Lundström, and Sturm (2006) used the Fraser Institute index in a neoclassical growth equation which is regressed for the period 1975–1990 for 80 countries, using both the level of economic freedom in 1975 and the change in freedom in the period 1975–1990 as explanatory variables. The main conclusion is that more economic freedom fosters economic growth, but the initial level of freedom is not related to growth.<sup>3</sup> Although interesting, this study suffers from at least four problems. First, it relies on cross-section estimations rather than on panel-data estimations so that temporal effects are neglected. Second, there is likely a causality/endogeneity problem related to economic freedom index which can be severe although the authors tried to minimize it by using the initial level of this index in some regressions. Third, this study does not clarify the transmission channel(s) of the effects of economic freedom to GDP per capita growth. That is, nothing is said on how economies can grow or stagnate when their institutions become more or less free. Finally, the study is silent with regard to the components of economic freedom that matter the most for economic growth. Some studies tended to shed light on the possible channel(s) of transmission of the effect of economic freedom to economic growth and development. For example, Dawson (1998) reported evidence in favor of

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<sup>3</sup> Other studies as Gwartney et al. (1999), Adkins et al (2002), Dawson (1998), and Weede and Kämpf (2002) find also that the level of economic freedom at the beginning of the growth period studied does not contribute significantly to explaining growth, but that positive changes in economic freedom do so.

both direct productive efficiency effect and indirect investment effect associated with economic freedom, for 85 countries and over the period 1975-1990. Nonetheless, this study remains silent with respect to the elements of economic freedom that matter the most. Bengoa and Robles (2003) provided evidence that economic freedom affects economic growth through its effect on Foreign Direct Investment (FDI) inflows. The study relies on panel data analysis for a sample of 18 Latin American countries for 1970-1999 and uses the aggregated "Fraser Institute" index.

However, it remains unclear which of its various aspects are more relevant for FDI and, thus, for growth. More recently, by using data from 1972 to 2011 on 109 countries, Horst (2016) found that, over the sample period, the "Fraser Institute" index had a substantial positive effect on human capital investment -as proxied by secondary enrollment rate. Although statistically relevant, this result still leaves unclear the question of the channel through which does this effect arise. In the same line of ideas, Hafer (2013) showed that the effect of economic freedom on economic growth transmits partially via financial development. The author found that countries with higher levels of initial economic freedom, on average, exhibit greater levels of financial intermediary development in subsequent years. If greater financial intermediary development engenders faster economic growth, the results of this study explain, at least partially, the observed link between economic freedom and economic growth.

While all these studies did not clarify the relative contributions of various components of economic freedom to growth, some studies attempted to overcome this shortcoming. For instance, Carlsson and Lundström (2002) used the seven categories from the 2000 version of the Fraser Institute Index and reported that only one category is positively and robustly related to growth, one has a robust hump-shaped relation and one is negatively and robustly related to growth. In addition, by using Granger-causality tests between the different economic freedom categories and growth, Dawson (2003) concluded that only two on the categories can be said to granger-cause growth. Berggren and Jordahl (2005) identified only some factors within the categories that are the most important determinants of economic growth. In addition, by using Heston-Summers growth data, Heckelman and Stroup (2000) found that only a few of the economic freedom indicators significantly affect growth. Similarly, Justesen (2008) conducted a series of Granger causality tests between the various components of economic freedom and economic growth using panel data for the period 1970-1999. The results suggest that some (but not all) aspects of economic freedom affect economic growth and investment. On the other hand, there is only weak evidence that growth affects economic freedom. This result is in line with that in Hossein et al. (2014) which used data from 13 MENA countries over the period of 2000 to 2009 and showed that the Fraser Institute economic freedom index does affect positively economic growth, although not all the five elements of economic freedom are positively and significantly correlated with economic growth.

Our study aims to contribute to the existing literature on the virtues of economic freedom for economic development in countries of the GCC and Asian NIEs while taking into account the shortcomings and gaps evoked above. Therefore, i) we use panel data rather than cross-section data, ii) we clarify the transmission channel (TFP), iii) we use economic freedom indexes in their aggregated and disaggregated

forms, and iv) we deal with the causality/endogeneity econometric issue of these indexes.

## **II- Economic freedom and economic development in gcc and east asia: overview and econometric analysis**

This section aims at bringing answers to the following questions: i) why in the same region (GCC or East Asia), labor productivity in some countries far exceeds that in other countries? ii) Why some East Asian countries have increased dramatically their labor productivity to the point of surpassing those of some GCC countries? iii) what do TFP differences between countries of the studied regions reflect? Below, we test the conjecture that economic freedom determines TFP and is, therefore, one important reason behind the observed economic development disparities across countries of these regions.

### **II-1- Economic freedom indicators in the GCC and East Asian countries**

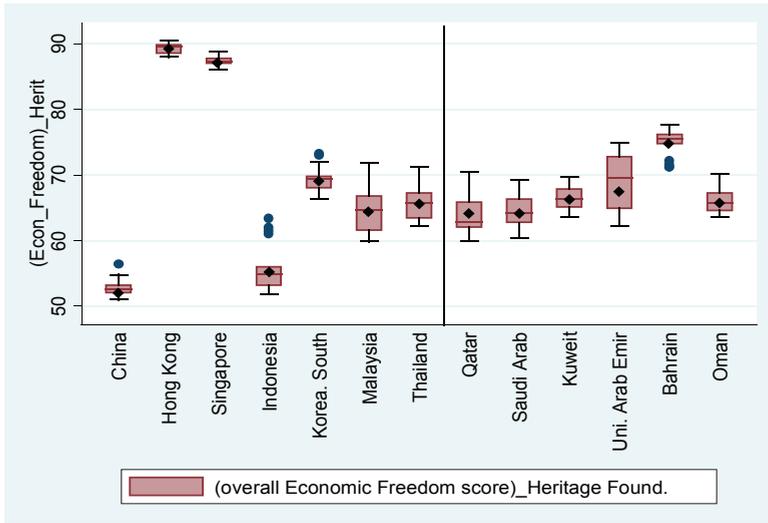
To assess the degree of economic freedom in the studied regions we use the index calculated by both "*The Heritage Foundation*" in collaboration with "*The Wall Street Journal*" and the one calculated by "*The Fraser Institute*". The box-plots reported in Figures 2a and 2b, in the appendix, provide a useful summary of the data on economic Freedom scores for the GCC and Asian countries using data on the indexes described above. The box-plots, with the mean (known as whisker diagrams) summarize the distribution of our data set by displaying the centering and spread of the data. They highlight important points. First of all, Economic Freedom scores reveal more variability across the Asian region than across the GCC countries. Indeed, the inner fences in the boxes indicate a much larger range of the medians in the case of the Asian group than in the GCC countries. Asian countries are, thereby, relatively more heterogeneous in terms of their economic freedom scores, with Hong-Kong, Singapore and South Korea coming out as the freest economies of the sample. Overall, China and Indonesia appear as the least free countries of the sample no matter if one refers to the Heritage Foundation or the Fraser Institute indexes.

From GCC countries' side, Bahrain followed by the U.A.E achieved over the studied period slightly better scores than the other members, but are left lagging behind the most developed Asian countries (Hong-Kong and Singapore). The rest of GCC countries (Qatar, Oman, Kuwait and KSA) achieved almost similar scores than those realized by Malaysia and Thailand. Further, the distribution of Economic Freedom indexes is either symmetric for most of countries if we consider the Heritage Foundation data, or negatively skewed if we look at the Fraser Institute scores implying, in this case, a greater concentration of the data on their higher values.

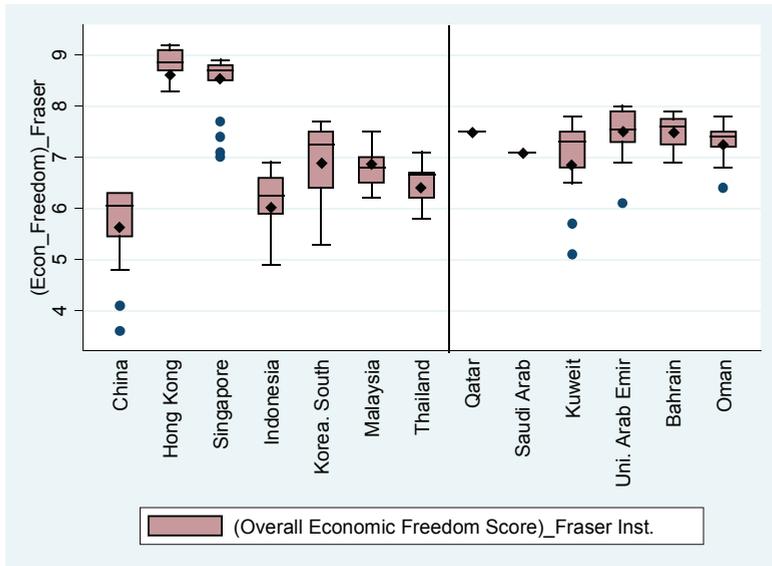
Finally, the box-plots reveal a remarkable correlation between the two constructed Economic Freedom indexes. Overall, they provide similar qualitative results in terms of the countries' scores.<sup>4</sup>

Overall, China and Indonesia appear as the least free countries of the sample no matter if one refers to the Heritage Foundation or the Fraser Institute indexes.

<sup>4</sup> The correlation coefficient across values of the two indexes is 90 %.



**Figure 1a:** Economic Freedom index by the Heritage Foundation in the GCC and Asian countries (1995-2012)



**Figure 1b:** Economic Freedom index by the Fraser Institute in the GCC and Asian countries (1970-2012)

**Notes:** The Diamond point inside the box is the mean and the horizontal line inside the box is the median value of the distribution of Economic Freedom scores. The points outside the inner fence are outliers. In case of Saudi Arabia and Qatar, only two observations are available for each.

The next step is to assess the extent to which differences in Economic Freedom scores do contribute in generating cross-country differences in TFP and GDP per-worker in countries of the two studied regions.

## II-2 Econometric analysis: the model and estimation techniques

We estimate separately the following two equations:

$$\begin{aligned} \text{Log}(y_{NO})_{it} = & \alpha_0 + \alpha_1 \text{Log}(inv)_{it} + \alpha_2 \text{Log}(sec)_{it} + \alpha_3 \text{Log}(1+n)_{it} \\ & + \alpha_4 \text{Log}(Eco\_Free)_{it} + \mu_i + e_{it} \end{aligned} \quad (I)$$

$$\begin{aligned} \text{Log}(A_{NO})_{it} = & \beta_0 + \beta_1 \text{Log}(h)_{it} + \beta_2 \text{Log}(k)_{it} \\ & + \beta_3 \text{Log}(Eco\_Free)_{it} + v_i + \eta_{it} \end{aligned} \quad (II)$$

Equation (I) is an extended version of the neoclassical growth model (Solow 1956; Mankiw et al. 1992). It links the level of the non-oil<sup>5</sup> GDP per worker ( $y_{NO}$ ) -assumed to be in its long-run steady state- to a set of classical flow variables as physical investment rate ( $inv$ ), human capital investment rate -as proxied by secondary enrolment rate ( $sec$ )-, and demographical growth rate ( $n$ ).<sup>6</sup> We extended this set of explanatory variables to economic freedom ( $Eco\_Free$ ). This variable is, first, introduced in its aggregated form, then in its disaggregated form. Notice that as introduced in Equation (I),  $Eco\_Free$  comes out as a component of TFP which influences the level of GDP per worker. We confirm this conjecture in Equation (II) by regressing directly TFP ( $A_{NO}$ )<sup>7</sup> on its determinants, including  $Eco\_Free$ . This specification reflects well-known important results in the endogenous growth theory along which, inter-country gaps in technological progress are explained by differences in the stock endowments (rather than flows) of human and physical capital. Technological transfers and, thus, TFP improvements come first from externalities associated with the disposable stock of human capital; an idea raised initially by Nelson and Phelps (1966) and then taken up and developed later by Lucas (1988), Benhabib and Spiegel (1994) and others. Improvements in TFP come also from externalities of physical capital stock. The higher this stock (private and public) in a country, the more important is the capacity of that country to innovate and to benefit from increasing returns (Romer 1990; Grossman and Helpman 1991, Barro 1990). In equation (II), average schooling years of the population aged more than 25 are used as a proxy of the per worker human capital stock ( $h$ ). The variable ( $k$ ) refers to the

<sup>5</sup> We calculate GDP per-worker in the studied regions by using data on GDP in constant 2005 US\$ and on employment as confined by the Penn World Tables (PWT, Heston, Summers and Aten, version 8.0 (2013)). For an accurate comparison of economic development across countries of these two regions, we consider only non-oil real GDP. Series for non-oil real GDP are obtained by using data on the share of oil (and gas) rents as percentage of GDP obtained from the World Bank Indicators database.

<sup>6</sup> We rely primarily on the Penn World Tables (PWT, Heston, Summers and Aten, version 8.0 (2013)) to extract data concerning human and physical capital stocks per employed worker. Human capital ( $h$ ) is measured as the average years of schooling for the population over 25 years of age.

<sup>7</sup> TFP is calculated as a residual in the COBB-DOUGLAS production function including the stocks of physical capital and labour, and assuming a value of 0.3 for the coefficient of production-to-capital elasticity.

per worker physical capital stock. In addition to  $h$  and  $k$ , we introduce *Eco\_Free* to test the robustness of the hypothesis made in equation (I) along which, the economic institutional environment affects GDP per worker through the TFP channel.

In equations above, indexes  $i$  and  $t$  refer to countries and years, respectively; and the terms  $(\mu_i, \nu_i)$  and  $(e_{it}, \eta_{it})$  to the country-specific effects and the error terms, respectively. Estimations cover the period 1970-2012. The coefficients  $\alpha_1\alpha_1$  to  $\alpha_4\alpha_4$  (respectively  $\beta_1\beta_1$  to  $\beta_3\beta_3$ ) measure elasticities of GDP per worker (respectively TFP) to the various explanatory variables.

Estimations results for these two equations are presented in Tables 1a to 2b in the appendix. Tables 1a and 1b report the results for equation (I) while using *Econ\_Free* indexes compiled by the Heritage Foundation and the Fraser Institute, respectively. The same indexes are used in estimating equation (II) consecutively in Tables 2a and 2b. As a first step, we apply both fixed (within) and random-effects regressions techniques to estimate the models and report the results in the first two specifications of the tables. In all four tables, the results show the presence of heteroskedasticity and autocorrelation problems as revealed by the corresponding tests shown in the bottom of each table. Therefore, we use the FGLS regressions (Feasible Generalized Least Squares) which allow taking these problems simultaneously into account.

### II-3: Estimation results

The diverse specifications considered in these regressions provide interesting results which can be summarised as follows:

- i) According to the results in Tables 1a and 1b, it comes out that differences in investment rates in physical capital as well as in schooling significantly matter in explaining differences in countries' GDP per-worker, with supremacy of the schooling investment effect. However, differences in TFP are more associated with disparities in accumulated physical capital stocks.
- ii) The influence of economic freedom indicators is considerably significant no matter a) whether *Econ-Free* is used in its aggregated or disaggregated form; b) whether we use data of the Fraser Institute or that of the Heritage Foundation and c) whether the explained variable is GDP per-worker or TFP.
- iii-1) Taken in its *aggregated* form, *Econ-Free* index has coefficients which come out positive and highly significant (at less than 1% significance level) in all four tables. This result supports the central hypothesis of this study regarding to the contribution of the quality of economic institutions to explain inter-countries gap in TFP and, thereby, in GDP per-worker.
- iii-2) By using *Econ-Free* index in its disaggregated form, we estimate various specifications of Equations (I) and (II) considering different components of Economic freedom according to the two definitions. In order to test for statistical robustness of these components, we proceed in three ways. First, a given component is initially employed alone, then integrated with other components so that the list of the components used in the regressions goes larger from one specification to the following one. Second, the components belonging to a given list vary from one specification to another. Finally, all the components are gathered in a same specification (the last column). This procedure yields interesting results summarised below with respect to the relative contributions of the economic freedom elements:

a) By looking at the determinants of the levels of GDP per-worker, the various specifications considered in Tables 1a and 1b suggest that:

a-1) Most aspects of economic freedom play significant role, no matter which definition of economic freedom is employed. Particularly, *less corruption, more enforcement and protection of property rights, smaller government's size, less regulation in the credit and labour markets and more freedom in doing business and investing for the citizens and the foreigners*, all are components of the institutional environment which are statistically robust and have significant influence on cross-country differences in GDP per-worker. Because these components are scored on the same scale, their

**Table 1a: Estimation of the impacts of Economic Freedom on the level of non-oil GDP per worker using "Heritage Foundation" index : 1995-2012**

Dependent Variable: <i>Log (y<sub>NO</sub>)</i>	F.E (a)		R.E (b)		FGLS regressions with heteroskedastic panels and panel-specific AR(1) correlations (d)									
	(1)	(2)	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	1.038** (1.99)	1.261** (2.03)	4.688**** (11.2)	-20.73**** (-11.0)	-0.921 (-0.56)	-21.33**** (-8.89)	-18.40**** (-5.77)	-12.82**** (-3.92)	-16.14**** (-5.47)	-14.40**** (-5.38)	-16.61**** (-4.61)	-19.24**** (-4.94)		
Log (inv)	0.807**** (6.52)	0.789**** (6.37)	0.285**** (3.87)	0.349** (2.12)	0.103 (0.55)	0.282**** (2.79)***	0.637**** (2.74)	0.405** (2.24)	0.203 (0.80)	0.248**** (2.57)	0.387** (2.17)	0.433**** (2.29)		
Log (sec)	1.296**** (18.3)	1.306**** (18.4)	0.740**** (9.81)	2.005**** (7.23)	1.241**** (3.73)	1.732**** (5.57)	3.323**** (13.6)	2.011**** (7.90)	3.268**** (10.9)	2.551**** (12.3)	2.826**** (12.3)	2.892**** (12.5)		
Log (1 + n)	-0.091**** (-2.66)	-0.087**** (-2.55)	0.007 (0.77)	-0.020 (-1.07)	0.014 (0.44)	-0.018 (-0.99)	-0.024 (-0.94)	0.003 (0.14)	-0.004 (-0.13)	-0.012 (-0.63)	-0.008 (-0.51)	-0.004 (-0.23)		
Log (Eco_Freedom)_Her				4.818**** (19.7)										
Log (Corruption_Freedom)					1.183**** (9.75)	0.765**** (6.29)					0.493**** (3.96)	0.629**** (4.63)	0.444**** (2.98)	
Log (Property_Rights)						0.595**** (5.07)	1.342**** (10.3)				0.688**** (6.93)	0.630**** (4.23)	0.487**** (2.91)	
Log (Fiscal_Freedom)						3.900**** (5.98)	3.667**** (5.40)				1.820**** (3.20)	2.833**** (4.73)	2.984**** (4.43)	
Log (Gov_Spending)								-2.223**** (-3.86)	-2.079**** (-3.91)		-1.055** (-2.12)	-2.293**** (-4.75)	-2.075**** (-4.27)	
Log (Business_Freedom)									2.673**** (12.6)		0.981**** (3.61)		0.689** (2.01)	
Log (Monetary_Freedom)										1.029**** (3.02)	0.964** (2.06)	1.032**** (2.59)	1.122**** (2.97)	
Log (Int_Trade_Freedom)										1.293**** (3.44)	-0.238 (-0.68)		-0.278 (-0.71)	
Log (Inv_Freedom)											0.784**** (4.82)	0.372**** (3.09)	0.365**** (3.01)	
Log (Fin_Freedom)											1.119**** (5.53)	-0.109 (-0.60)	-0.179 (-0.94)	
- N. Obs	228	228	228	152	152	152	152	152	152	152	152	152	152	152
- Signif. Test (p-value) <sup>(e)</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
- Hetero. Test (p-value) <sup>(f)</sup>	0.000	0.000	0.000											
- Autocor. Test (p-value) <sup>(g)</sup>	0.003	0.000												

Notes : (a) : Fixed-effects (within) regression. (b) : Random-effects regression. (c) : Feasible Generalized Least Squares regression. (d) : Global model significance test. (e) : Modified Wald test for groupwise heteroskedasticity : The null hypothesis H0: sigma(i)^2 = sigma^2 for all i. (f) : Wooldridge test for autocorrelation in panel data : The null hypothesis H0: no first-order autocorrelation. Parameters in brackets are the t-statistics. \*, \*\*, \*\*\* and \*\*\*\* denote significance of the estimated coefficient at 10%, 5%, 1% and less than 1%, respectively.

**Table 1b : Estimation of the impacts of Economic Freedom on the level of non-oil GDP per worker using "Fraser Institute" index : 1970-2012**

Dependent Variable: <i>Log (y<sub>NO</sub>)</i>	F.E (a)		R.E (b)		FGLS regressions with heteroskedastic panels and panel-specific AR(1) correlations (d)									
	(1)	(2)	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Constant	2.119** (2.09)	1.239 (1.04)	-1.989* (-1.86)	1.754**** (2.80)	-2.613* (-1.81)	3.945**** (4.36)	2.018** (1.96)	-1.472 (-1.17)	-1.855 (-1.69)	-1.684 (-1.59)	-0.926 (-0.44)	-2.271* (-1.79)		
Log (inv)	0.342 (1.43)	0.034 (0.14)	0.426*** (2.74)	0.515**** (5.82)	0.778**** (-2.94)	0.233 (1.43)	0.433*** (2.62)	0.419** (1.98)	0.552** (3.12)	0.754**** (3.41)	0.334 (1.39)	0.404** (1.96)		
Log (sec)	1.175**** (8.07)	0.963**** (6.16)	0.833**** (5.32)	1.164**** (12.4)	1.074**** (4.52)	0.864**** (6.01)	0.815**** (4.93)	1.425**** (7.32)	1.023**** (5.07)	1.054**** (5.20)	0.602**** (2.93)	0.807**** (4.56)		
Log (1 + n)	-0.038 (-1.18)	-0.035 (-0.92)	-0.013 (0.72)	0.006 (0.77)	-0.009 (-0.23)	0.019* (1.91)	0.023 (1.11)	0.042 (1.28)	-0.014 (-0.51)	-0.025 (-0.77)	-0.014 (-0.14)	0.006 (0.23)		
Log (Eco_Freedom)_Fra	0.503 (0.71)	2.098**** (2.93)	4.510**** (12.2)											
Log (Gov_size)				0.363**** (2.98)							1.238**** (4.90)	1.278**** (4.73)	0.908**** (3.34)	0.704**** (2.90)
Log (Property_Rights)					2.480**** (10.4)						1.916**** (7.92)	2.185**** (8.55)	1.847**** (7.26)	1.279**** (5.03)
Log (Sound_Money)						0.023 (0.08)					0.004 (0.01)	-0.131 (-0.33)	0.230 (0.65)	
Log (Int_Trade_Freedom)							0.835** (2.53)				1.678**** (3.53)	0.896** (2.08)		
Log (Reg_Credit_Labor_Busin)									1.681**** (5.29)				1.749**** (5.32)	
- N. Obs	141	141	141	141	141	141	141	141	141	141	141	141	141	141
- Signif. Test (p-value) <sup>(e)</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
- Hetero. Test (p-value) <sup>(f)</sup>	0.000	0.000												
- Autocor. Test (p-value) <sup>(g)</sup>	0.005	0.005												

Notes : (a) : Fixed-effects (within) regression. (b) : Random-effects regression. (c) : Feasible Generalized Least Squares regression. (d) : Global model significance test. (e) : Modified Wald test for groupwise heteroskedasticity : The null hypothesis H0: sigma(i)^2 = sigma^2 for all i. (f) : Wooldridge test for autocorrelation in panel data : The null hypothesis H0: no first-order autocorrelation. Parameters in brackets are the t-statistics. \*, \*\*, \*\*\* and \*\*\*\* denote significance of the estimated coefficient at 10%, 5%, 1% and less than 1%, respectively.

relative contributions can be compared by directly referring to their corresponding estimated coefficients.

a-2) Some other components of Economic Freedom index are found to be non-robust to the addition of other elements of this index or to a change in the definition of economic freedom. Indeed, while *Freedom to Internationally Trade* (Int\_Trad\_Free) comes out statistically significant and robust if we use the Fraser Institute definition, it appears non-robust in the case we use the Heritage Foundation definition. Similarly, while *Monetary Freedom* (proxied essentially by the levels of inflation and money growth) plays a role when the Heritage Foundation is adopted, it comes out non-robust with the Fraser Institute definition (Sound\_money). Finally, *Financial Freedom* (as proxied by the Heritage Foundation by public authorities' control of banks and financial markets) is not robust, while the sub-index Reg\_Credit\_Labor\_Busin used by the Fraser Institute (and covers the financial freedom aspect) is found to exert significant effect.

b) Tables 2a and 2b show the results of estimating the effects of Economic Freedom indexes in the TFP equation (Equation II) while controlling for the effects of other determinants of TFP such as human and physical capital stocks. It follows that:

b-1) Overall, most of Economic Freedom components continue to exert significant and robust effects on TFP whatever is the adopted Economic Freedom index. Indeed, *less corruption, more enforcement and protection of property rights, and more freedom in doing business and investing for the citizens and the foreigners* appear as the most relevant aspects of Economic Freedom which explain cross-countries differences in TFP levels.

b-2) Some other components exert significant effects but are not robust either to the change in the index used for Economic Freedom (as *Gov\_size* and *Sound\_Money*), or to the specification considered within each index (as *Fin\_Free*, *Inter\_Trade\_Free*, *Reg\_Credit\_Labor\_Busi*).

Table 2a: Estimation of the impacts of Economic Freedom on TFP in the non-oil sectors using the "Heritage Foundation" index: 1995-2012

Dependent Variable:	F.E. <sup>(a)</sup>		R.E. <sup>(b)</sup>		FGLS regressions with heteroskedastic panels and panel-specific AR(1) correlations <sup>(c)</sup>								
	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		
Log (A <sub>1st</sub> )													
Constant	0.720*** (3.03)	0.575*** (2.23)	-5.389*** (-10.8)	-2.191*** (-6.31)	-2.916*** (-3.92)	-2.953*** (-3.78)	-4.504*** (-8.80)	-4.531*** (-8.41)	-3.031*** (-3.59)	-3.485*** (-4.72)	-3.430*** (-3.94)		
Log (h)	-0.434*** (-3.63)	-0.467*** (-3.94)	0.393* (1.75)	0.545* (1.75)	-0.075 (-0.31)	-0.224 (-0.94)	0.044 (0.24)	-0.091 (-0.43)	0.150 (0.75)	0.005 (0.03)	-0.065 (-0.33)		
Log (k)	0.415*** (15.2)	0.431*** (16.2)	0.527*** (15.0)	0.581*** (14.2)	0.612*** (17.3)	0.602*** (17.7)	0.542*** (20.1)	0.682*** (20.6)	0.586*** (16.2)	0.597*** (19.7)	0.566*** (16.5)		
Log (Eco_Freedom_Her)			0.988*** (7.28)										
Log (Corruption_Freedom)				0.045 (1.28)	0.089** (2.19)	0.093** (2.30)	0.097** (2.16)		0.095** (2.19)	0.083* (1.90)	0.083* (1.83)		
Log (Property_Rights)					0.353*** (7.36)	0.301*** (5.46)	0.330*** (5.89)		0.409*** (7.90)	0.335*** (5.99)	0.351*** (6.02)		
Log (Fiscal_Freedom)					-0.184 (-0.89)	-0.324 (-1.56)			-0.302 (-1.55)	-0.322 (-1.63)	-0.281 (-1.43)		
Log (Gov_Spending)							-0.045 (-1.32)			-0.052 (-1.40)	-0.052 (-1.41)		
Log (Business_Freedom)							0.311*** (3.17)	0.268** (2.62)		0.274*** (2.69)	0.282*** (2.76)		
Log (Monetary_Freedom)								-0.062 (-0.59)	0.072 (0.61)	-0.079 (-0.72)	-0.090 (-0.84)		
Log (Int_Trade_Freedom)								0.089 (1.59)	0.048 (0.65)	0.053 (0.89)	0.097* (1.67)		
Log (Inv_Freedom)								0.139*** (3.81)	0.164*** (3.86)	0.165*** (4.57)	0.138*** (3.55)		
Log (Fin_Freedom)									0.180*** (3.24)	0.003 (0.06)	0.006 (0.13)		
- N. Obs	432	432	181	181	181	181	181	181	181	181	181		
- Signif. Test (p-value) <sup>(d)</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
- Hetero. Test (p-value) <sup>(e)</sup>	0.000	0.000											
- Autocor. Test (p-value) <sup>(f)</sup>	0.003	0.003											

Notes: (a) : Fixed-effects (within) regression. (b) : Random-effects regression. (c) : Feasible Generalized Least Squares regression. (d) : Global model significance test. (e) : Modified Wald test for groupwise heteroskedasticity : The null hypothesis H0: sigma(i)^2 = sigma^2 for all i. (f) : Wooldridge test for autocorrelation in panel data : The null hypothesis H0: no first-order autocorrelation. Parameters in brackets are the t-statistics. \*, \*\*, \*\*\* and \*\*\*\* denote significance of the estimated coefficient at 10%, 5%, 1% and less than 1%, respectively.

**Table 2b : Estimation of the impacts of Economic Freedom on TFP in the non-oil sectors using the "Fraser Institute" index: 1970-2012**

Dependent Variable: <i>Log ( A<sub>ND</sub> )</i>	F.E. <sup>(a)</sup>		R.E. <sup>(b)</sup>		FGLS regressions with heteroskedastic panels and panel-specific AR(1) correlations <sup>(d)</sup>									
	(1)	(2)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
Constant	2.104**** (5.32)	1.474**** (3.59)	-0.021 (-0.05)	0.499 (1.18)	0.169 (0.47)	0.402 (1.01)	-0.310 (-1.02)	0.793* (1.95)	-0.102 (-0.27)	-0.324 (-0.86)	-0.933** (-2.36)	-3.231**** (-5.99)		
Log (h)	0.589** (2.54)	0.313 (1.35)	0.371 (1.47)	0.577** (2.26)	0.209 (0.94)	0.487* (1.84)	0.034 (0.16)	0.693*** (2.66)	0.156 (0.72)	0.060 (0.28)	0.224 (1.15)	0.301 (1.35)		
Log (k)	0.214**** (4.31)	0.287**** (5.86)	0.327**** (7.34)	0.337**** (7.36)	0.414**** (10.7)	0.347**** (7.23)	0.448**** (16.0)	0.324**** (6.64)	0.409**** (11.0)	0.406**** (11.0)	0.434**** (13.5)	0.481**** (12.7)		
Log (Eco_Freedom_Fra)	-0.006 (-0.04)	0.026 (0.15)	0.613**** (4.75)											
Log (Gov_size)				0.212*** (3.26)					0.210*** (3.47)	0.199*** (3.41)	0.224*** (3.58)	0.345*** (4.19)		
Log (Property_Rights)					0.090 (1.53)				0.092* (1.65)	0.103* (1.88)	0.144** (2.22)	0.290**** (3.50)		
Log (Sound_Money)						0.192** (2.35)				0.165** (2.23)	0.196** (2.32)	0.315*** (2.93)		
Log (Int_Trade_Freedom)							0.180* (1.85)				0.098 (1.10)	0.453**** (3.62)		
Log (Reg_Credit_Labor_Busin)								0.060 (0.92)				0.166* (1.74)		
- N. Obs	160	160	160	160	158	162	159	161	158	158	157	156		
- Signif. Test (p-value) <sup>(e)</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
- Hetero. Test (p-value) <sup>(f)</sup>	0.000	0.000	0.000											
- Autocor. Test (p-value) <sup>(g)</sup>	0.025	0.025												

**Notes:** (a) : Fixed-effects (within) regression. (b) : Random-effects regression. (c) : Feasible Generalized Least Squares regression. (d) : Global model significance test. (e) : Modified Wald test for groupwise heteroskedasticity : The null hypothesis H0:  $\sigma_i^2 = \sigma^2$  for all i. (f) : Wooldridge test for autocorrelation in panel data : The null hypothesis H0: no first-order autocorrelation. Parameters in brackets are the t-statistics. \*, \*\*, \*\*\* and \*\*\*\* denote significance of the estimated coefficient at 10%, 5%, 1% and less than 1%, respectively.

### III- Overcoming endogeneity: system-GMM estimates

Although the results above tend to provide robust evidence that economic freedom significantly matters in explaining the development gap across countries from the GCC and East Asian NIEs, there is still endogeneity issue left which should be treated. Endogeneity problems come either from the correlation of the explanatory variables with past or current achievements of the error term and/or with specific country effects, or from reverse causality between the explained and explanatory variables, or from omitted variables. In the present study, it is reasonable to conjecture that economic environment quality is not strictly exogenous. As underlined in Acemoglu et al. (2008), economic institutions are determined as collective choices of the society that are the outcome of a political process and the distribution of political power in society. Furthermore, there is potential reverse causality. Specifically, the degree of Economic Freedom in a country could itself be influenced by the level of development of this country. In presence of this potential reverse causality, there is endogeneity issue and, the classical panel-data estimators used above can yield biased results.

Therefore, our strategy for dealing with potential endogeneity is to re-estimate Equations (I) and (II) using the System Generalized Moments Method (System-GMM) which allows biases elimination, particularly in the case of small samples. Developed by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998), the System-GMM estimator became widely used particularly in dynamic panel-data studies.

Table 3, in the appendix, reports the estimation results while using aggregated Economic Freedom indexes. In the bottom of this table we show the outcomes of various tests that we conducted to assess the quality of the estimates. The Fisher test shows the global significance of the specified model. The Arellano-Bond test for

autocorrelation (of 2<sup>nd</sup> order) and the Hansen test for over-identification assess the validity of the lagged variables used as instruments of those same variables. The Difference Hansen test is important as it allows assessing the validity of the System-GMM estimator compared to the 1<sup>st</sup> Difference-GMM estimator. It appreciates the validity of the instruments used while excluding those of the level equation, as well as the validity of the instruments used only in the level equation.

**Table 3: Estimations results of the impacts of Economic Freedom (Heritage and Fraser indexes) on GDP per worker and TFP using system-GMM techniques: 1970-2012**

Dependent variable :	System-GMM regressions			
	Log ( $y_{NO}$ )		Log ( $A_{NO}$ )	
	(1)	(2)	(1)	(2)
Constant	-21.02**** (-4.11)	-9.864**** (-5.33)	-9.784*** (-3.44)	-3.273**** (-4.77)
Log (Inv)	0.172 (0.51)	0.118 (0.38)		
Log (sec)	2.847**** (4.70)	1.394** (2.43)		
Log (1+n)	-0.075 (-0.78)	-0.046** (-2.47)		
Log (h)			0.053 (0.05)	0.086 (0.19)
Log (k)			0.414** (1.97)	0.406*** (3.01)
<b>Log (Eco_Freedom)_Her</b>	0.942**** (3.88)		0.804**** (4.14)	
<b>Log (Eco_Freedom)_Fra</b>		1.742**** (6.55)		1.865**** (6.54)
- N. Observations	152	141	181	160
- N. Instruments	16	16	17	17
- Fisher Signif. Test (p-val)	0.000	0.000	0.000	0.000
- A-Bond (AR2) Test (p-val)	0.187	0.977	0.137	0.805
- Hansen Test (p-value)	0.357	0.681	0.731	0.938
Difference in Hansen Test (p-values)				
- Exogeneity of additional instruments (in levels)	0.226	0.571	0.960	0.824
- Validity of exog. variables as instruments (in levels)	0.592	0.623	0.203	0.582

*Notes: Estimates are corrected from heteroskedasticity by means of the Robust option. Economic Freedom is considered endogenous and therefore is instrumented by its lagged values of 2<sup>nd</sup> year to 5<sup>th</sup> year. Parameters in brackets are the t-statistics. \*, \*\*, \*\*\* and \*\*\*\* denote significance of the estimated coefficient at 10%, 5%, 1% and less than 1%, respectively.*

Notice first of all that, all tests reported in Table 3 provide high evidence on the specifications high statistical significance as well as on the instruments validity and the effectiveness of the considered estimator. Second, the estimations results are univocal and provide additional evidence on the main conclusions pointed out in the previous section. On the one side, they confirm that human capital investment plays a more significant role in countries' per-worker GDP in the long-run, while physical capital stocks matter more in explaining TFP levels. The extents of these effects are almost similar to those found above with other estimators. On the other side, these results corroborate the central hypothesis of this study along which, Eco-Freedom is a major determinant of TFP and, thereby, GDP per-worker in the long-run. This result holds no matter if the Heritage Foundation or the Fraser Institute index is used. Notice also that the impacts of the Eco-Freedom indexes are slightly lower here relatively to the previous estimates, but still significantly high.

As a final step in this study, we calculate from the estimates above the economic freedom contribution to the differentials in TFP and GDP per worker observed across GCC region and Asian NIEs. This exercise is shown in Table 4, in the appendix.

	<i>Economic Freedom Index</i>	
	<i>Heritage Foundation (1995-2012)</i>	<i>Fraser Institute (1970-2012)</i>
• <i>Economic Freedom gap : Δ Log (Eco_Freedom):</i>	0.188	0.096
• <i>TFP gap : Δ Log (A<sub>NO</sub>)</i>		
- <i>Estimated :</i>	0.151	0.179
- <i>Observed :</i>	0.275	0.275
• <i>Gap explained (in% ) (Estimated / observed) :</i>	<b>54.91</b>	<b>65.09</b>
• <i>Development gap: Δ Log (y<sub>NO</sub>)</i>		
- <i>Estimated :</i>	0.177	0.167
- <i>Observed :</i>	0.246	0.246
• <i>Gap explained (in% ) (Estimated / observed) :</i>	<b>71.95</b>	<b>67.88</b>
<i>Note: The estimated coefficients used in this table are those reported in Table 3.</i>		

It comes out that, depending on the index used, the difference in economic freedom between the two regions, alone, explains between 55 and 65 percent of the observed differential in TFP and between 68 and 72 percent of the differential in GDP per worker. This result is unequivocal. It clearly appeals the governments of GCC countries, particularly Saudi Arabia, Kuwait and Oman to further promote freedom of their economic institutions. The efforts should especially aim at achieving more enforcement and protection of property rights, less corruption and more freedom in doing business and investing for nationals and foreigners. This should improve TFP in the long run in this region and contribute in catching up with the East Asian NIEs.

### Conclusions

In the years 1970-80, non-energy GDP per employed worker in GCC countries represented, on average, more than twice the one achieved by the East Asian NIEs. In 2012, this situation was totally reversed as non-energy output per worker in the GCC represented only 70 percent of that achieved by the NIEs in the Asian region. The econometric analysis showed unambiguously that the degree of economic freedom -whether approximated by an aggregate index or disaggregated into different indicators-, is a crucial factor which significantly matters for TFP and economic development. Therefore, countries from the GCC, especially Saudi Arabia, Kuwait and Oman would benefit more by further promoting freedom of their economic institutions. In particular, freedom to do business, integrity of the judiciary, protection of property rights and low levels of corruption are elements of economic freedom which come out as the most relevant to explaining inter-country variances in long-

term levels of development in the two considered regions. Raising human capital stock and improving its quality is also one of the most important challenges facing most countries of GCC to catch up with the Asian NIEs.

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