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A Random Walk to Economic Freedom?

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Abstract

Given the wide use of economic freedom in economic literature it is imperative to understand how economic freedom evolves. Results suggest that levels of economic freedom are dominated by random shocks. Using a test for stationarity devised by Westerlund and Larsson (2012) we are unable to reject the null hypothesis of a random walk. The changes to economic freedom also are mostly driven by random shocks with only a minor role played by country specific characteristics. Additionally, changes to economic freedom are partially reversed as increases (decreases) in one year are partially offset by decreases (increases) in the next year.

JEL Classification: P5, P00, H1

Keywords: economic freedom index, random walk, growth

1. Introduction

What causes economic growth has been a perennial question in economic theory dating back at least to Adam Smith. In response to the claim that freedom is related to economic growth, indices that measure economic freedom have been developed and the role of freedom in determining economic growth has been investigated extensively. While there is a great deal of research on the relationship between economic freedom and economic growth there are only a few studies on the underlying causes of economic freedom.

The major shortcoming in the literature is that economic freedom is often used as an independent variable but only rarely, and recently, used as a dependent variable. In this study, we wish to bridge this gap in the literature by attempting to forecast changes to economic freedom with a variety of potential determinants. Because changes to economic freedom are so poorly understood much of the literature has ambiguous results regarding the impact of economic freedom on economic growth or other characteristics. By forecasting economic freedom we can avoid endogeneity issues and establish causation instead of correlation.

To determine the causes of economic freedom we establish a modeling framework to forecast economic freedom using economic fundamentals of the underlying economy. This is notably different from other research which tries to examine the historical and cultural environments of the economies to determine their level of economic freedom. Because the historical/cultural environment is already determined, we choose to examine the *evolution* of economic freedom instead. Initial levels of observed economic freedom may be highly impacted by past events, cultural aspects and colonial history but what causes economic freedom to *change*?

Brown and Alm (2006) show that most of the world's proven oil lies in countries with less economic freedom. Is this another resource curse? Do countries with a growing mining/oil industries lose economic freedom? Cavalcanti and Tavares (2008)

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show that lower prices for household appliances causes an increase in the rate of female labor force participation. If countries have increased access to household appliances, or other relevant goods, then is more economic freedom demanded?

Using the Economic Freedom Index of the World from the Heritage Foundation we show that changes to economic freedom are difficult to forecast. We also see that levels of economic freedom follows a near random path. The literature suggests that economic freedom is correlated with development and economic growth. If economic growth follows a random pattern, as suggested by Easterly et al (1993), then economic freedom may also be highly random. Empirically, new methodologies have been specifically designed to test for unit roots in panel data sets. Given that we examine economic freedom from a forecasting perspective it's important that the prospect of a random walk, at least, be tested (Diebold and Killian, 2000).

With a newly designed method from Westerlund and Larsson (2012) we are unable to reject the hypothesis that *levels* of economic freedom follow a near random walk. Statistically significant determinants of the *changes* of economic freedom from one year to the next are highly dependent on model specification. This suggests that Type I error, accepting a variable as being a significant determinant of economic freedom when it is actually insignificant, is a real possibility. Additionally, statistically significant determinants to changes in economic freedom have very small coefficients and are not very *economically* significant.

One robust result shows that changes to economic freedom are partially reversed; countries with increases of economic freedom in one year are likely to see decreases in the next year. Even controlling for country and time fixed effects the most complete regression specification is capable of forecasting only 20% of the changes to the overall level of economic freedom. We can make no argument that *initial levels* of economic freedom are randomly determined as they may be determined by a confluence of historical and cultural events. However, *ensuing changes* to economic freedom are driven mostly by random shocks. Certainly, the evolution of economic freedom is not likely to stop and the seemingly random shocks may be driven by economic characteristics, cultural factors or the political entrepreneurs described in Leighton and Lopez (2012).

2. Literature

There is an extensive literature on the relationship between growth and economic freedom which in general has found that economic freedom is an important determinant of economic outcomes. Most of the research uses the index created by the Fraser institute. (See Berggren, 2003, for a survey and De Haan et al., 2006, for an example of more recent research.) Much of the earlier research examining the relationship between economic freedom and economic growth has found that economic freedom does make a significantly positive contribution to growth (see Barro and Sala-i-Martin, 1995, Gwartney et al., 1996, among others). In addition, many researchers have investigated the components of the freedom index. Heckelman and Stroup (2000) disaggregated components of the ndex to determine which one or ones contribute to economic growth. Similarly, Carlsson and Lundström (2002) decomposed components of the economic freedom index (EFI) to see which aspects of economic freedom impact growth.

However, it has become increasingly recognized that econometric analysis of the relationship between economic growth and economic freedom may be plagued by concerns of endogeneity. Do greater levels of economic freedom portend faster growth?

Or do countries that grow more quickly choose to acquire more economic freedom? Are both directions of causation true? The literature draws mixed conclusions. DeHaan and Sturm (2000) found that changes in economic freedom are more relevant than the actual level of economic freedom in explaining growth. A number of other researchers have investigated whether the level of economic freedom or changes are more important. (See Dawson 1998, Gwartney at al., 1999 for earlier examples.) Heckelman and Knack (2009) commented that often in this line of research the change in economic freedom and growth are measured over the same time period thus introducing possible endogeneity. They address the endogeneity problem by using lagged variables.

As De Haan et al. (2006) note, there were few studies up till that time that deal with the causes of economic freedom. Since then, Heckelman and Knack (2009), for example, investigate how foreign aid affects economic freedom but are unable to find a robust relationship. Shirazi et al. (2009) used the economic freedom index as a dependent variable determined by ICT (information communication technology) and a vector of control variables including GDP growth, regulation and education.

Rather than specify the determinants of economic freedom, a number of papers looked at Granger causality. Farr et al. (1998) used a Granger causality analysis to investigate the relationship between economic freedom, political freedom, and GNP. With respect to economic freedom they concluded that freedom Granger causes greater average GNP and vice versa. Heckelman (2000) continued in the same vein and found that some components of economic freedom Granger cause growth but not the other way round in the short run. Dawson (2003) decomposed the economic freedom index and found that several of the components are Granger caused by growth, while others Granger cause growth. Thus, there is sufficient evidence to warrant concluding that economic freedom is an endogenous variable. Other researchers over the years have also addressed the endogeneity issue; Faria and Montesinos (2009), Sturm and de Haan (2001), Scully (2002), and Vega-Gordillo and Álavrez-Arce (2002) to name a few.

In this paper, we choose to examine a variety of economic outcomes, in addition to growth, to determine what may impact the evolution of economic freedom or if economic freedom evolves randomly. Beck and Katz (2011) warn against testing for unit roots in political science panel data sets. The authors suggest that random walk tests are inappropriate for most political science variables for two reasons. One, political science variables tend to be bounded (as is economic freedom which falls between 0 and 100) unlike GDP growth or nominal exchange rates. Two, the traditional unit root tests for political science variables, which typically have a short time dimension, have very low power.

The first concern is real but as noted in Cavaliere and Xu (forthcoming) the hypothesis of a unit root in traditional tests is *over-rejected* in bounded time series variables. Thus, testing for a unit root in economic freedom will, if anything, be biased in finding a non-random process where a random process exists. The second concern is also reparable; in this study we implement a new unit root test by Westerlund and Larsson (2012) which uses a random coefficients model specifically designed for panel data sets and is highly resilient to serial correlation which is usually difficult to identify with a short time series.

In this study we examine the determinants of economic freedom by forecasting future economic freedom on the basis of past economic characteristics. We use this approach to avoid concerns of endogeneity which, as noted, plague research involving economic freedom; simply, a forecasting approach allows us to determine *causation* not

merely correlation. As noted in Diebold and Killian (2000) unit root tests are recommended in forecasting applications.

Lastly, within the literature there's a theoretical suggestion that economic freedom could be driven mostly by a random process. A defining feature of random processes is that shocks do not decay over time; which is precisely what we would see if economic freedom causes greater economic growth and vice versa. Imagine a shock to a country's normal economic growth process. A positive shock may result from the discovery of a new mineral resource (like the offshore oil discovery in Brazil) or a negative shock from a natural disaster (similar to the recent earthquake and tsunami in Japan). A positive growth shock would induce greater economic freedom which in turn would create conditions for faster economic growth. This cycle would imply that shocks to economic freedom do not decay over time; which would make economic freedom behave similarly to a random process and worthy of at least conducting a test for stationarity.

3. Data

We choose to analyze the Economic Freedom Index of the World from the Heritage Foundation in the years 1999-2010 for 134 countries. Because some countries lacked trade data from COMTRADE or National Accounts data from the United Nations not all countries in the Heritage index are included in the analysis.

The economic freedom index calculated by the Fraser Institute, which is used in much of the literature, records data from 1970-2000 at five year intervals and then annually after 2000. The Heritage index, begins in 1995 and is calculated annually. The Fraser index has only 9 observations per country, if using the data collected every five years, and if using annual data the Fraser index has a smaller time dimension than the Heritage index because they start collecting the data annually in 2000. We choose to use the Heritage index instead of the Fraser index because of the greater number of forms of economic freedom that they try to measure (10 instead of 5). The overall level of Heritage economic freedom index is composed of business freedom, trade freedom, fiscal freedom, freedom from government spending, monetary freedom, investment freedom, financial freedom, property rights, freedom from corruption and labor freedom. This study examines the overall economic freedom index and 9 of the 10 components (we omit labor freedom because of its shorter time series). Descriptive statistics for the overall level of economic freedom and nine components as well as annual changes are given in Table 1. By examining Table 1 we can observe general characteristics of economic freedom and its components. But what drives changes to economic freedom?

Beach and Kane (2008) give an excellent summary regarding the methodology of the Heritage Foundation to create these measurements of economic freedom. Elements include, but are not limited to, the legal environment for businesses and workers, inflation, fiscal policy and the size of government, various measurements of judicial efficacy and indicators of corruption. But are changes to these elements driven by underlying economic characteristics? Are they merely random chance?

To answer these questions we will empirically search for economic determinants of economic freedom. The potential determinants include the industrial composition of the underlying economy taken from the United Nations National Accounts (for example, the percentage of GDP for a country derived from the various sectors and the size of the country's exports and imports relative to GDP). Because of endogeneity issues all of the potential determinants are lagged by *at least* two years.

Table 1. Descriptive Statistics of Economic Freedom and Components

Levels	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Overall Economic Freedom	60.58	10.46	21.4	90
Business Freedom	64.39	15.53	10	100
Trade Freedom	69.36	13.93	15	95
Financial Freedom	73.05	13.80	29.8	99.9
Freedom from Government Spending	69.03	20.12	3.2	99.3
Monetary Freedom	74.44	13.06	5	95.4
Investment Freedom	52.58	19.80	5	95
Financial Freedom	52.59	20.02	5	95
Property Rights	48.47	24.08	5	100
Freedom from Corruption	41.43	22.21	4	97
Annual Changes	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Overall Economic Freedom	0.15	2.05	-9.9	8.1
Business Freedom	0.17	5.25	-45	27
Trade Freedom	1.34	6.76	-42.2	60
Financial Freedom	0.72	4.05	-28.6	35.4
Freedom from Government Spending	0.01	6.69	-39.2	42.3
Monetary Freedom	-0.23	4.53	-24.5	25
Investment Freedom	-0.32	7.01	-40	25
Financial Freedom	0.03	7.22	-40	40
Property Rights	-0.76	4.92	-40	36
Freedom from Corruption	0.11	4.36	-24	33

Note: Data are taken from the Heritage Foundation 2000-2010

Depken and Sonora (2005) investigated the impact of economic freedom on trade flows. In their conclusion they suggest that future research look into how access to foreign consumer goods influences economic freedom over time. In this study we include trade information of culturally "relevant" goods. The culturally "relevant" nature of the goods we examine are admittedly highly questionable. Cavalcanti and Tavares (2008) show that consumption and availability of household appliances were culturally relevant by inducing more women to work. It may very well be true that changes in the consumption of some imported goods portend changes to economic freedom. From COMTRADE we have included potential determinants of economic freedom such as imports of alcoholic beverages (SITC Revision 2: 112), household appliances (697), photo and film equipment (881), electrical generators (7161 and 7162), non-monetary gold (9710), film and movie media (883), pesticides (591), printed media (892), radios (762), soap (554), stationary (6422) and televisions (761). Each culturally "relevant" imported good is measured with respect to the size of importing country's GDP. Because there are no great theoretical underpinnings for the culturally "relevant" goods that we have included, we don't necessarily *expect* to find that these imported goods determine future levels of economic freedom. However, the culturally "relevant" variables are included in our analysis in order to find *any* evidence for cultural determinants of the evolution of economic freedom. Or potentially, to rule out culturally "relevant" goods from impacting changes to economic freedom.

4. Results

We begin the analysis of economic freedom using the simple AR(1) process below.

$$EF_{i,t} = \propto + \beta EF_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

$EF_{i,t}$ is the level of economic freedom for country *i* at time *t*. The regression in Eq. 1 is run for the overall level of economic freedom as well as nine of its component parts. Results are given in Table 2.

Table 2. AR(1) results for Economic Freedom and Components

Levels	**Overall Economic Freedom**	**Business Freedom**	**Trade Freedom**	
Lagged Level	0.981** (0.0049)	0.968** (0.0087)	0.861** (0.0113)	
Constant	1.293** (0.3001)	2.190** (0.5736)	10.819** (0.7850)	
R-squared	0.9620	0.8866	0.7855	
	Financial Freedom	**Freedom from Government Spending**	**Monetary Freedom**	
Lagged Level	0.935** (0.0070)	0.935** (0.0081)	0.922** (0.0083)	
Constant	5.412** (0.5165)	4.487** (0.5826)	5.573** (0.6311)	
R-squared	0.9182	0.8938	0.8857	
	Investment Freedom	**Financial Freedom**	**Property Rights**	**Freedom from Corruption**
Lagged Level	0.959** (0.0090)	0.931** (0.0088)	0.979** (0.0051)	0.967** (0.0050)
Constant	1.826** (0.5096)	3.676** (0.4977)	0.282 (0.2799)	1.459** (0.2340)
R-squared	0.8764	0.8747	0.9588	0.9626

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Standard errors are given in parenthesis.*

A naïve interpretation is to see a highly autoregressive series. The lagged level of economic freedom is highly significant and the R-squared statistic is quite high. However, the coefficients are perilously close to 1; indicating the potential for a near random walk. Additionally, the coefficient for the lagged level of EF is restricted in Eq. 1 to be the same for all countries. It's likely that the true value of the lagged level of economic freedom is lower than that reported in Table 2 for some countries and greater for others: perhaps equal to one (a random walk) or greater than one (an explosive time series).

One large restriction of the data now becomes very important. While the economic freedom index includes many countries, the time series is too short to conduct a meaningful test for a random walk in each country. To conduct a test for a unit root we make use of a new technique outlined in Westerlund and Larsson (2012) that is specifically designed for panel data sets. The test statistic from Westerlund and Larsson is well suited to panel data sets with a short time dimension because of the test's resilience to serial correlation. With serial correlation, estimates are less efficient because a shock in one period can carry over into future time periods. In data sets with a short time series, like the economic freedom index, it's more difficult to identify serial correlation. However, the random coefficients framework of the Westerlund and Larsson test statistic isn't as susceptible to this problem as other existing techniques. The multistage test examines the autocorrelation of volatility adjusted error terms of an AR(1) regression with separate slope coefficients on the lag for each time series. Specifically, we calculate the LM^{1}_{μ,σ^2} test statistic developed by Westerlund and Larsson; the most stringent test statistics provided in the study suggest that the LM^{1}_{μ,σ^2} test coefficient must be above 4.0 in order to reject the null hypothesis of a unit root at the 95% confidence level. Results of the Westerlund and Larsson the LM^{1}_{μ,σ^2} test can be found in Table 3. In order to calculate the LM^{1}_{μ,σ^2} test statistics many countries without a full set of data from 1999-2010 are dropped in order to create a balanced panel data set. 96 countries remain in the sample.

Table 3. Westerlund-Larsson stationarity test

Levels	**Westerlund-Larsson LM^{1}_{μ,σ^2} test statistic**
Overall Economic Freedom	0.936
Business Freedom	2.391
Trade Freedom	1.769
Financial Freedom	3.159
Freedom from Government Spending	2.260
Monetary Freedom	1.854
Investment Freedom	1.278
Financial Freedom	2.915
Property Rights	3.755
Freedom from Corruption	2.685

Note: In order to disprove that the variable is local to unity at the 95% confidence the LM^{1}_{μ,σ^2} test statistic should be greater than 4.0. Additionally, the number of countries examined was pared down to 96 to create a balanced panel data set required by the test.

As shown in Table 3, the hypothesis of a random walk can't be rejected for the overall level of economic freedom index or any of the nine components tested. The levels of economic freedom appear to be more or less random. As such we choose to analyze the determinants to *changes* in economic freedom as opposed to *levels*. We make use of the following base line regression.

$$\Delta EF_{i,t} = \beta_0 + \beta_1 \Delta EF_{i,t-1} + \beta_\pi \pi_{i,L} + \beta_y y_{i,L} + \beta_E \Delta X_{L,E} + \beta_C \Delta X_{L,M} + \beta_T I_T + \beta_I I_I + \mu_{i,t} \quad (2)$$

$\Delta EF_{i,t}$ is the annual change in the economic freedom index for country *i*. The lagged change in economic freedom is included along with time and country indicators I_T and I_I respectively. The countries average inflation rate and real GDP growth rate ($\pi_{i,L}$ and $y_{i,L}$) are also included. The subscript *L* denotes that these variables are lagged from *t-7* to *t-2*. The same lag structure is used for the economy composition variables ($X_{L,E}$) and the culturally "relevant" imports ($X_{L,M}$)[4].

For both the economy composition variables and the culturally "relevant" imports we measure the *changes* to the variables from *t-7* to *t-2*. The purpose of these lags is to reduce concerns of endogeneity while highlighting the changes to the underlying economy that impact *future* economic freedom, not just correlate to simultaneous changes to economic freedom. Results for Eq. 2 are given in Table 4.

Additional results on the components of economic freedom can be found in the appendix and a summary is included in Table 6.

As shown in Table 4, the negative coefficient for the lagged economic freedom change suggests changes to economic are partially reversed in the next year. In every specification the coefficient on the lagged change of economic freedom is significantly negative; countries that experience an increase (decrease) in economic freedom may later be influenced towards a decrease (increase) in economic freedom. The negative coefficient on the lagged change of economic freedom may result from the measurement error as economic freedom is particularly difficult to quantify. Most other independent variables are statistically insignificant. However, there are some variables that appear statistically significant in multiple specifications. Past real GDP growth rates are positively related to changes in economic growth. This result confirms what has been found in much of the rest of the literature that economic growth and economic freedom are highly correlated.

Other statistically significant factors include imports of household appliances, imports of radios, imports of printed media and imports of pesticides. Cavalcanti and Tavares (2008) suggest that greater access to household appliances increases the supply of female labor and it may be that this increase in female labor also increases the demand for economic freedom. Imports of printed media are associated with decreasing economic freedom while imports of radios increase economic freedom; given that radios allow for greater access to domestic information rather than foreign printed media we could surmise that communication content can impact economic freedom depending on the source of the communication. Increased imports of pesticides reduce the level of economic freedom; it's possible that the pesticide use is a negative externality that is countered by decreases in economic freedom. These explanations may not hold true to greater robustness checks and the effects, though statistically significant, aren't very economically significant. Furthermore, as will be shown in Table 6 there's a large risk of Type I error.

[4] Admittedly, the theoretical relevance of the culturally "relevant" variables is highly debated. Their inclusion is purely to test for any empirical effect not to hypothesize a theory for their importance (or lack thereof).

Table 4. Evolution of Economic Freedom

	Annual Change in Overall EF	**Annual Change in Overall EF**	**Annual Change in Overall EF**	**Annual Change in Overall EF**
Lagged Annual Change	-0.077**	-0.127**	-0.123**	-0.125**
- (t-1)	(0.029)	(0.034)	(0.033)	(0.034)
Average Inflation	-1.480	-1.898	-1.965	-2.300
- Years (t-7) to (t-2)	(1.806)	(2.529)	(2.290)	(2.614)
Average Real GDP growth	5.872*	11.269**	10.141*	10.734*
- Years (t-7) to (t-2)	(3.350)	(5.714)	(5.236)	(5.638)
Agriculture + Fishing		-1.968		-3.443
- % of GDP, Change (t-7) to (t-2)		(4.240)		(4.211)
Mining + Utilities		2.060		1.634
- % of GDP, Change (t-7) to (t-2)		(3.758)		(3.888)
Manufacturing		0.451		0.832
- % of GDP, Change (t-7) to (t-2)		(4.066)		(4.071)
Construction		-2.495		-2.350
- % of GDP, Change (t-7) to (t-2)		(7.213)		(7.291)
Wholesale + Retail trade		-2.047		-3.670
- % of GDP, Change (t-7) to (t-2)		(4.604)		(4.618)
Transportation		7.482		7.749
- % of GDP, Change (t-7) to (t-2)		(5.947)		(5.948)
% of Imports - Homogenous		-2.032		-1.602
- Change (t-7) to (t-2)		(1.992)		(2.020)
% of Imports - Differentiated		-0.483		0.002
- Change (t-7) to (t-2)		(1.512)		(1.539)
% of Exports - Homogenous		-1.249		-0.949
- Change (t-7) to (t-2)		(0.762)		(0.774)
% of Exports - Differentiated		-0.739		-0.460
- Change (t-7) to (t-2)		(0.753)		(0.755)
Investment		1.522		1.255
- % of GDP, Change (t-7) to (t-2)		(1.997)		(2.013)
Government Spending		-3.879		-3.668
- % of GDP, Change (t-7) to (t-2)		(3.719)		(3.760)
Net Exports		0.553		0.747
- % of GDP, Change (t-7) to (t-2)		(1.361)		(1.357)
Total Trade (X+M)		-0.450		-0.600
- % of GDP, Change (t-7) to (t-2)		(0.486)		(0.553)

Table 4 (continued). Evolution of Economic Freedom

Alcoholic Beverages			-71.78	-68.92
- M % of GDP, Change (t-7) to (t-2)			(54.53)	(54.76)
Tobacco			17.39	14.98
- M % of GDP, Change (t-7) to (t-2)			(33.50)	(34.46)
Soap			19.93	20.70
- M % of GDP, Change (t-7) to (t-2)			(76.13)	(77.84)
Pesticides			-192.90**	-172.22*
- M % of GDP, Change (t-7) to (t-2)			(91.70)	(94.08)
Animal Hides			-10.81	-5.43
- M % of GDP, Change (t-7) to (t-2)			(50.19)	(49.17)
Stationary			-259.11	-17.28
- M % of GDP, Change (t-7) to (t-2)			(1,355)	(1,390)
Household Appliances			64.00**	63.27**
- M % of GDP, Change (t-7) to (t-2)			(31.81)	(31.88)
Generators			54.06	55.59
- M % of GDP, Change (t-7) to (t-2)			(35.52)	(36.40)
Televisions			19.53	29.65
- M % of GDP, Change (t-7) to (t-2)			(37.92)	(38.55)
Radios			176.22**	233.44**
- M % of GDP, Change (t-7) to (t-2)			(85.55)	(100.24)
Photo/Cinema Equipment			138.28	136.29
- M % of GDP, Change (t-7) to (t-2)			(86.83)	(90.71)
Movies and Film			-919.40	543.65
- M % of GDP, Change (t-7) to (t-2)			(2,698)	(2,597)
Printed Media			-55.42**	-54.50*
- M % of GDP, Change (t-7) to (t-2)			(26.38)	(29.35)
Musical Instruments			18.26	21.68
- M % of GDP, Change (t-7) to (t-2)			(32.24)	(31.82)
Gold			-20.00	-14.34
- M % of GDP, Change (t-7) to (t-2)			(21.62)	(22.88)
R-Squared	0.1296	0.1771	0.1842	0.1912

*Note: Table continued from the previous page. Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

As shown in the Table 5, if we use the average value of the relevant, statistically significant RHS coefficients, then the impact of a change in these variables by one standard deviation is unable to change the level of overall economic freedom by more than 1. The most economically significant effect is the impact of real GDP growth; a 3% higher growth rate over a 5 year time period is equally to an increase of economic freedom of only 1.

Table 5. Economic Significance of Eq. 2

	Mean	Std. Dev.	Avg. Coef. (Table 4)	Avg. Coef. X Std. Dev.
Average Real GDP growth - Years (t-7) to (t-2)	0.0116	0.0356	9.5	0.338
Household Appliances - M % of GDP, Change (t-7) to (t-2)	0.0001825	0.001812	63.6	0.115
Radios - M % of GDP, Change (t-7) to (t-2)	-0.0000871	0.000562	204.8	0.115
Pesticides - M % of GDP, Change (t-7) to (t-2)	-0.0000215	0.000646	-182.6	-0.118
Printed Media - M % of GDP, Change (t-7) to (t-2)	-0.0000256	0.001954	-55.0	-0.107

Note: Calculation is based off results in Table 4

The annual change in economic freedom remains difficult to forecast. The R-squared statistic denotes the very low explanatory power of the independent variables. Even though country and year indicators are included no specification is able to predict more than 20% of the variation in the evolution of economic freedom despite the inclusion of over 200 explanatory variables. This implies that up to 80% of the changes of economic freedom are either randomly decided or unrelated to the years the data are reported, the countries themselves or their underlying economies[5].

A summary of results for the nine components of economic freedom is given in Table 6. The full results can be found in the online appendix. Eight of the nine components of economic freedom are mean reverting; the coefficient of the lagged term is significantly negative. Past real GDP growth rates significantly impact only changes to business freedom. Other variables related to the composition of the underlying economies or the importation of culturally "relevant" goods are rarely consistently significant. Of the 279 economy composition or culturally "relevant" import coefficients summarized in Table 6, there are only 34 coefficients found to be statistically significant at either the 10% or 5% level; as such, we don't consider these significant coefficients very robust given the very real likelihood of Type I error. Whether examining overall economic freedom or its components, much of the evolution of economic freedom appears highly random.

[5] The adjusted R-squared of the most complete specification is only 0.0486: emphasizing the unpredictability of the evolution of economic freedom. The adjusted R-squared isn't included in Table 4 because we choose instead to include robust standard errors. The adjusted R-squared is calculated using the most complete model without robust standard errors.

Table 6. Summary of Results for Components of Economic Freedom

	Business Freedom	Trade Freedom	Financial Freedom	Freedom from Gov't. Spending	Monetary Freedom	Investment Freedom	Financial Freedom	Property Rights	Freedom from Corruption
Lagged Annual Change	-**	-**	-**	-**		-**	-**	-**	-**
Average Inflation					+**				
Average Real GDP growth	+**								
Agriculture + Fishing						-*			
Mining + Utilities				+**					
Manufacturing					+*				
Construction									
Wholesale + Retail trade					+*				
Transportation	+*						+*		
% of Imports - Homogenous									
% of Imports - Differentiated									
% of Exports - Homogenous					-*				+**
% of Exports - Differentiated				+*				+*	
Investment									
Government Spending	-*		-**			+**		-**	
Net Exports									-*
Total Trade (X+M)						+**			
Alcoholic Beverages								-**	
Tobacco									
Soap					+**			+*	
Pesticides		-**							
Animal Hides									
Stationary								-*	
Household Appliances									-**
Generators	+**	-*		+*					
Televisions			-**			+**			
Radios		+**				+**			
Photo/Cinema Equipment		+**							
Movies and Film			+*						
Printed Media									
Musical Instruments									
Gold					+**				
R-Squared	.1754	.1898	.1751	.1378	.2620	.1677	.0973	.1812	.1722

*Note: "+" denotes a significant, positive coefficient and "-" denotes a significant, negative coefficient. Blank areas denote statistically insignificant coefficients. Significance at the 10% and 5% levels is denoted by * and ** respectively.*

5. Conclusion

The results herein suggest that the evolution of economic freedom is highly random. Initial levels of economic freedom may reflect the aggregation of past historical events and a country's cultural background but ensuing changes are difficult to forecast.

These results mirror those of Easterly et al (1993). The authors suggest that much of a country's economic growth is driven by shocks, while country specific characteristics have much less impact in determining a country's growth rates. For economic freedom, it appears that much of the evolution of economic freedom is driven by random shocks as country specific determinants play only a minor role. However, economic freedom is both difficult to define and difficult to measure. It's entirely possible that much of the year to year change in the level of economic freedom is the result of random measurement error. If this is the case, then the *true* level of economic freedom may not follow a random walk, instead only our *measurement* of economic freedom is random. For the foreseeable future, measurement error will be a major limitation to studying economic freedom as a dependent variable.

The literature has found ambiguous results regarding the relationship between economic freedom and growth or wealth. These ambiguous results are not surprising given the highly random nature of the changes in economic freedom. If a highly random independent variable (like economic freedom levels) is used to explain movement in a mostly random dependent variable (like economic growth) then many different statistical relationships could be found depending on what data is included and the formation of the regression analysis.

Based on our forecasting approach, we find that only business freedom, not the other categories of economic freedom, is increasing with recent economic growth. Indeed, our results imply two practical conclusions. One, econometricians who use economic freedom levels or changes as explanatory variables need not be terribly concerned with endogeneity. If economic freedom is driven mostly by random shocks, and not economic events, then there's little reason to fear endogeneity biases. Two, by simply excluding business freedom, future research on the impact of economic freedom on growth need not be overly concerned about endogeneity.

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Appendix

Table A1. Evolution of Components of Economic Freedom (1 of 3)

	Annual Change in Business Freedom	Annual Change in Trade Freedom	Annual Change in Financial Freedom
Lagged Annual Change	-0.168**	-0.252**	-0.137**
- (t-1)	(0.031)	(0.048)	(0.039)
Average Inflation	5.794	-8.425	-4.705
- Years (t-7) to (t-2)	(6.168)	(7.836)	(5.075)
Average Real GDP growth	46.991**	-6.658	-4.795
- Years (t-7) to (t-2)	(12.417)	(14.057)	(10.433)
Agriculture + Fishing	10.621	-5.664	-3.404
- % of GDP, Change (t-7) to (t-2)	(7.995)	(15.029)	(8.343)
Mining + Utilities	1.775	-13.279	3.932
- % of GDP, Change (t-7) to (t-2)	(7.367)	(13.491)	(6.400)
Manufacturing	-8.297	-4.679	-6.213
- % of GDP, Change (t-7) to (t-2)	(9.538)	(11.827)	(7.416)
Construction	18.424	-6.658	4.381
- % of GDP, Change (t-7) to (t-2)	(15.320)	(23.261)	(11.589)
Wholesale + Retail trade	-2.796	-4.310	5.061
- % of GDP, Change (t-7) to (t-2)	(9.303)	(16.702)	(9.729)
Transportation	28.937*	-21.588	4.893
- % of GDP, Change (t-7) to (t-2)	(16.012)	(21.994)	(12.105)
% of Imports - Homogenous	-4.030	-2.304	2.846
- Change (t-7) to (t-2)	(4.948)	(7.026)	(4.864)
% of Imports - Differentiated	3.425	3.225	4.314
- Change (t-7) to (t-2)	(3.764)	(5.410)	(2.962)
% of Exports - Homogenous	0.580	1.449	-1.337
- Change (t-7) to (t-2)	(2.478)	(2.995)	(1.579)
% of Exports - Differentiated	-2.878	-0.182	-1.310
- Change (t-7) to (t-2)	(2.591)	(3.585)	(1.189)
Investment	-4.331	-1.728	-3.001
- % of GDP, Change (t-7) to (t-2)	(4.335)	(6.410)	(3.768)
Government Spending	-15.382*	-1.077	-19.059**
- % of GDP, Change (t-7) to (t-2)	(8.176)	(13.091)	(7.430)
Net Exports	-0.246	1.847	-3.143
- % of GDP, Change (t-7) to (t-2)	(3.221)	(4.300)	(2.937)
Total Trade (X+M)	-0.481	-0.222	0.486
- % of GDP, Change (t-7) to (t-2)	(1.096)	(1.597)	(1.057)
R-Squared	0.1754	0.1898	0.1751

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

Table A1 – continued. Evolution of Components of Economic Freedom (1 of 3)

	Annual Change in Business Freedom	Annual Change in Trade Freedom	Annual Change in Financial Freedom
Alcoholic Beverages	238.99	117.66	-42.74
- M % of GDP, Change (t-7) to (t-2)	(154.58)	(202.22)	(143.87)
Tobacco	50.55	-27.12	38.12
- M % of GDP, Change (t-7) to (t-2)	(66.60)	(118.67)	(40.74)
Soap	-141.82	-130.14	99.79
- M % of GDP, Change (t-7) to (t-2)	(233.34)	(225.40)	(154.70)
Pesticides	-83.16	-841.84**	-121.64
- M % of GDP, Change (t-7) to (t-2)	(397.53)	(356.84)	(194.39)
Animal Hides	-59.04	-334.62	-31.52
- M % of GDP, Change (t-7) to (t-2)	(213.55)	(212.37)	(86.42)
Stationary	5081.00	54.63	-3218.85
- M % of GDP, Change (t-7) to (t-2)	(4,243.83)	(4,170.51)	(4,038.52)
Household Appliances	107.12	16.10	34.04
- M % of GDP, Change (t-7) to (t-2)	(93.81)	(97.11)	(58.62)
Generators	224.94**	-173.04*	2.62
- M % of GDP, Change (t-7) to (t-2)	(99.00)	(91.86)	(66.62)
Televisions	-8.07	-28.05	-151.09**
- M % of GDP, Change (t-7) to (t-2)	(112.56)	(102.83)	(70.03)
Radios	-166.21	685.75**	132.63
- M % of GDP, Change (t-7) to (t-2)	(272.16)	(307.56)	(168.86)
Photo/Cinema Equipment	-115.55	414.44**	-10.94
- M % of GDP, Change (t-7) to (t-2)	(201.65)	(199.08)	(99.31)
Movies and Film	4794.12	17154.04	8616.48*
- M % of GDP, Change (t-7) to (t-2)	(5,237.18)	(11,089.69)	(5,089.37)
Printed Media	-117.57	-209.09	-40.65
- M % of GDP, Change (t-7) to (t-2)	(87.46)	(151.97)	(66.27)
Musical Instruments	59.81	173.20	-42.91
- M % of GDP, Change (t-7) to (t-2)	(71.18)	(105.73)	(46.03)
Gold	78.43	11.96	-41.62
- M % of GDP, Change (t-7) to (t-2)	(73.82)	(78.04)	(37.38)
R-Squared	0.1754	0.1898	0.1751

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

Table A2. Evolution of Components of Economic Freedom (2 of 3)

	Annual Change in Freedom from Government Spending	Annual Change in Monetary Freedom	Annual Change in Investment Freedom
Lagged Annual Change	-0.172**	-0.017	-0.117**
- (t-1)	(0.044)	(0.040)	(0.029)
Average Inflation	-10.856	11.444**	-14.644
- Years (t-7) to (t-2)	(8.746)	(5.254)	(9.176)
Average Real GDP growth	11.411	5.486	4.717
- Years (t-7) to (t-2)	(19.203)	(13.994)	(21.724)
Agriculture + Fishing	-7.817	-7.346	-24.863*
- % of GDP, Change (t-7) to (t-2)	(14.373)	(9.785)	(14.311)
Mining + Utilities	31.486**	-5.737	-9.730
- % of GDP, Change (t-7) to (t-2)	(14.870)	(9.547)	(13.040)
Manufacturing	-5.567	14.251*	-7.504
- % of GDP, Change (t-7) to (t-2)	(15.190)	(7.878)	(13.949)
Construction	11.555	-8.385	-10.954
- % of GDP, Change (t-7) to (t-2)	(24.343)	(17.341)	(25.835)
Wholesale + Retail trade	-0.781	20.956*	-18.579
- % of GDP, Change (t-7) to (t-2)	(16.702)	(11.750)	(15.741)
Transportation	-3.232	-9.127	-3.792
- % of GDP, Change (t-7) to (t-2)	(23.795)	(14.794)	(21.828)
% of Imports - Homogenous	4.175	1.820	-10.442
- Change (t-7) to (t-2)	(7.448)	(4.250)	(7.036)
% of Imports - Differentiated	3.934	-1.615	-6.391
- Change (t-7) to (t-2)	(5.456)	(3.415)	(5.465)
% of Exports - Homogenous	-4.585	-3.310*	2.254
- Change (t-7) to (t-2)	(3.157)	(1.948)	(3.046)
% of Exports - Differentiated	4.596*	-1.201	-2.681
- Change (t-7) to (t-2)	(2.779)	(1.649)	(2.705)
Investment	-4.400	-0.596	3.290
- % of GDP, Change (t-7) to (t-2)	(8.056)	(4.612)	(7.289)
Government Spending	-18.698	-3.180	38.939**
- % of GDP, Change (t-7) to (t-2)	(12.671)	(8.063)	(13.254)
Net Exports	-1.241	0.013	6.661
- % of GDP, Change (t-7) to (t-2)	(5.822)	(3.143)	(5.124)
Total Trade (X+M)	-2.207	-0.954	-4.577**
- % of GDP, Change (t-7) to (t-2)	(2.102)	(1.337)	(1.987)
R-Squared	0.1378	0.262	0.1677

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

Table A2 – continued. Evolution of Components of Economic Freedom (2 of 3)

	Annual Change in Freedom from Government Spending	Annual Change in Monetary Freedom	Annual Change in Investment Freedom
Alcoholic Beverages	-183.21	72.19	-216.83
- M % of GDP, Change (t-7) to (t-2)	(251.47)	(172.79)	(204.37)
Tobacco	-81.32	21.33	64.81
- M % of GDP, Change (t-7) to (t-2)	(107.80)	(66.43)	(60.54)
Soap	159.94	430.39**	-175.25
- M % of GDP, Change (t-7) to (t-2)	(319.08)	(169.67)	(295.98)
Pesticides	149.71	96.43	-476.35
- M % of GDP, Change (t-7) to (t-2)	(257.90)	(202.59)	(355.67)
Animal Hides	12.96	53.86	-16.52
- M % of GDP, Change (t-7) to (t-2)	(152.39)	(127.39)	(195.38)
Stationary	3471.21	-3726.20	7823.67
- M % of GDP, Change (t-7) to (t-2)	(4,493.68)	(3,933.69)	(6,224.92)
Household Appliances	117.55	-58.95	74.42
- M % of GDP, Change (t-7) to (t-2)	(102.17)	(65.09)	(119.80)
Generators	180.43*	-53.20	272.47
- M % of GDP, Change (t-7) to (t-2)	(105.37)	(78.18)	(179.34)
Televisions	61.10	53.82	292.67**
- M % of GDP, Change (t-7) to (t-2)	(118.85)	(84.31)	(131.04)
Radios	343.09	-168.48	957.23**
- M % of GDP, Change (t-7) to (t-2)	(338.37)	(250.88)	(465.23)
Photo/Cinema Equipment	-112.94	204.16	170.97
- M % of GDP, Change (t-7) to (t-2)	(210.38)	(152.05)	(202.71)
Movies and Film	-16783.46	-4816.47	3376.80
- M % of GDP, Change (t-7) to (t-2)	(10,203.34)	(5,777.43)	(9,350.71)
Printed Media	-8.99	38.33	-101.56
- M % of GDP, Change (t-7) to (t-2)	(82.61)	(79.98)	(105.65)
Musical Instruments	-69.22	13.44	-63.86
- M % of GDP, Change (t-7) to (t-2)	(94.53)	(63.83)	(92.86)
Gold	-11.86	89.58**	-7.74
- M % of GDP, Change (t-7) to (t-2)	(66.56)	(44.56)	(114.44)
R-Squared	0.1378	0.262	0.1677

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

Table A3. Evolution of Components of Economic Freedom (3 of 3)

	Annual Change in Financial Freedom	Annual Change in Property Rights	Annual Change in Freedom from Corruption
Lagged Annual Change	-0.083**	-0.196**	-0.113**
- (t-1)	(0.031)	(0.035)	(0.032)
Average Inflation	-4.909	3.871	-6.293
- Years (t-7) to (t-2)	(9.971)	(6.215)	(5.208)
Average Real GDP growth	12.488	15.266	17.123
- Years (t-7) to (t-2)	(17.729)	(13.553)	(11.550)
Agriculture + Fishing	2.114	-2.518	0.639
- % of GDP, Change (t-7) to (t-2)	(14.799)	(8.918)	(8.301)
Mining + Utilities	3.680	2.368	-3.655
- % of GDP, Change (t-7) to (t-2)	(11.091)	(8.691)	(8.977)
Manufacturing	16.010	12.978	-8.956
- % of GDP, Change (t-7) to (t-2)	(14.260)	(8.545)	(8.119)
Construction	2.117	-15.215	-4.475
- % of GDP, Change (t-7) to (t-2)	(27.540)	(17.401)	(15.352)
Wholesale + Retail trade	-12.505	2.019	-9.397
- % of GDP, Change (t-7) to (t-2)	(17.320)	(12.937)	(9.709)
Transportation	43.814*	-0.521	3.792
- % of GDP, Change (t-7) to (t-2)	(23.240)	(15.517)	(14.145)
% of Imports - Homogenous	0.045	2.344	-1.183
- Change (t-7) to (t-2)	(7.135)	(5.391)	(4.785)
% of Imports - Differentiated	1.958	5.061	-2.480
- Change (t-7) to (t-2)	(4.948)	(4.412)	(4.393)
% of Exports - Homogenous	-2.537	-0.547	-5.718**
- Change (t-7) to (t-2)	(3.230)	(2.363)	(2.756)
% of Exports - Differentiated	-1.504	3.361*	-3.440
- Change (t-7) to (t-2)	(2.525)	(1.869)	(3.049)
Investment	4.703	5.222	-5.710
- % of GDP, Change (t-7) to (t-2)	(6.106)	(4.359)	(5.312)
Government Spending	-7.891	-20.100**	6.697
- % of GDP, Change (t-7) to (t-2)	(11.458)	(8.398)	(7.445)
Net Exports	-0.598	-5.248	-6.749*
- % of GDP, Change (t-7) to (t-2)	(4.002)	(3.678)	(3.527)
Total Trade (X+M)	-0.189	-1.837	0.446
- % of GDP, Change (t-7) to (t-2)	(1.822)	(1.346)	(1.079)
R-Squared	0.0973	0.1812	0.1722

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*

Table A3 – continued. Evolution of Components of Economic Freedom (3 of 3)

	Annual Change in Financial Freedom	Annual Change in Property Rights	Annual Change in Freedom from Corruption
Alcoholic Beverages	-10.05	-460.32**	-157.69
- M % of GDP, Change (t-7) to (t-2)	(233.04)	(197.70)	(149.16)
Tobacco	157.49	-24.44	-100.67
- M % of GDP, Change (t-7) to (t-2)	(96.35)	(57.21)	(126.84)
Soap	-283.21	346.78*	236.91
- M % of GDP, Change (t-7) to (t-2)	(308.52)	(208.83)	(169.57)
Pesticides	23.79	-325.44	-124.31
- M % of GDP, Change (t-7) to (t-2)	(443.79)	(239.11)	(204.75)
Animal Hides	280.45	62.40	-275.14
- M % of GDP, Change (t-7) to (t-2)	(216.66)	(106.74)	(198.85)
Stationary	1301.82	-7743.12*	-712.88
- M % of GDP, Change (t-7) to (t-2)	(5,532.93)	(4,297.27)	(3,348.74)
Household Appliances	151.20	125.08	-149.49**
- M % of GDP, Change (t-7) to (t-2)	(114.16)	(83.17)	(71.65)
Generators	70.86	18.11	-94.07
- M % of GDP, Change (t-7) to (t-2)	(120.08)	(99.30)	(76.08)
Televisions	41.49	83.62	-64.79
- M % of GDP, Change (t-7) to (t-2)	(154.97)	(100.52)	(80.50)
Radios	573.86	-181.65	-98.55
- M % of GDP, Change (t-7) to (t-2)	(378.52)	(265.22)	(225.65)
Photo/Cinema Equipment	619.81	133.31	196.95
- M % of GDP, Change (t-7) to (t-2)	(420.84)	(228.25)	(126.95)
Movies and Film	9210.97	-5040.59	5659.15
- M % of GDP, Change (t-7) to (t-2)	(6,736.03)	(7,535.69)	(7,758.44)
Printed Media	20.84	-50.52	-60.35
- M % of GDP, Change (t-7) to (t-2)	(119.94)	(66.29)	(53.48)
Musical Instruments	23.59	-26.78	-8.35
- M % of GDP, Change (t-7) to (t-2)	(105.07)	(58.73)	(63.85)
Gold	-30.73	-19.27	-57.51
- M % of GDP, Change (t-7) to (t-2)	(91.05)	(74.76)	(53.17)
R-Squared	0.0973	0.1812	0.1722

*Note: Significance at the 10% and 5% levels is denoted by * and ** respectively. Robust standard errors are given in parenthesis. Country indicators, year indicators and a constant are included but not reported.*