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5 November 2013

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Abstract. This study investigates the hypothesis that higher levels of economic freedom in an "economic region" promote a higher *level* of economic activity and hence yield higher *levels* of per capita real income (GDP) in that economic region, *ceteris paribus*. However, in the pursuit of a broader perspective, this study also investigates the hypothesis that the higher the taxation level relative to GDP, the lower the per capita real income *level*. Finally, in the pursuit of a broader perspective, this study also investigates the hypothesis that higher quality regulation leads to higher per capita real income *level*.

1. Introduction

Over the past quarter of a century, numerous studies have been conducted expressly to investigate the impact of economic freedom on economic growth. Most of these empirical studies find that there exists a strong, positive impact of economic freedom, especially a measure of *overall* economic freedom, on the *rate of economic growth* (Ali, 1997; Ali and Crain, 2001, 2002; Arora and Vamvakidis, 2006; Cebula, 2011; Clark and Lawson, 2008; Dawson, 1998, 2003; De Haan and Strum, 2000; Goldsmith, 1995; Gwartney, Holcombe, and Lawson, 2006; Heckelman, 2000; Heckelman and Stroup, 2000; Norton, 1998; Tortensson, 1994). Indeed, the study by Cole (2003, p. 196) concludes that, ". . . economic freedom is a significant factor in economic growth, regardless of the basic theoretical framework." This generalization is predicated presumably upon the argument that increased economic freedom elevates the growth of economic activity through incentives to work, invest, save, hire/dismiss, make business decisions, and take risk in a market-based economy.

The present study focuses on a similar, but not identical, potential and reasonable impact of higher economic freedom levels, namely, higher real income *levels*.[1] In particular, this study investigates the hypothesis that higher levels of economic freedom in an "economic region" promote a higher *level* of economic activity and hence yield higher *levels* of per capita real income (GDP) in that economic region, *ceteris paribus*. However, in the pursuit of a broader perspective, this study also investigates the hypothesis that the higher the taxation level relative to GDP, the lower the per capita real income *level*. Finally, in the pursuit of a broader perspective, this study also investigates the hypothesis that higher quality regulation leads to higher per capita real income *level*.

To provide a broad and diverse context for the empirical analysis of these joint hypotheses, we begin with the observation that, in the Global Economy of the 21st century, the nature of what constitutes a region for economics purposes can easily transcend that of merely some arbitrary or non-arbitrary geographic or politically delineated portion of a single nation. Indeed, a "nation" can very reasonably be defined as a "region" *per se*, such as in the case of an organization like the OECD (consisting of 30 nations/regions in the early years of this century and of 34 nations/regions as of 2010).[2] Within this perspective, the present study investigates whether "regional" per capita real income differentials are a function of differential levels of economic freedom, differential tax burden levels, and differentials in the quality of government regulation.[3] The study period runs from 2003-2009 and encompasses a panel dataset estimated

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[1] This emphasis on economic freedom and the *per capita real income level* is compatible, in principle, with that in Wiseman and Young (2011) for states within the U.S., and with certain other studies, including Grubel (1997), Islam 1996), Nissan and Niroomand (2008), and Cebula (2013).

[2] One compelling reason to study the OECD is to control for the fact that all of the countries are at least somewhat similar and therefore are more reasonably comparable in their parallel development.

[3] In addition, this study investigates whether higher taxation reduces per capita real income and whether higher regulatory quality and greater political stability act to elevate per capita real income and thus act to create income differentials.

using the fixed effects model. A variety of estimates are provided to test the resiliency and consistency of the findings of the basic model.

2. The Framework

In this study, per capita real income is measured by the per capita real GDP in each of the OECD nations over the eight-year study period from 2003 through 2009. Per capita real income, *RPCY*, is a measurement that parallels, in principle, what has been the focus of most of the more recent related studies on macroeconomic *growth*, which is *the percentage rate of change* (rather than the *level) of per capita real income* or *the percentage rate of change of real GDP* (Tortensson, 1994; Cebula, 2011; Goldsmith, 1995; Ali, 1997; Norton, 1998; Dawson, 1998, 2003; Cole, 2003; Hall, Sobel, and Crowley, 2010). The value of per capita real income is made comparable across nations by *PPP* (purchasing-power-parity) adjustments. Given the emphasis in this study on the role of economic freedom in determining per capita real income and regional differentials thereof, the most fundamental hypothesis of this study is that per capita real income (as defined) depends directly upon economic freedom (*FREEDOM*) in each of its various studied forms, *ceteris paribus*. In addition, per capita real income is hypothesized to be a decreasing function of the tax burden, expressed as a percent of GDP, *TAXREVGDP*,[4] because higher tax burdens reduce disposable income and limit the ability to purchase new goods and services and thereby restrict the level of economic activity. In addition, per capita real income is hypothesized to be an increasing function of regulatory quality, *REGQUAL*,[5] adopted in lieu of business freedom,

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[4] As explained below, *TAXREVGDP* is adopted in lieu of the Heritage Foundation (2013) economic freedom referred to as fiscal freedom,

[5] As explained below, *REGQUAL* is adopted in lieu of the Heritage Foundation (2013) economic freedom referred to as business freedom,

because high quality regulations interferes less with the efficiency functioning of the market economy (Upadhyaya, Raymond, and Mixon, 1997; Ugur, 2009; Yandle, 2013).

Per capita real income is also hypothesized to be a function of political stability as well as a variety of other economic variables, such as unemployment rates and interest rates (*OTHER*). Thus, the basic framework for analysis is expressed, as follows:

$$RPCYjt= f(FREEDOMnjt, TAXREVGDPjt, REGQUALjt, POLSTABjt, OTHERjt) \qquad (1)$$

where *RPCYjt* is the *level* of the purchasing-power-parity adjusted per capita real GDP (income) in OECD nation *j* in year *t*; *FREEDOMnjt* refers to the value of the economic freedom measure (index) *n* in nation *j* in year *t* (*n*=8 in several of the estimates, as explained below)*;*

TAXREVGDPjt is the ratio of *all* taxes within nation *j* in year *t*, expressed as percent; *REGQUALjt* refers to the role played by government in the economy under the rubric of regulations and in fact is an index that measures the overall quality of those regulations in nation/region *j* in year *t*; *POLSTABjt* is an index that measures the degree of political stability in each nation/region *j* in year *t*; and *OTHERjt* refers to the values of explicitly fundamental economic control variables, namely the unemployment rate and long term interest rate) in nation *j* in year *t*. A trend variable is also included in the empirical estimates; interestingly, although this variable is linear, use of a non-linear trend variable in its place does not alter the conclusions.

a. **Economic Freedom, The Tax Burden, and Regulatory Quality**

This study *initially* considers the economic freedom indices developed by The Heritage Foundation (2013). An alternative measure of economic freedom is also considered in the estimates, one based on Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009). Based on the central hypothesis investigated in this study, as stated above, per capita real income

is expected to be an increasing function of both of these indices of economic freedoms, *ceteris paribus*.

Evidence in various forms of a positive impact of economic freedom on per capita income can be found in several prior studies. These studies include a fundamentally graphical cross-country analysis by Grubel (1997, pp. 289-291, esp. Figure 1) from which the author infers that countries with higher levels of economic freedom have higher per capita income levels. Another of these papers is a cross-section study by Islam (1996) of countries for the year 1992. The cross-section estimates in Islam (1996) find a direct impact of economic freedom on per capita income in low income countries and all countries taken as a group. A cross-section study of states in the U.S. by Wiseman and Young (2011) also finds evidence of a positive impact of economic freedom on per capita income. Finally, Cebula (2013), examines each of the ten Heritage Foundation (2013) measures, while omitting any variables except these ten freedom measures, to find which of these specific measures actually raises per capita income; he finds that at least three fail to do so.

The present study extends these studies in a variety of ways. To begin with, this study differs with most prior studies by focusing on the OECD nations/"economic regions." More importantly, it estimates a balanced seven-year (2003 through 2009) panel dataset by fixed effects. Furthermore, the present study constructs an overall average measure of economic freedom which expressly discards two of the ten Heritage Foundation (2013) economic freedoms, fiscal freedom and business freedom, partly because of multi-collinearity problems their presence creates and partly to replace them with arguably better variables to measure what the fiscal freedom and business freedoms seek to measure, namely, the ratio of all taxes to GDP (expressed as a percent) and a direct measure of regulatory quality, the principal component of

business freedom. These substitutions are further explained later on in this section of the study. Finally, the present analysis provides linear, linear-log, and log-log estimates to test for consistency of results, as well as introduces a number of *de facto* economic control variables and a *de facto* political control variable.[6]

Given this context, we first identify *freedom from excessive government size,* or simply *government size freedom* (Heritage Foundation, 2013), an index that reflects the degree of *freedom* in an economy *from* the *burden of excessive government in terms of expenditures* (i.e., freedom from government on the *expenditure* side). Government outlays compete with private agents and interfere with natural market processes, prices, and interest rates by over-stimulating demand and diverting resources through "crowding out" effects (Carlson and Spencer, 1975; Cebula, 1978; Abrams and Schmitz, 1978). This economic freedom is labeled as *HECFR1.*

The trade freedom index reflects the openness of an economic system to imports of goods and services from other nations and the ability of citizens to interact freely as buyers and sellers in the global marketplace. Government hindrance of the free flow of such commerce (through taxation of imports and/or exports, bans, quotas, and so forth) has a negative impact on the ability of individuals and firms to pursue economic goals (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR2*

A free citizenry requires a steady and reliable currency as a medium of exchange and as a store of value. The monetary freedom index is an indicator of stable currency and market-determined prices. A high degree of monetary freedom is characterized by an independent central bank, policies promoting low inflation, and the absence of price controls (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR3.*

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[6] Also included in all of the estimates there is a trend variable and in two of the estimates there is a dummy/binary variable for G8 nations.

The investment freedom index is greater in a nation with fewer (1) restrictions on foreign investment, (2) restrictions that tend to limit capital inflows and outflows, and (3) restrictions that hinder the ability of capital to flow to its best and most efficient use. Such restrictions interfere with the freedom of investors and firms seeking capital (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR4*.

Nearly all nations impose some form of supervision/oversight on banking institutions and the providers of other financial services, including markets for equities. The financial freedom index is an indicator of the degree to which the financial sector of the economy is free from *excessive* banking and financial regulation (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR5*.

Secure property rights provide citizens the confidence to engage in entrepreneurial activities, including commercial activities, saving, and investing. The ability to accumulate private property is the primary motivation in a market economy; a "rule of law" that effectively protects property rights is critical to an efficient free market economy. The greater the protections afforded to property rights under the rule of law, the greater the property rights freedom index (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR6*.

Political corruption by public officials manifests itself in many forms, including bribery, extortion, embezzlement, and graft, and it enables certain public officials to steal or otherwise profit illegitimately from public funds. Political corruption interferes with market efficiency. The freedom from corruption index indicates the degree to which an economy is free from such forms of corruption (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR7*.

The labor freedom index is a composite index that reflects freedom from government wage and price controls, and, thus, measures the ability of both workers and firms to interact

freely without restrictions imposed by government. The greater the degree of labor freedom in an economy, the more efficient and productive is that economy (Heritage Foundation, 2013; Nissan and Niroomand, 2008).   This economic freedom is labeled as *HECFR8*.

The fiscal freedom index (Heritage Foundation, 2013) reflects the freedom of individuals and firms to keep and control their income and wealth for their own use/benefit. Fiscal freedom is a measure of freedom from the burden of government (from the *revenue* side): the lower this burden, the higher the value of the fiscal freedom index. Technically, fiscal freedom includes freedom from both the tax burden, in terms of both the *top income tax rate* (on corporations and individuals, taken separately) and the overall amount of tax revenue as a percentage of a nation's GDP. The underlying idea is that higher taxation not only interferes with the ability of individuals and businesses to pursue their goals in the marketplace, it may also reduce the incentive to work, save, invest, or take risk. This economic freedom is labeled as *HECFR9*.

The business freedom index reflects the individual's right and ability to freely conduct entrepreneurial activities (i.e., to create, to operate and thereby make economic, financial, and management decisions, and close an enterprise without government interference). It is argued that burdensome, redundant regulations are the most common barriers to the free conduct of entrepreneurial endeavors, and indeed are a *de facto* form of taxation that [makes] it difficult for entrepreneurs to produce goods and services (Heritage Foundation, 2013). This economic freedom is labeled as *HECFR10*.

Of the ten economic freedoms measure above, two, *HECFR9* and *HECFR10*, are of special interest here in terms of whether there is a reasonable alternative way in which to capture their essential significance but perhaps in either a more direct fashion or in a technically less problematic fashion, i.e., one that avoids multi-collinearity with one or more other variables in

the system. In particular, to measure economic freedom using the Heritage Foundation (2009A)

indices of economic freedom and to address the fact that, technically, the ten economic freedoms

interact, i.e., are overlapping, although the exact mechanisms for this interaction are not easily

identifiable or entirely clear (Heritage Foundation, 2013), we define, with two notable exceptions

(fiscal freedom, *HECFR9* and business freedom, *HECFR10*) the *overall* economic freedom

measure, *FREEDOMjt*, as the average of the economic freedoms described above, where *n*

denotes the *n*th economic freedom:

$$FREEDOMjt = \sum_{n=1}^{8} HECFRnjt/8, \; j=1,\ldots, 29; \; t= 2003, 2004. \; 2005, 2006, 2007, 2008, 2009 \quad (2)$$

The reason for defining the overall freedom index *without fiscal freedom (HECFR9)*

included is that *HECFR9* is constructed in part with an unnecessary focus on just the *top*

corporate and personal income tax brackets and hence neglects to provide a systematic inclusion

of the remainder of the corporate and personal income tax structures, be they imposed by central

governments or sub-central government entities. In point of fact, there are also other tax forms

besides income taxation that arguably must be systematically considered when quantifying fiscal

freedom. Furthermore, *HECFR9* is highly correlated ($r = 0.767$) with *government size freedom*,

HECFR1, and therefore also introduces a multi-collinearity problem. Accordingly, *HECFR9* is

replaced with a simple measure of the overall tax burden in each of the "OECD regions,"

TAXREVGDPjt . This substitute for *fiscal freedom* has two advantages over *HECFR9:* simplicity

and comprehensiveness on the one hand, i.e., it is computed as simply the sum of *all* taxes in

nation/region j in year t expressed as a percent of GDP, and on the other hand, it is not highly

correlated with *HECFR9*. In the spirit of *HECFR9*, it is expected that real per capita income is a

decreasing function of *TAXREVGDP*, *ceteris paribus* (Clark and Lawson, 2008; Cebula, 2011;

Yandle, 2013). This expectation is re-inforced by the anticipated impact of higher tax rates on

income tax evasion (Cebula, 1997; Cebula and Feige, 2012)

The most fundamental reason for defining the overall freedom index *without business*

freedom (*HECFR10*) *included* is the simple fact that this economic freedom measure is highly

correlated ($r = 0.613$) with the measure of regulatory quality adopted in this study, i.e., the basic

composition of *HECFR10* is in fact regulation. That said, in order to reflect at least in part the

role of government in the economic environment *as* a regulator *per se*, this study adopts in place

of the variable *HECFR10* described as "regulatory quality" by the World Bank Institute (2012).

This variable, expressed by the symbol *REGQUALjt* in the present study, is an index that reflects

"…the ability of the government to provide sound policies and regulations that enable and

promote private sector development" (World Bank Institute, 2012, p. 1). It is hypothesized that

the greater/higher the degree of regulatory quality in nation *j* in year *t*, *REGQUALjt*, the greater

the rate of real per capita GDP growth in nation *j* in year *t* is likely to be, *ceteris paribus*

(Upadhyaya, Raymond, and Mixon, 1997; Ugur, 2009; Yandle, 2013, esp. pp. 5-9).[7]

Economic and Political Stability Control Variables and a Trend Variable

In addition to the hypothesized impacts of economic freedom, taxes as a percent of GDP, and

regulatory quality on real income, this study initially includes two explicitly economic "control"

variables, a political control variable, and a trend variable. The explicitly economic control

variables are the percentage unemployment rate in country/region *j* in year *t* (*URjt*) and the *ex*

post real long term rate of interest in country/region *j* in year *t* (*RLONGINTjt*). The

unemployment rate variable controls for the expected negative influence of higher

unemployment rates on per capita real income levels: the greater the percent of the labor force

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[7] The potential economic significance of regulation (good quality) is considered in a diverse literature
(Mixon, 1994, 1995; Yandle, 1999, 2013; Clark, Boettke and Stringham, 2008).

that is unemployed, the lower the per capita income, *ceteris paribus*. Furthermore, the higher the

ex post real long term rate of interest, the lower the present value of investment for firms, and

hence the lower the rate of investment in new plant and equipment. Moreover, the *ex post* real

long term rate of interest also captures the fact that consumption, particularly that of durable

goods, is a decreasing function of the *ex post* real long term rate of interest, *ceteris paribus*. Thus

the higher the *ex post* real long term interest rate, the lower the level of economic activity and

hence the lower the per capita real income level, *ceteris paribus*.

We also introduce a political control variable for each nation/region, *POLSTABjt*, which

is an index of political stability and the absence of violence in those nations/regions. It is

hypothesized that economic prosperity for an economy as a whole should be an increasing

function of political stability, which by its very nature, promotes orderly or lower risk decision

making and greater efficiency for markets to function in an economic system and thereby should

act, *ceteris paribus*, to elevate per capita real income. Finally, the linear trend variable, *TR*, is

included to account for trending of variables over the study period.

For the interested reader, it is observed that the variables reflecting "regulatory quality"

and "political stability" are in fact quite different. The variable used to measure regulatory

quality, *REGQUAL*, reflects the ability of the government of a nation both to formulate and

execute/implement sound, rational, and objective policies and regulations that not only permit

but also promote private sector development and efficiency (World Bank, 2012, p. 5). By

contrast, the variable political used to reflect political stability, *POLSTAB*, actually measures the

perceived likelihood that the government of a nation is vulnerable to being destabilized or even

overthrown by either constitutional or violent means, with the latter including politically-

motivated violence and terrorism (World Bank, 2012, p. 9). From a different perspective, to

illustrate how statistically unrelated these two variables are, the zero-order correlation coefficient

is nearly 0, i.e., $r = 0.068$.

Linear Fixed Effects PLS Estimation Results

Based on the eclectic economic freedom-based model of investigating the determination of per

capita real income described above, the following model is to be estimated initially:[8]

$$RPCYjt = f(HECFRjt, REGQUALjt, TAXREVGDPjt, POLSTABjt, URjt, RLONGINTRjt, TR) \qquad (3)$$

where it is hypothesized that:

$$f_{HECFR} > 0, \; f_{REGQUAL} > 0, \; f_{TAXREVGDP} < 0, \; f_{POLSTAB} > 0, \; f_{UR} < 0, \; f_{RLONGINTR} < 0 \qquad (4)$$

Data for each of the economic freedom variables/indices (*HECFR*) initially considered were

obtained from the Heritage Foundation (2013); data for the real per capita income variable

(*RPCY*) were obtained from the International Monetary Fund (2013); data for the variables

TAXREVGDP, *UR*, and *RLONGINTR* variables were obtained from the OECD (2013); and data

for the governance indices for quality regulation (*REGQUAL*) and political stability (*POLSTAB*)

were obtained from the World Bank (2012). Finally, *TR* is a linear trend variable. Descriptive

statistics for each of the non-trend variables in the analysis are provided in Table 1.[9]

Equation (3), which is expressed initially in linear form (but also subsequently expressed

in linear-log form and in log-log form), was estimated by PLS (panel least squares), first using

the random effects model and then using the fixed effects model. In the case of this linear

specification, a Hausman specification test (Hausman, 1978) was performed and it generated a *t*-

statistic with a $p = .0436$, so that the study adopted the fixed effects model. Similar findings for

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[8] *HECFR* is adopted as the symbol for economic freedom based on the Heritage Foundation (2013) indices. In subsequent estimations, i.e., in half of those estimations, an alternative measure of economic freedom (Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009) is substituted for *HECFR*.
[9] A complete dataset for Iceland was unavailable, so that only 29 of the 30 member OECD nations/"regions" over the study period could be studied.

the linear-log and log-log specifications of equation (3) were obtained using the Hausman test (1978), i.e., in both cases, $p < 0.05$. Thus, these specifications were also estimated using fixed effects.

Equation (3) is initially estimated in linear form, adopting the White (1980) cross-section correction.[10] These results are provided in column (a) of Table 2, where all six of the estimated coefficients for the non-trend variables shown exhibit the expected signs. Of these six coefficients, three are statistically significant at the 1% level, two are statistically significant at the 2.5% level, and one is statistically significant at the 5% level. Thus, as hypothesized, these fixed effects results reveal that the per capita real income level among OECD nations/regions during the study period is an increasing function of economic freedom, regulatory quality, and political stability and a decreasing function of the tax burden (as a percent of GDP), as well as the unemployment rate and the *ex post* real long term interest rate. Thus, for example, bearing in mind that the mean of *HECFR* is 69.95, a one unit increase in the Heritage Foundation overall economic freedom index would *elevate* per capita real income by $348. Therefore, a rise in this Heritage Foundation (2013) measure of economic freedom index of 10 units would be expected to elevate per capita real income by approximately $3,480. In addition, a rise in the *REGQUAL* index of one unit would raise per capita real income by $382, while a rise of 1% in the percentage ratio of taxes to GDP would reduce per capita real income by $248. Meanwhile, the coefficient of determination values (the R^2 and adjusted R^2) imply that the model explains approximately two-thirds of the variation in the dependent variable, per capita real income. Finally, the F-ratio is statistically significant at the 1% level, attesting to the overall strength of the model.

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[10] *All* of the estimations in this study adopt the White (1980) cross-section heteroskedasticity correction.

The estimate in column (a) of Table 2 is predicated upon Heritage Foundation (2013) measures of economic freedom. As a test of credibility of the overall model and of the resiliency and consistency of the conclusions for the per capita real income effects of economic freedom, as well as the regulatory quality and tax-burden variables, the next estimation provided in Table 2 of this study offers alternative fixed effects results of a parallel model. The only difference between the specification of this alternative model and that considered in column (a) is the measure of economic freedom. In particular, the economic freedom index *HECFR* from the Heritage Foundation (2013) is replaced by the overall measure of economic freedom from Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009), *GLECFR*. In principle, the two economic measures *HECFR* and *GLECFR* measure much the same thing; however, as illustrated in Table 1, the scale of these two variables is quite different. For the study period, for example, the mean for the *HECFR* index is 69.96 whereas that for the *GLECFR* index is 7.5. In practical terms, what this implies is that should the coefficient on *GLECFR* be statistically significant, its coefficient could be much larger than that for *HECFR*. This is at least in part because, in say a linear estimation, a one unit increase in *GLECFR* implies approximately a 13.33% higher degree of overall economic freedom, whereas a one unit increase in *HECFR* would be imply approximately only a 1.4% rise in overall economic freedom.

That observation having been made, it is also observed that in this study, equation (3) is estimated not only in linear form but also in linear-log form and log-log form with the *HECFR* index of economic freedom replaced by the *GLECFR* economic freedom index. Each of these versions of equation (3) was estimated by PLS (panel least squares), first using the random effects model and then using the fixed effects model. A Hausman specification test (Hausman,

1978) generated a *t*-statistic with a $p < 0$ in all cases; therefore, in all of estimates provided in this study the fixed effects model is adopted.

In the fixed effects results shown in column (b) of Table 2, all six of the estimated non-trend coefficients exhibit the expected signs; furthermore, all six are statistically significant at the 1% level. In addition, the R^2 value and adjusted R^2 value imply that the explanatory variables in the model explain effectively seven-tenths of the variation in the variable *RPCY*. Finally, the *F*-statistic is statistically significant at beyond the 1% level. These results imply that per capita real income level among OECD nations/regions during the study period is found to be an increasing function of economic freedom, regulatory quality, and political stability, while being a decreasing function of the tax burden (as a percent of GDP), the unemployment rate, and the *ex post* real long term interest rate. Thus, for example, a one unit increase in the Gwartney-Lawson overall economic freedom index would appear to *elevate* per capita real income by $7,857. This outcome constitutes a much larger response to a one unit increase in the *GLECFR* index than is the case with the Heritage Foundation index ($348), *HECFR*. As observed above, however, much of this differential response reflects the fact that a one unit increase in the *GLECFR* index (mean=7.5) is a 13.33% increase in overall economic freedom, as opposed to a one unit increase in the *HECFR* index (mean=69.95), which is only a 1.4% rise in overall economic freedom. Other results of interest in column (b) would be that a rise in the *REGQUAL* index of one unit would raise per capita real income by $398, while a rise of 1% in the percentage ratio of taxes to GDP would reduce per capita real income by $374. These latter two results parallel those in column (a), although they arguably are somewhat stronger.

3. Testing Credibility and Consistency Using Linear-log and Log-Log Estimations

The initial results provided in Table 2 indicate strong support for the hypotheses being investigated here, namely, that per capita real income is an increasing function of economic freedom and regulatory quality and a decreasing function of the burden of taxation. To provide further evidence of the credibility of these results, two additional sets of findings are to be considered. The first involves linear-log estimates of the basic model (shown in Table 3), whereas the second provides log-log estimates (shown in Table 4). Indeed, two of the latter estimates consider an additional control variable to further test the resiliency of the findings of the model.

The linear-log estimation of equation (3) using the Heritage Foundation (2013) economic freedom measure is provided in column (a) of Table 3, whereas the linear-log estimation of equation (3) adopting the Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009) measure of economic freedom is provided in column (b) of Table 3.

In the estimation shown in column (a) of Table 3, all six coefficients exhibit the expected signs. In addition, four are statistically significant at the 1% level, one is statistically significant at the 2.5% level, and one is statistically significant at the 5% level. Thus, as in the linear estimates in columns (a) and (b) of Table 2, per capita real income level among OECD nations/regions over the study period is an increasing function of economic freedom, regulatory quality, and political stability, while being a decreasing function of the tax burden (as a percent of GDP), as well as the unemployment rate, and the *ex post* real long term interest rate. Meanwhile, the coefficient of determination (R^2) value implies that the model explains nearly two-thirds of the variation in the dependent variable, per capita real income. Finally, the *F*-ratio is statistically significant at the 1% level, attesting to the overall strength of the model. Overall,

these results are compatible with those in Table 2. Of greatest relevance, the findings for the economic freedom, taxation, and regulatory variables receive further validation by the linear-log estimations found in column (a) of Table 3.

In the estimation shown in column (b) of Table 3, all six coefficients exhibit the expected signs. In addition, three are statistically significant at the 1% level, and two are statistically significant at the 5% level; only the coefficient on the political stability variable fails to be statistically significant (at even the 10% level). Thus, as in the linear estimate in columns (a) and (b) of Table 2, per capita real income level among OECD nations/regions over the study period is an increasing function of economic freedom and regulatory quality, while being a decreasing function of the tax burden (as a percent of GDP), as well as the unemployment rate, and the *ex post* real long term interest rate. Meanwhile, the coefficient of determination (R^2) value implies that the model explains nearly two-thirds of the variation in the dependent variable, per capita real income. Finally, the *F*-ratio is statistically significant at the 1% level, attesting to the overall strength of the model. Overall, aside from the result for the political stability variable, these results are compatible with those in Table 2; in other words, of greatest relevance, the findings for the economic freedom, taxation, and regulatory variables receive further validation from the linear-log results shown in column (b) of Table 3.

Finally, we come to the log-log estimations. The results of fixed effects estimations of the log-log form of equation (3), in the first case using the Heritage Foundation (2013) economic freedom index and in the second case using the Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009) economic freedom index are provided in columns (a) and (c), respectively, of Table 4. As shown in column (a) of Table 4, all six of the estimated coefficients on the non-trend variables exhibit the expected signs, with four statistically significant at the 1% level and one

statistically significant at the 2.5% level; once again, the political stability variable is not statistically significant at even the 10% level.[11] Despite the latter result, these log-log results offer further support for the key findings in Table 2 in that the per capita real income level among OECD nations/regions during the study period is found to be an increasing function of economic freedom and regulatory quality while being a decreasing function of the tax burden as a percent of GDP.[12] Meanwhile, the coefficient of determination (R^2) value of 0.77 and adjusted R^2 value of 0.75 imply that the model explains approximately three-fourths of the variation in the dependent variable, per capita real income. Finally, the F-ratio is statistically significant at the 1% level, attesting to the overall strength of the model.

As for the findings in column (c) of Table 4, five of the six estimated coefficients on the non-trend variables exhibit the expected signs, with three statistically significant at the 1% level, one statistically significant at the 2.5% level, and one statistically significant at the 5% level. In this estimate, it is the long term interest rate that fails to be statistically significant at even the 10% level and even exhibits a positive sign. Despite the latter result, these findings offer further support for the key findings in Table 2 in that the per capita real income level among OECD nations/regions during the study period is found to be an increasing function of economic freedom and regulatory quality as well a decreasing function of the tax burden (as a percent of GDP).[13] Meanwhile, the coefficient of determination (R^2) value of 0.79 and the adjusted R^2 value of 0.77 imply that the model explains nearly four-fifths of the variation in the dependent variable, per capita real income. Finally, the F-ratio is statistically significant at the 1% level, attesting to the overall strength of the model.

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[11] Technically, these "coefficients" are actually elasticities.
[12] There are also negative impacts from the unemployment rate and the *ex post* real long term interest rate.
[13] There is also a positive impact from political stability and a negative impact from unemployment.

As a final test of the consistency of the model, a new variable is now added to the log-log specification. Specifically, this study now adopts a *de facto* economic control *dummy* variable, *G8DUMMY*, which assumes a value of 1 for a G8 nation and a value of 0 otherwise. This variable is included in the analysis to control for the fact that G8 nations tend to have educational, technology, infrastructure, and other advantages as compared with many if not most non-G8 nations and the fact that these advantages will tend to result in labor higher productivity and hence higher per capita real income levels, *ceteris paribus*.

The log-log estimations of the basic model with the *G8DUMMY* included can be found in columns (b) and (d) of Table 4, where column (b) adopts the *HECFR* index of economic freedom and column (d) adopts the *GLECFR* index of economic freedom. In column (b), all seven of the estimated non-trend coefficients exhibit the expected signs, with six statistically significant at the 1% level and one statistically significant at the 2.5% level. The coefficients of determination (R^2 = 0.79; adjusted R^2 = 0.76) imply the model explains more than three-fourths of the variation in the dependent variable. Furthermore, the *F*-statistic is statistically significant at the 1% level. Thus, once again, per capita real income is an increasing function of economic freedom, regulatory quality, and political stability. It also is positively impacted by having G8 status. Per capita real income is also a decreasing function of higher taxation, the unemployment rate, and the *ex post* real long term interest rate. Clearly, among other things, this estimate provides strong support for the three basic hypotheses being investigated in this study.

In column (d) of Table 4, six of the seven of the estimated non-trend coefficients exhibit the expected signs, with five statistically significant at the 1% level and one statistically significant at the 2.5% level; once again (as in column (c) of Table 4), in the log-log specification, the interest rate variable has the "wrong" sign but is not statistically significant at

even the 10% level. The coefficients of determination ($R^2 = 0.81$; adjusted $R^2 = 0.79$) imply the

model explains effectively four-fifths of the variation in the dependent variable. Furthermore, the

F-statistic is statistically significant at the 1% level. In any case, once again, per capita real

income is an increasing function of economic freedom, regulatory quality, and political stability.

It also is positively impacted by having G8 status. Per capita real income is also a decreasing

function of higher taxation and the unemployment rate. Clearly, among other things, this

estimate provides strong support for the three basic hypotheses being investigated in this study.

Before closing this section of the study, it might be of interest to the reader for us to

further interpret these log-log findings. We focus on those in columns (b) and (d) of Table 4

since they are not only consistent for the most part but also include the additional *G8DUMMY*

control variable. According to the findings in column (b), a 1% higher level of economic

freedom (as measured by *HECFR*) implies that the per capita real income level will be 0.9%

higher. According to column (d), a 1% higher level of economic freedom (as measured by

GLECFR) implies that the per capita real income level will be 1.76% higher.[14] These results

imply strong support for the hypothesis that the *level* of per capita real income is positively

impacted by a higher level of economic freedom.

Next, we examine the results for regulatory quality. In column (b), a 1% higher level of

regulatory quality (*REGQUAL*) implies a 1.01% higher level of per capita real income, whereas

in column (d), a 1% higher level of *REGQUAL* implies a 1.19% higher level of per capita real

income. These results strongly support our hypothesis that the *level* of per capita real income is

an increasing function of regulatory quality.

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[14] A stronger impact resulting from the *GLECFR* variable than from the *HECFR* variable is expected based on the discussion earlier in this paper and is consistent with the other results in Tables 2, 3, and 4.

Examining the results for the tax burden variable, *TAXREVGDP*, the finding in column (b) implies that a 1% higher tax burden level would reduce the level of per capita real income by 0.37%, whereas the finding in column (d) implies that a 1% higher tax burden would reduce the per capita real income by 0.45%. These results both strongly support the hypothesis being investigated here that the *level* of per capita real income is a decreasing function of the overall ax burden in an economy.

As for the other findings, in columns (b) and (d) of Table 4, a 1% rise in the index of political stability raises the level of per capita real income by 0.16% and 0.24%, respectively. These results are consistent with our expectations in this study. Next, in columns (b) and (d), a 1% higher unemployment rate reduces the level of per capita real income by 0.19% in both cases. Although the interest rate variable is statistically insignificant in column (d) of Table 4, the finding in column (b) of Table 4 implies that a 1% higher *ex post* real interest rate would lower the level of per capita real income by 0.35%. The latter finding is consistent with our expectations. Finally, there are the results for the *G8DUMMY* variable. Following Halvorsen and Palmquist (1980), according to columns (b) and (d), being a G8 nation implies a roughly 0.17% or 0.25% higher level of per capita real income.

5. Summary

This study of the impacts of economic freedom, regulatory quality, and taxation on the *level* of per capita real GDP among OECD nations/"regions" over the 2003-2009 period adopts two alternative measures of economic freedom (one computed by the Heritage Foundation (2013) and one computed by Gwartney and Lawson (2003; 2004; 2005; 2006; 2007; 2008; 2009)) and provides PLS fixed effects estimates for linear, linear-log, and log-log specifications. Each nation during this time frame can be regarded either as a nation *per se* or as a *de facto* "economic

region" within the OECD. The eight estimations in this study all provide strong support for the three central hypotheses considered here, namely: (1) the higher the degree of economic freedom, the higher the per capita real income (GDP) *level*; (2) the higher the level of regulatory quality, the higher the *level* of per capita real income (GDP); and (3) the higher the overall tax burden, expressed as a percent of GDP, the lower the *level* of per capita real income (GDP).

Naturally, these conclusions are at least somewhat preliminary. More work, using alternative data and additional years need to be considered and estimated. In addition, alternative specifications involving additional or different variables (including different control variables) could yield broader, if not more compelling, insights. Thus, although these results would appear to suggest a strong relationship between the level of per capita real income (GDP) on the one hand and economic freedom, regulatory quality, and the overall tax burden on the other hand, this topic requires further scrutiny and formal investigation.

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Table 1. Descriptive Statistics

Variable	Mean	Standard Deviation
RPCY	26,248	11,651
HECFR	69.95	8.19
REGQUAL	65.11	21.84
TAXREVGDP	35.92	7.198
POLSTAB	88.5	26.6
UR	6.55	3.17
RLONGINTR	4.58	2.23
GLECFR	7.5	0.51
G8DUMMY	0.241	0.43

Table 2. Linear Estimates (Fixed Effects)
Dependent Variable: *RPCY*
Economic Freedom Measure: <u>Heritage Foundation</u>   <u>Gwartney-Lawson</u>

Explanatory Variables	(a)	(b)
HECFR	348**	-----
	(2.44)	
GLECFR	-------	7,857***
		(3.75)
REGQUAL	382***	399***
	(7.18)	(7.42)
TAXREVGDP	-248**	-374***
	(-2.27)	(-3.45)
POLSTAB	98.46***	111****
	(2.65)	(3.12)
UR	-692*	-701***
	(-2.04)	(-3.46)
RLONGINTR	-1,564***	-2,125***
	(-2.66)	(-5.68)
TR	-1,362	-0.02*
	(-1.51)	(-2.07)
Constant	-1,852	-299
	(-0.14)	(-0.34)
R^2	0.65	0.71
adjR^2	0.62	0.68
F	20.86***	27.03***

***statistically significant at 1% level; **statistically significant at 2.5% level; *statistically significant at 5% level.

Table 3. Linear-log PLS Estimates (Fixed Effects)
Dependent Variable: *RPCY*
Economic Freedom Measure: <u>Heritage Foundation</u>   <u>Gwartney-Lawson</u>

	(a)	(b)
Explanatory Variables		
Log HECFR	24,502***	-------
	(2.64)	
Log GLECFR	-------	36,261*
		(2.12)
Log REGQUAL	19,511***	11,157***
	(7.12)	(4.33)
Log TAXREVGDP	-11,583***	-8,885*
	(-2.97)	(-1.99)
Log POLSTAB	6,394*	1,416
	(2.11)	(0.60)
Log UR	-6,461**	-7,408***
	(-2.35)	(-3.57)
Log RLONGINTR	-6,665***	-12,432***
	(-2.95)	(-5.02)
TR	-1,304	281
	(-1.43)	(0.28)
Constant	-119,105**	-35,675
	(-2.30)	(-0.76)
R^2	0.64	0.64
adjR2	0.61	0.61
F	20.09***	20.18***

***statistically significant at 1% level; **statistically significant at 2.5% level; *statistically significant at 5% level.

Table 4. Log-log PLS Estimates (Fixed effects)
Dependent Variable: *Log RPCY*
Economic Freedom Measure:

	Heritage Foundation	Gwartney-Lawson	Heritage Foundation	Gwartney-Lawson
	(a)	(b)	(c)	(d)
Explanatory Variables				
Log HECFR	0.83**	0.90***	-------	-------
	(2.32)	(2.60)		
Log GLECFR	-------	-------	1.74***	1.76***
			(2.61)	(2.76)
Log REGQUAL	1.02***	1.01***	1.22***	1.19***
	(7.39)	(7.30)	(7.97)	(8.06)
Log TAXREVGDP	-0.42***	-0.37**	-0.57***	-0.45**
	(-2.71)	(-2.52)	(-2.64)	(-2.29)
Log POLSTAB	0.16	0.16***	0.21*	0.24***
	(1.55)	(3.32)	(1.98)	(5.13)
Log UR	-0.19***	-0.19***	-0.17**	-0.19***
	(-2.62)	(-2.70)	(-2.33)	(-2.77)
Log RLONGINTR	-0.40***	-0.35***	0.045	0.001
	(-3.55)	(-2.97)	(0.55)	(0.01)
G8DUMMY	-------	0.16***	-------	0.24***
		(3.32)		(5.13)
TR	-0.09**	-0.09**	-0.03	-0.03
	(-2.57)	(-2.41)	(-0.77)	(-0.64)
Constant	4.3**	3.71*	2.98	2.7
	(2.37)	(2.08)	(1.86)	(1.80)
R^2	0.77	0.79	0.79	0.81
adjR2	0.75	0.76	0.77	0.79
F	38.05***	35.17***	41.78***	41.5***

***statistically significant at 1% level; **statistically significant at 2.5% level; *statistically significant at 5% level.