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# **Economic Freedom, Regulatory Quality, Taxation, and Living Standards**

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18 August 2014

Online at <https://mpra.ub.uni-muenchen.de/58108/>  
MPRA Paper No. 58108, posted 25 Aug 2014 01:07 UTC

# Economic Freedom, Regulatory Quality, Taxation, and Living Standards

## 1. INTRODUCTION

Over the last two decades, numerous studies have been undertaken expressly to investigate the impact of economic freedom on economic growth. Depending upon the study, economic growth is measured typically either as the percentage growth rate of GDP or other measure of output or as the percentage growth rate of some measure of per capita real income. 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; Bennett and Vedder, 2013; Cebula, 2014; Clark and Lawson, 2008; Cole, 2003; Dawson, 1998, 2003; De Haan and Strum, 2000; Easterly, 2011; Farr, Lord and Wolfenbarger, 1998; Goldsmith, 1995; Gwartney, Holcombe, and Lawson, 2006; Gwartney, Lawson, and Holcombe, 1999; Hall and Lawson, 2014; Hall, Nikolaev, Pulito, and VanMetre, 2013; Heckelman, 2000; Heckelman and Stroup, 2000; Mathers and Williamson, 2011; Norton, 1998; Powell, 2003; Tortensson, 1994).

These various studies investigate the potential economic growth-economic freedom relationship from a variety of perspectives. For example, Farr, Lord, and Wolfenbarger (1998) use Granger-causality testing to examine the relationship between freedom and economic growth. The authors find evidence of bi-directional causality, i.e., that economic freedom Granger-causes the level of economic growth and that economic growth Granger-causes economic freedom. Gwartney, Lawson and Holcombe (1999) examine the importance of market institutions and economic freedom as prerequisites for

growth demonstrating that economic freedom is a significant determinant of economic growth, even when human capital, physical capital, and demographic considerations are taken into account. Powell (2003) analyzes the relationship between freedom and economic growth in Ireland, finding that as economic freedom increased, Ireland grew more rapidly. Reforms following Ireland's fiscal crisis slashed the government's role in the economy, reduced large government budget deficits and tax rates, and improved the institutional environment in which entrepreneurs operate, thereby elevating the pace of economic growth. Cole (2003) evaluates the impact of economic freedom on economic growth under alternative theoretical frameworks. He finds that economic freedom was robust with respect to major changes in all the model specifications and concludes that economic freedom was a significant factor in economic growth, regardless of the basic theoretical framework of analysis. Easterly (2011) finds that by examining many examples of rapid economic growth in both autocracy and democracy, democracy does significantly better than autocracy at reducing shocks from outside the political system and thus freedom is more important in producing growth than even good autocratic leadership.

Despite considerable variations in the modeling of economic growth, in the study periods, and in the geographic contexts among these various studies, economic freedom appears to play a consistently significant role in elevating that growth. This generalization is predicated presumably upon the argument that increased economic freedom elevates the growth/pace of economic activity through incentives to work, invest, save, hire/dismiss, make market-based business decisions, and participate in risk-reward behavior in a market-based economy.

The present study focuses on a similar, but not identical potential impact of higher economic freedom levels, namely, real income *levels*. Alternatively stated, this study focuses upon the impact of economic freedom (as well as tax burdens and regulatory quality) on the standard of living in a nation. In this study, the latter is measured in this study as the level of purchasing-power-parity (*ppp*) adjusted per capita real GDP in the nation, or simply, per capita real GDP. Although the existing literature in fact does to a limited extent focus on the effect of higher levels of economic freedom on real income levels, this is not the primary focus of the majority of the related literature. In contrast to the vast majority of the economic freedom-economic outcomes literature, this study exclusively investigates the hypothesis that higher levels of overall economic freedom in an economy promote a higher *level* of economic activity and hence yield higher *levels* of per capita real income (GDP) in that economy, *ceteris paribus*. To some extent, this present study principally differs from the existing related literature is that, although focusing on the overall Heritage Foundation (2013) economic freedom index, the present study deconstructs that overall economic freedom index to create an eight-component rather than ten-component economic freedom measure; for reasons provided below, two Heritage economic freedom measures are deleted from the overall measure, namely, fiscal freedom and business freedom. In the pursuit of a broader perspective *and* to compensate for the deletion of fiscal freedom and business freedom, this study also investigates two additional, complementary hypotheses, namely: (1) the higher the total taxation level relative to GDP, the lower the per capita real GDP *level*; and (2) higher quality regulation leads to a higher per capita real GDP *level*.

So as to provide a broad and diverse context for the empirical analysis of these joint hypotheses, unlike most previous related studies, we focus on the member nations of the OECD, consisting of 30 nations over the 2003-2009 study period considered in this paper. This study focuses upon the impacts of the three factors identified above on the standard of living, or simply per capita real GDP, in a nation. Alternatively stated, the present study investigates whether international per capita real GDP differentials are a function of differential levels of economic freedom, differential tax burden levels, and differentials in the quality of government regulation.<sup>1</sup> The study period runs from 2003-2009 and, based on Hausman (1978), encompasses a balanced panel dataset estimated 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. FRAMEWORK OF ANALYSIS

In this study, per capita real income is measured by the per capita real GDP *level* in each of the OECD nations over the seven-year study period from 2003 through 2009. Per capita real income, *RPCY*, is an economic variable that parallels, in principle, what have been the foci of most of the more recent related studies on macroeconomic *growth*, namely, the *percentage rate of change* (rather than the *level per se*) of *per capita* real GDP or *the percentage rate of change* of real *GDP* itself (Ali, 1997; Cebula, Clark, and Mixon, 2013; Cole, 2003; Dawson, 1998, 2003; Goldsmith, 1995; Norton, 1998; Tortensson, 1994). The value of per capita real income is made comparable across nations by *PPP* (purchasing-power-parity) adjustments. Given the emphasis in this study

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<sup>1</sup> 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.

on the role of economic freedom in determining per capita real income and hence international 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*,<sup>2</sup> because higher tax burdens reduce disposable income and limit the ability to purchase new goods and services and thereby reduce/restrict the level of economic activity. In addition, per capita real income is hypothesized to be an increasing function of regulatory quality, *REGQUAL*,<sup>3</sup> because high quality regulation interferes less with the efficiency functioning of a market-based economy (Clark, Boettke, and Stringham, 2008; Ugur, 2009; Upadhyaya, Raymond, and Mixon, 1997; Yandle, 2013).

The level of per capita real GDP is also hypothesized to be a function of political stability as well as economic variables such as unemployment rates and *nominal* long term interest rates (*OTHER*). Thus, the basic framework for analysis is initially expressed, as follows:

$$RPCY_{jt} = f(FREEDOM_{njt}, TAXREVGDP_{jt}, REGQUAL_{jt}, POLSTAB_{jt}, OTHER_{jt}) \quad (1)$$

where *RPCY<sub>jt</sub>* is the *level* of the purchasing-power-parity adjusted per capita real income (GDP) in OECD nation *j* in year *t*; *FREEDOM<sub>njt</sub>* refers to the value of the economic

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<sup>2</sup> As explained below, *TAXREVGDP* is adopted in lieu of economic freedom referred to as “fiscal freedom” (The Heritage Foundation, 2013)

<sup>3</sup> As explained below, *REGQUAL* is adopted in lieu of The Heritage Foundation (2013) economic freedom referred to as “business freedom.”

freedom measure (index)  $n$  in nation  $j$  in year  $t$  ( $n=8$  in each of the primary estimations, as explained below);  $TAXREVGDP_{jt}$  is the ratio of *all* taxes in nation  $j$  to the GDP level within nation  $j$  in year  $t$ , expressed as percent;  $REGQUAL_{jt}$  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  $t$ ;  $POLSTAB_{jt}$  is an index that measures the degree of political stability in each nation/region  $j$  in year  $t$ ; and  $OTHER_{jt}$  refers initially to the values of fundamental expressly economic control variables, namely, the unemployment rate and the nominal *long term* interest rate, in nation  $j$  in year  $t$ .<sup>4</sup>

### *2.1 Economic Freedom, Burden of Taxation, and Regulatory Quality*

This study, like much of the previous literature it is based upon, *initially* considers the economic freedom indices developed by The Heritage Foundation (2013). However, an alternative and arguably stronger measure of economic freedom is also considered in the estimates, namely, that computed by Gwartney, Lawson, and Hall (2012) as a “reality test” of the results based on The Heritage Foundation (2013) data. Although, as observed by Hall (2013), the Gwartney-Lawson-Hall measure is not strictly comparable to The Heritage Foundation (2013) measure, especially given the ways in which the latter is modified in this study, the two indices do correlate highly in other research frequently exceeding 0.85 and offer supporting evidence of the freedom hypothesis. Based on the central hypothesis investigated in this study, as stated above, the level of per capita real

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<sup>4</sup> A trend variable is also included in the empirical estimates.

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

Evidence in various forms of a positive impact of economic freedom on the level of per capita income can be found in certain earlier studies, although the models, study periods, and variables adopted in those studies are quite different from those presented here. These studies include a fundamentally graphical cross-country analysis by Grubel (1997, pp. 289-291, esp. Figure 1) from which he 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. Nissan and Niroomand (2008) find a positive impact of economic freedom on the productivity of labor and infer that this implies that the real wage rate is an increasing function of economic freedom. In addition, 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.<sup>5</sup>

The present study extends these earlier studies in a variety of ways. To begin with, this study differs with most prior studies by focusing on the OECD nations. In addition, it estimates a balanced seven-year (2003 through 2009) panel dataset by fixed effects. Furthermore, for half of the estimates provided here, the present study constructs an overall average measure of economic freedom which expressly discards two of the ten Heritage Foundation (2013) economic freedoms, namely, fiscal freedom and business

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<sup>5</sup> Other studies, including Cole (2003) address real income levels, although only secondarily, focusing primarily upon economic growth.

freedom, primarily because of the multi-collinearity problems their presence creates and partly to replace them with arguably better variables to measure what the fiscal freedom and business freedom 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. In addition, the present analysis provides modest testing for validity and consistency of results in the forms of linear, linear-log, and log-log estimates. Finally, this study also introduces a number of *de facto* economic control variables and a *de facto* political control variable.<sup>6</sup>

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 (Abrams and Schmitz, 1978; Carlson and Spencer, 1975; Cebula, 1978). This economic freedom is labeled *HECFRI*.

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)

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<sup>6</sup> Also, a trend variable is included in all of the estimates and two of the estimates include a dummy/binary variable for G8 nations.

has a negative impact on the ability of individuals and firms to pursue their economic goals (Heritage Foundation, 2013). This economic freedom is denoted 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 referred to here as *HECFR3*.

The investment freedom index is greater in a nation with (1) fewer restrictions on foreign investment, (2) fewer restrictions that tend to limit capital inflows and outflows, and (3) fewer 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 referred to here 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 *HECFR5*.

Secure property rights provide citizens the confidence to engage in entrepreneurial activities, including commercial activities, saving, investing, and risk taking. The ability to accumulate private property is a primary motivation, if not *the* primary motivation, for participation 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 referred to here as *HECFR6*.

Political corruption by public officials manifests itself in many forms, including bribery, extortion, embezzlement, and graft. As such, political corruption enables certain public officials to steal or otherwise profit illegitimately from public funds and/or the abuse of political power. 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 it endeavors to measure 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). This economic freedom is referred to here as *HECFR8*.

The fiscal freedom index (Heritage Foundation, 2013) reflects the freedom of individuals, households, 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 identified as *HECFR10*.

Out of the ten economic freedoms described above, two, namely, *HECFR9* and *HECFR10*, are of particular 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 (2013) 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 average* economic freedom measure based on the Heritage Foundation (2013) indices,

$HFFREEDOM_{jt}$ , as the average of the economic freedoms described above, where  $n$  denotes the  $n$ th economic freedom:

$$HFFREEDOM_{jt} = \frac{\sum_{n=1}^8 HECFR_{njt}}{8}, j=1, \dots, 29 \text{ for } t=2003, \dots, 2009 \quad (2)$$

The principal reason for defining the overall freedom index *without fiscal freedom (HECFR9) included* is that *HECFR9* is highly correlated ( $r = 0.767$ ) with *government size freedom, HECFR1*, and therefore introduces a multi-collinearity problem. In addition, however, it is noteworthy that the *HECFR9* index is constructed in part with an arguably excessive focus on just the *top* corporate and personal income tax brackets so that it may *potentially* fail to provide a systematic and purely objective 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 numerous other tax forms besides income taxation that arguably must be systematically considered when quantifying fiscal freedom. Accordingly, *HECFR9* is replaced with a simple measure of the overall tax burden in each of the OECD nations, *TAXREVGDP<sub>jt</sub>*. 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  $j$  in year  $t$  expressed as a percent of GDP, and on the other hand, it is not highly correlated with *HECFR9* ( $r = 0.392$ ). In the spirit of *HECFR9*, it is of course expected that real per capita income is a *decreasing* function of *TAXREVGDP*, *ceteris paribus* (Clark and Lawson, 2008; Yandle, 2013).

The most fundamental reason for defining the overall freedom index with *business freedom (HECFR10) excluded* is the simple fact that this economic freedom

measure, whose principal component is government regulation, is highly correlated ( $r = 0.632$ ) with investment freedom. 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 *HECFR10* the variable described as “regulatory quality” by the World Bank Institute (2012, p. 1). This regulatory quality variable, expressed by the symbol *REGQUAL<sub>jt</sub>* 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. 9). It is hypothesized that the greater/the higher the degree of regulatory quality in nation *j* in year *t*, *REGQUAL<sub>jt</sub>*, the greater the level of economic activity and hence the greater the level of per capita income (GDP) in nation *j* in year *t*, *ceteris paribus* (Upadhyaya, Raymond, and Mixon, 1997; Ugur, 2009; Yandle, 2013).

## *2.2 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 average percentage unemployment rate in country *j* in year *t* (*UR<sub>jt</sub>*) and the average nominal *long term* rate of interest in country *j* in year *t* (*LONGINT<sub>jt</sub>*). 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 that is unemployed, the lower the per capita income, *ceteris paribus*. Next, according to the “conventional wisdom” then, the higher the nominal *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, *ceteris paribus*. Moreover, consumption, particularly consumption of durable goods (including housing), is likely also a decreasing function of the *long term* rate of interest, *ceteris paribus*. Thus, the higher the *long term* interest rate, the lower the level of economic activity and hence the lower the per capita real income/GDP level.

We also introduce a political control variable for each nation, *POLSTAB<sub>jt</sub>*, which is an index of political stability and the absence of violence in those nations. 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 (World Bank Institute, 2012, p. 9) and thereby should act, *ceteris paribus*, to elevate per capita real income. Finally, the non-linear trend variable, *TR*, is included to account for trending of variables/data over the seven-year study period. Interestingly, the use of a linear trend rather than a non-linear trend does not influence the conclusions and essentially leaves the actual estimation results unchanged.

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<sub>t</sub>*, 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 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 Institute, 2012, p. 9). From a different perspective, to illustrate how statistically unrelated these two variables are, the zero-order correlation coefficient between them is nearly 0, i.e.,  $r = 0.068$ .

### 3. LINEAR FIXED EFFECTS PLS ESTIMATION RESULTS

Predicated upon the eclectic framework of per capita real income/GDP determination described above, the following model is to be estimated *initially*:<sup>7</sup>

$$RPCY_{jt} = f(HFFREEDOM_{jt}, REGQUAL_{jt}, TAXREVGDP_{jt}, POLSTAB_{jt}, UR_{jt}, LONGINTR_{jt}, TR) \quad (3)$$

where it is hypothesized that:

$$f_{HFFREEDOM} > 0, f_{REGQUAL} > 0, f_{TAXREVGDP} < 0, f_{POLSTAB} > 0, f_{UR} < 0, f_{LONGINTR} < 0 \quad (4)$$

Data for each of the economic freedom variables/indices (*HFFREEDOM*) 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 *LONGINTR* (the percentage *nominal* average annual *long term* interest rate yield) were obtained from the OECD (2013); and data for the governance indices for regulatory quality (*REGQUAL*) and political stability (*POLSTAB*) were obtained from the World Bank Institute (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.<sup>8</sup>

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<sup>7</sup> *HFFREEDOM*<sub>jt</sub> is adopted as the symbol for the *overall average level of economic freedom* based on The Heritage Foundation (2013) indices. In subsequent estimations, i.e., in half of the estimations presented here, an alternative measure of economic freedom based on Gwartney, Lawson, and Hall (2012), *GLHECFREEDOM*, is substituted for *HFFREEDOM*<sub>jt</sub>.

<sup>8</sup> A complete dataset for Iceland was unavailable, so that only 29 of the 30 member OECD nations over the study period could be studied through 2009.

Equation (3), which is expressed initially in linear form, was estimated by PLS (panel least squares), first using the random effects model and then using the fixed effects model. In this linear specification, a Hausman specification test (Hausman, 1978) was performed, and it generated a  $t$ -statistic with a  $p = 0.0419$ , so that the study adopted the fixed effects model.

Equation (3) is initially estimated in linear form, adopting the White (1980) cross-section correction.<sup>9</sup> These results are provided in column (a) of Table 2, where all six of the estimated coefficients for the non-trend variables 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 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 *nominal* long term interest rate. Thus, for example, bearing in mind that the mean of  $HFFREEDOM_{jt}$  is 69.96, 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

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<sup>9</sup> All of the estimations in this study adopt the White (1980) cross-section heteroskedasticity correction.

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.

The estimate in column (a) of Table 2 is predicated upon Heritage Foundation (2013) measures of economic freedom. As a modest initial test of the potential robustness 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. This second model specification is not intended to substitute for the first in any way but simply to serve as a relatively approximate reality check on the validity and consistency of the first. The only difference between the specification of this alternative model and that considered in column (a) of Table 2 is the measure of economic freedom. In particular, the economic freedom index *HFFREEDOM* from The Heritage Foundation (2013) is replaced by the overall measure of economic freedom from Gwartney, Lawson, and Hall (2012), *GLHECFREEDOM*. In principle, the two economic measures *HFFREEDOM* and *GLHECFREEDOM* 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 *HFFREEDOM* index is 69.96 whereas that for the *GLHECFREEDOM* index is 7.52. In practical terms, what this implies is that should the coefficient on *GLHECFREEDOM* be statistically significant, its coefficient could be much larger than that for *HFFREEDOM*. This is at least in part because in, say, a linear estimation, a one unit increase in *GLHECFREEDOM* implies approximately a 13.3% higher degree of overall economic freedom, whereas a one unit

increase in *HFFREEDOM* would be approximately 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 *HFFREEDOM* index of economic freedom replaced in *half* of the estimations by the *GLHECFREEDOM* 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  $p < 0.05$  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 during the 2003-2009 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 nominal long term interest rate. In this estimate, a one unit increase in the Gwartney, Lawson, and Hall (2012) 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 overall economic freedom index supplied by Gwartney, Lawson, and Hall (2012),

*GLHECFREEDOM*, than is the case with The Heritage Foundation index (\$348). As observed above, however, much of this differential response reflects the fact that a one unit increase in the *GLHECFREEDOM* index (mean = 7.52) is a 13.3% increase in overall economic freedom, as opposed to a one unit increase in the *HFFREEDOM* index (mean=69.96), 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.

#### 4. LINEAR-LOG AND LOG-LOG ESTIMATIONS

The initial results provided in Table 2 indicate support for the central hypotheses being investigated here, namely, that per capita real income is an increasing function of economic freedom (as reconfigured in this study) and regulatory quality and a decreasing function of the burden of taxation. To provide further evidence of the credibility and potential validity of these results, two additional sets of findings are to be considered. The first set of findings 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 group of estimates consider an additional control variable to yet 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, Lawson, and Hall (2012) 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 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 *nominal* 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. 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; the coefficient on the political stability variable fails to be statistically significant at 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 over the study period is an increasing function of economic freedom and regulatory quality, while being a decreasing function of the tax burden (as well as the unemployment rate and the *nominal* long term interest rate). Meanwhile, the coefficient of determination ( $R^2$ ) implies that the model explains nearly two-thirds of the variation in the dependent variable, per capita real income, and the  $F$ -ratio is statistically significant at the 1% level.

Overall, aside from the result for the political stability variable, these results are compatible with those in Table 2, as well as those in column (a) of Table 3. In other words, of greatest relevance, the findings for the economic freedom, taxation, and regulatory quality variables receive further validation from the linear-log results shown in column (b) of Table 3.

Finally, the log-log estimations are considered. 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, Lawson, and Hall (2012) 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.<sup>10</sup> 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 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.<sup>11</sup> 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. The  $F$ -ratio is again statistically significant at the 1% level; indeed, as shown in Table 4, the  $F$ -statistic is statistically significant in all of the estimates, just as it is in Table 2 and 3.

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<sup>10</sup> Technically, these “coefficients” are actually elasticity values.

<sup>11</sup> There are also negative impacts from the unemployment rate and the *nominal* long term interest rate.

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 *nominal* long term interest rate that fails to be statistically significant at even the 10% level. 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 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).<sup>12</sup> 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.

As a final test of the potential validity 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 higher productivity labor 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 *HFFREEDOM* measure of economic freedom and column (d) adopts the *GLHECFREEDOM* measure of

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<sup>12</sup> There is also a positive impact from political stability and a negative impact from unemployment.

economic freedom. In column (b), all seven of the estimated non-trend coefficients exhibit the expected signs, with five statistically significant at the 1% level, one statistically significant at the 2.5% level, and one is statistically significant at the 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. 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 *nominal* long term interest rate. Clearly, among other things, this estimate provides strong support for the three central 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 four statistically significant at the 1% level and two 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. 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 also provides strong support for the three main 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 not only are statistically significant for the most part but also include the additional *G8DUMMY* control variable, which also is statistically significant. According to the findings in column (b), a 1% higher level of economic freedom (as measured by *HFFREEDOM<sub>jt</sub>*) 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 *GLHECFREEDOM*) implies that the per capita real income level will be 1.76% higher.<sup>13</sup> These results both 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 both strongly support our hypothesis that the *level* of per capita real income is an increasing function of regulatory quality.

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 0.38%, 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 tax burden in an economy.

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<sup>13</sup> A stronger impact resulting from the *GLHECFREEDOM* variable than from the *HFFREEDOM* variable is expected based at least in part on the discussion earlier in this paper and is consistent with the other results in Tables 2, 3, and 4. On the other hand, the *GLHECFREEDOM* index might simply also be more efficient than the *HFFREEDOM* index.

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 approximately 0.17% and 0.21%, 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 *nominal* 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, where 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 AND CONCLUSIONS

The standard of living in a nation is measured in this study as the level of purchasing-power-parity (*ppp*) adjusted per capita real GDP in the nation. Using this definition, this study of the impacts of economic freedom, regulatory quality, and taxation on the *level* of per capita real GDP among OECD nations over the 2003-2009 period adopts a modified version of the *overall* economic freedom index computed by The Heritage Foundation (2013), with the fiscal freedom and business freedom indices removed, and provides PLS fixed effects estimates for linear, linear-log, and log-log specifications. The estimations in this study all provide strong support for the three central hypotheses considered here, namely: (1) the higher the overall degree of economic freedom (as modified here), 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). A rudimentary reality check that adopts fixed-effects estimations involving the overall economic freedom index by Gwartney, Lawson, and Hall (2012) provides crude support for these three basic findings.

Naturally, these conclusions are at least somewhat preliminary. Alternative specifications involving additional or different variables (including different control variables) could yield broader, if not more compelling, insights. In addition, perhaps the adoption/study of alternative datasets and/or additional years needs to be considered and estimated. Thus, although these results 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
<i>RPCY</i>	27,838	12,304
<i>HFFREEDOM</i>	69.96	8.28
<i>REGQUAL</i>	1.36	0.54
<i>TAXREVGDP</i>	35.9	7.42
<i>POLSTAB</i>	0.776	0.57
<i>UR</i>	6.97	3.66
<i>LONGINTR</i>	4.97	2.39
<i>GLHECFREEDOM</i>	7.52	0.55
<i>G8DUMMY</i>	0.24	0.43

**Table 2.** Linear Estimates (Fixed Effects)

Dependent Variable: *RPCY*

Economic Freedom Measure: Heritage Foundation      Gwartney-Lawson-Hall

Explanatory Variables	(a)	(b)
<i>HFFREEDOM</i>	348.5** (2.43)	-----
<i>GLHECFREEDOM</i>	-----	7,857.4*** (3.75)
<i>REGQUAL</i>	382.4*** (7.18)	398.5*** (7.42)
<i>TAXREVGDP</i>	-247.7** (-2.28)	-373.9*** (-3.45)
<i>POLSTAB</i>	98.5*** (2.66)	110.8*** (3.12)
<i>UR</i>	-691.7* (-2.04)	-700.9*** (-3.46)
<i>LONGINTR</i>	-1,564*** (-2.66)	-2,125*** (-5.68)
<i>TR</i>	-1,310 (-1.51)	-290 (-0.37)
<i>Constant</i>	-1,852 (-0.16)	-33,417 (-1.92)
$R^2$	0.65	0.71
adj $R^2$	0.62	0.68
<i>F</i>	20.9***	27.1***

\*\*\*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: Heritage Foundation    Gwartney-Lawson-Hall

Explanatory Variables	(a)	(b)
<i>Log HFFREEDOM</i>	24,501*** (2.65)	-----
<i>Log GLHECFREEDOM</i>	-----	36,260* (2.13)
<i>Log REGQUAL</i>	19,513*** (7.11)	11,156*** (4.31)
<i>Log TAXREVGDP</i>	-11,584*** (-2.96)	-8,885* (-1.99)
<i>Log POLSTAB</i>	6,393* (2.10)	1,413 (0.61)
<i>Log UR</i>	-6,460** (-2.34)	-7,407*** (-3.56)
<i>Log LONGINTR</i>	-6,665*** (-2.94)	-12,431*** (-5.03)
<i>TR</i>	-1,300 (-1.48)	274 (0.29)
<i>Constant</i>	-119,102** (-2.29)	-35,673 (-0.77)
<i>R</i> <sup>2</sup>	0.64	0.64
adj <i>R</i> <sup>2</sup>	0.61	0.61
<i>F</i>	20.1***	20.2***

\*\*\*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:

	<u>Heritage Foundation</u>		<u>Gwartney-Lawson-Hall</u>	
	(a)	(b)	(c)	(d)
Explanatory Variables				
<i>Log HFFREEDOM</i>	0.83** (2.31)	0.89*** (2.61)	-----	-----
<i>Log GLHECFREEDOM</i>	-----	-----	1.73*** (2.62)	1.76*** (2.74)
<i>Log REGQUAL</i>	1.02*** (7.38)	1.02*** (7.30)	1.23*** (7.96)	1.18*** (8.04)
<i>Log TAXREVGDP</i>	-0.42*** (-2.70)	-0.38** (-2.53)	-0.56*** (-2.62)	-0.45** (-2.28)
<i>Log POLSTAB</i>	0.16 (1.54)	0.17* (1.98)	0.21* (1.99)	0.21** (2.40)
<i>Log UR</i>	-0.19*** (-2.63)	-0.19*** (-2.68)	-0.17** (-2.33)	-0.19*** (-2.77)
<i>Log LONGINTR</i>	-0.41*** (-3.51)	-0.34*** (-2.96)	0.044 (0.56)	0.001 (0.03)
<i>G8DUMMY</i>	-----	0.16*** (3.31)	-----	0.24*** (5.10)
<i>TR</i>	-0.06** (-2.58)	-0.06** (-2.40)	-0.02 (-0.79)	-0.02 (-0.60)
<i>Constant</i>	4.3** (2.36)	3.7* (2.09)	2.99 (1.85)	2.7 (1.80)
<i>R</i> <sup>2</sup>	0.77	0.79	0.79	0.81
adj <i>R</i> <sup>2</sup>	0.75	0.76	0.77	0.79
<i>F</i>	38.1***	35.2***	41.8***	41.4***

\*\*\*statistically significant at 1% level; \*\*statistically significant at 2.5% level;  
\*statistically