Economic Freedom and Economic Volatility

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Abstract: Theory suggests that economic freedom—measured by the Economic Freedom of the World Index (EFW) -- may increase or decrease economic volatility. Similar to previous literature, we empirically test the relationship between economic freedom and economic volatility, but we differ from the literature in how we account for (1) changes in EFW, and (2) the nonlinear relationship between freedom and volatility. We find economic freedom, with the exception of government size, is generally negatively related to economic volatility; that is, as a nation's economic freedom increases, macroeconomic volatility decreases. However, there appears to be a nonlinear effect, where the improvement in volatility diminishes as freedom increases.

Keywords: Economic Freedom; Economic Volatility

JEL Classification: E32, E60, H10

"… though a great number of people should, by thus restoring the freedom of trade, be thrown all at once out of their ordinary employment and common method of subsistence, it would by no means follow that they would thereby be deprived either of employment or subsistence."

-Adam Smith, *Wealth of Nations*

1. Introduction

Economic freedom (EF), as measured by now-common indices, has been shown to lead to economic growth (e.g., Doucouliagos & Ulubasoglu 2006; De Haan, Lundstrom, & Sturm 2006; de Haan & Sturm 2000; and de Haan & Siermann 1998). However, does economic freedom come at the cost of an increase in economic volatility? After all, people may be unwilling to accept a mild average improvement in the economy if it results in a higher level of economic volatility.

Economic reasoning suggests that economic freedom may either increase or decrease volatility. Economic freedom may decrease economic volatility in many ways. For instance, freedom to adjust wages, contracts, or prices may prevent shortages or surpluses, and it may allow the economy to absorb shocks instead of suffering mass layoffs or loss of output. Freedom to trade and invest in foreign assets may spread out the risk of domestic shocks. Freedom to own

property and to have access to sound money can lessen uncertainty and provide a stable and secure environment for economic growth.

However, economic freedom may increase volatility in many ways as well. Freedom to create businesses and freedom to trade means some businesses will fail, and volatility can increase as the economy goes through adjustments in technology and new products. Open capital markets means funds can pour in or out of an economy quickly. A large public sector (reducing a nation's EF index number) will tend to have a smaller reaction to an economic downturn, and may not layoff as many employees compared to a large private sector. Government control over the money supply can theoretically be used to smooth business cycles. Since economic theory cannot satisfactorily answer the question as to whether economic freedom will increase or decrease economic volatility, the answer must come through an empirical analysis. This study contributes to the literature by testing the relationship between economic freedom and economic volatility.

To measure economic freedom, this paper uses the index of economic freedom published in the *Economic Freedom of the World* (EFW) (Gwartney & Lawson 2009). According to Gwartney and Lawson, et al. (1996), "individuals have economic freedom when property they acquire without the use of force, fraud, or theft is protected from physical invasions by others and they are free to use, exchange, or give their property as long as their actions do not violate the identical rights of others." The EFW index has five major components: (1) size of government; (2) legal system and property rights; (3) sound money; (4) freedom to trade internationally; and (5) regulation. The index is scaled from 0 to 10, where 0 represents the least free and 10 represents the most free. The index number is calculated so that the EFW score for Country *i* in time period *t* may be compared to scores across all *i* and *t*.

While a number of studies examine economic freedom and growth, the literature on economic freedom and volatility is relatively scarce. Two exceptions are the studies by Dawson (2010) and Lipford (2007). Both use the EFW index. Both studies find that EF and economic volatility have a significantly negative relationship. Both used the average overall EFW index (average of the 5 components) to represent EF, and the standard deviation of economic growth rates to measure volatility. Dawson (2010) also examined the components of the EFW index, and found a negative relationship, with the exception of government size, which had a positive relationship with volatility.

This paper differs from Dawson (2010) and Lipford (2007) in three distinct ways: 1) the initial level of EF and the growth of EF are used as explanatory variables instead of just the average level of EF; 2) the average economic growth rate is controlled for when explaining the variation in growth rates; and 3) diminishing returns to freedom are considered. These differences are important. First, using the growth (or decline) in economic freedom as an explanatory variable tells us the variation of freedom *within* a country, and its possible effect on economic volatility. However, the average freedom score, as used by the previous literature, gives insight to the

impact of the economic freedom level on volatility across countries. Therefore, the question being asked in this paper is different than the question asked by Dawson (2010) and Lipford (2007). Second, larger numbers typically have more variance than smaller numbers, and economic growth rates are no exception. A country experiencing a large boom or downturn will likely experience more volatility than a country growing at a modest pace. Therefore, we control for the average growth rate in absolute terms. Using the coefficient of variation (dividing the standard deviation by the mean) is a possible solution to the problem, but because the numbers range from negative to positive, and some around zero, controlling for the mean growth rate (in absolute terms) as an independent variable seems more appropriate. Third, improvements in economic freedom, such as an improvement in property rights, may help stabilize growth in a country with little freedom, but an improvement of freedom in a country with an already-high level of freedom may be of small help or even create some uncertainty that may increase volatility. This paper considers this possibility by introducing a squared freedom variable.

As will be shown in the following analysis, EF is not a mixed blessing – growth in the general EFW index increases economic growth without an increase in economic volatility for most countries. In fact, growth in EFW appears to be associated with a decrease in economic volatility. However, not all components of EFW interact with volatility in the same manner. An improvement in property rights and legal structure and the overall freedom level are associated with a decrease in volatility. However, an increase in government size (or decrease in freedom) is associated with an improvement in volatility.

2. Model and Results

This is a cross-sectional study of about 109 countries, focusing on the years 1990 to 2005. These years are the post-soviet and pre-financial crisis time period. To measure economic volatility, we use the standard deviation of annual growth rates of real Gross Domestic Product (GDP) per capita from 1990 to 2005 (Penn World Tables). Throughout the analysis, this will be the dependent variable in the regressions. The independent variables of interest in this paper are the initial levels of economic freedom and the growth of economic freedom, measured either with the summary index of EFW or with the components of the index. A key to the variables is in Table 1.

To understand the effects of economic freedom on economic volatility, it is necessary to understand the effects of economic freedom on economic growth. Numerous studies have used the EFW index when studying the relationship between economic freedom and economic growth. The literature has generally found a positive relationship between economic freedom and economic growth. De Haan, Lundstrom, and Sturm (2006) surveyed the literature that used the EFW index, and none of the reports in their summary found economic freedom to be bad for growth. They do find some discrepancies as to whether both the change in economic freedom and the level of economic freedom are good for growth. For instance, Dawson (1998) finds that both the level *and* change in EF are significantly correlated with economic growth, while De

Haan and Sturm (2000) find that only the change in EF is significantly correlated with economic growth. Doucouliagos and Ulubasoglu (2006) performed a meta-analysis, where they examined dozens of studies that tested the relationship between economic freedom and growth. Their analysis showed that there is a positive and robust relationship between EF and economic growth, regardless of the sample of countries or measure of economic freedom. They also showed that EF has a positive impact on physical capital formation, which generates economic growth. However, the only papers testing the relationship between EF and volatility we located were Dawson (2010) and Lipford (2007). Therefore, there is room for more work beyond just two studies.

One difficulty in analyzing the relationship between economic growth and economic freedom is endogeneity. It is quite possible that as an economy grows, people put more value on economic freedom. While econometric studies cannot prove that economic freedom causes growth, a few studies have demonstrated that overall economic freedom precedes growth using Granger causality tests. Dawson (2003) shows that there is evidence that the overall level of EF (Granger) causes economic growth, but the changes in EF appear to be determined jointly with economic growth. Examining the components of the EFW index, Dawson gets mixed results. For example, property rights appear to (Granger) cause economic growth, but government size appears to be (Granger) caused by growth. Heckelman (2000) uses the Heritage Foundation's economic freedom index, and finds through Granger causation tests that economic freedom precedes economic growth. One exception found by Heckelman is government intervention (government consumption and ownership), which may come after economic growth. Therefore, while economic volatility may have some influence on economic freedom, studies suggests that freedom precedes growth, which can influence volatility.

To see the effects of freedom on volatility, Table 2 gives the Ordinary Least Squares results for each component of the economic freedom index, including the summary index, along with its squared term. Each model controls for the initial value of economic freedom (efw90) and the average growth of GDP in absolute value (abaggdp). The purpose of this table is to see if economic freedom affects volatility, without controlling for the other variables (e.g., investment) that may affect economic growth (hence, volatility), since we do not yet want to control the channel through which freedom affects growth and volatility. For instance, Model 1 includes diff_1 as an explanatory variable, which is the difference in Area 1 of the EFW between the years 1990 and 2005. This index component is scaled from 0 to 10, with 10 being a small government and low taxes, and 0 being a large government with high taxes. Model 1 shows no significant relationship between the growth in the size of government and volatility (t-stat in italics). The average GDP growth rate (in absolute terms) has a positive and significant coefficient in all of the models, meaning that a country that is growing or shrinking at a high rate is experiencing more volatility than a country with a low level of growth or decline. The initial level of economic freedom (summary index in 1990) has a negative and significant coefficient in

all models.   This means that those countries with high levels of freedom in 1990 had low volatility in the following 15 years.

Model 2 in Table 2 shows that the growth in Area 2 (legal system and property rights) of the EFW report has a negative nonlinear relationship with volatility. The coefficient on the change in Area 2 (diff_2) is negative, while the coefficient on the squared term (diff_2sq) is positive, each statistically significant. This means that countries which experienced an improvement in property rights and legal structure had lower volatility than countries which did not have such an improvement in property rights or legal structure. However, the returns were diminishing; where property rights and legal structure were weak, an improvement was associated with a drop in volatility, but where the property rights and legal structure were strong, an improvement was not associated with such a drop in volatility, but possibly an increase in volatility. Such results are intuitive. Those countries with weak property rights and legal structure may experience volatile investment or consumption if there is great uncertainty as to whether property will be protected or contracts will be enforced. One would expect that volatility will decline if there was an improvement in certainty surrounding property rights and contracts. However, countries with sound property rights and legal structure may not experience a decline in volatility if there was some change, even if it was a small improvement in property rights or legal structure, since owners of property and business were already relatively certain about the enforcement of property rights and contracts. The change in the relatively-free country may increase volatility if the uncertainty it creates more than offsets the improvement in policy.

Area 3 (sound money) and Area 4 (freedom to trade internationally) of the EFW index also have a negative relationship with volatility, as evidenced by Models 2 and 3 in Table 2. The statistically significant negative coefficient on diff_3 in Model 3 says that countries which experienced an improvement in sound money also experienced less volatility than those countries that did not see such an improvement. One interpretation is that inflation may cause uncertainty and volatility. The statistically significant negative coefficient on diff_4 in Model 4 says that countries which experienced an improvement in the freedom to trade internationally also experienced less volatility than those countries that did not see such an improvement. Intuitively, government restrictions may disrupt trade and cause volatility. Area 5 (regulation) had a negative, but statistically insignificant coefficient, as evidenced by the coefficient on diff_5 in Table 2.

Model 6 in Table 2 includes the change in the summary index, diff_efw, which is the average of all of the components. The coefficient is negative and statistically significant. This result says that countries which experienced a growth in overall economic freedom experienced a decline in volatility relative to those countries which did not experience such a growth in freedom.

The results from Table 2 do not control for variables that would exist in a standard Solow growth model (Solow 1956), such as investment or population growth. Nor does it control for variables such as natural resources or openness, which could affect volatility.   However, economic

freedom may affect volatility through its effect on investment, natural resource dependence, or openness. Therefore, it is appropriate to estimate models that do not include the control variables, and then estimate models that do include the control variables.

Table 3 includes additional control variables which may affect economic growth or volatility. Each model includes the absolute value of the average growth rate (abaggdp), economic freedom in 1990 (efw90), real GDP per capita in 1990 (rdgdpch1990), the population growth (percent) between 1990 and 2005 (gpop), average Metal and Ore exports (percent of GDP) from World Development Indicators (avgore_metal), and average openness (avgopen) between 1990 and 2005. Each model also includes a component of the EFW index, and its squared term. As in Table 2, the initial level of freedom has a negative relationship with economic volatility – an increase in freedom is associated with a decrease in volatility. This relationship is statistically significant in all of the models (t-statistics are in italics). Average metal and ore exports have a significant and positive relationship with volatility in all models. This relationship is expected because the volatility of natural resource prices can cause uncertainty and affect production costs. Population growth has a negative and significant relationship in most models. One possible explanation for this result is that population may increase when the economy is good, limiting the per-capita GDP increase; when the economy is struggling, people may leave the country, limiting the per-capita GDP decline. Average openness also has a positive and significant relationship with volatility in all models in Table 3. Economic reasoning suggests that being open can decrease or increase volatility. Table 3 is evidence that openness increases volatility.

Model 1 in Table 3 includes the change in Area 1 of the EFW index (government size) from 1990 to 2005 (diff_1), and it is found to be negative but insignificant, just as in Model 1 in Table 2. However, the Model 2 and Model 6 in Table 3 show that the change in property rights and legal structure (diff_2) and the summary index (diff_efw) have a negative and significant relationship with volatility. Thus, while openness and natural resource dependence may affect the volatility in growth rates, improving the security of proper rights and/or improved law and order may also decrease the volatility in the economy. The other components of the index also have a negative coefficient, but they are not significantly different from zero after controlling for the other variables. Interestingly, the freedom to trade internationally (diff_4) was found to have a negative relationship with volatility in Table 2 without controlling for openness, but it does not appear to significantly affect volatility once accounting for the impact of openness in Table 3. If openness causes volatility, and restrictions were suggested to decrease openness and volatility, the results in Table 2 suggests that those policies would be counterproductive.

Tables 2 and 3 show that an improvement in EF may lead to less economic volatility, but the level of freedom may also be important, as shown in Dawson (2010). Table 4 looks at average freedom levels (1990-2005) instead of the change in freedom levels, which were the variables of interest in Tables 2 and 3. All of the EFW components in Table 4 have a negative coefficient, except for government size (avg1). However, only sound money (avg3) and the summary index

(avgefw) have coefficients that are statistically significant. "Sound money" is scaled from 0 to 10, where countries with low inflation rates and low money growth have numbers closer to 10 than those countries with high and volatile inflation rates. Theoretically, "sound money" can have two opposing effects on volatility. For instance, high and volatile inflation rates can cause uncertainty for savers and investors, causing volatility in investment and growth. On the other hand, monetary policy, such as quantitative easing, may increase inflation to encourage employment and stabilize the economy, which will cause a positive coefficient. However, if monetary policy was used only when the economy was volatile, then the coefficient will be negative. The average summary index (avgefw), which averages all of the components, has a negative and significant coefficient. Model 6 says that countries with an overall freedom index number that is 1 point lower (0-10 scale) than other countries, has 1.43 more standard deviations from their average growth rate of real GDP than those freer nations.

2.1 Nonlinear Effects

Tables 2 and 3 examined the nonlinear relationship between economic volatility and the *change* in EF. Table 4 estimated models similar to the previous literature, where the average *level* of EF was the explanatory variable of interest. However, the nonlinear relationship between the *level* of EF and GDP volatility were not estimated in the previous literate.   In Table 4, all of the components of EFW have a negative coefficient, except for Area 1, which is a measurement of government size (0-10 scale; an increase in the number implies a smaller government and lower taxes), though the coefficient for Area 1 was not statistically significant. However, the relationship between volatility and government size and taxes may not be a linear relationship, which can affect the significance of the coefficient. Figure 1 shows scatter plot and quadratic fit between Area 1 and the standard deviation of growth rates (sdgdp). Volatility appears to have a positive relationship with government size and taxes until countries are at about 6.5 out of 10 on the scale. After about an EFW value of 6.5, freer countries experience little change or less volatility.

Table 5 tests the nonlinear relationship between government size and taxes and volatility. Model 1 in Table five includes the average of Area 1 of the EFW index (avg1) and its squared term (avg1sq), along with the control variables from Table 4. The coefficient for Area 1 is positive, and its squared term is negative, both statistically significant. This result is evidence that countries with large governments may experience an increase in volatility if it decreased its government size (increased its number on the scale); but for those countries with small governments, a decrease in the size of government may lower volatility.

Since the general economic freedom index is shown to have a negative relationship with volatility, while Area 1 of the index has a positive relationship with volatility, a natural extension would be to separate out Area 1 from the general index. Model 1 in Table 5 shows that Area 1 has a positive and significant relationship with volatility, while Model 2 in Table 5 shows that the summary index (average of components 1-5) has a negative relationship with

volatility. Model 3 includes Area 1 as an explanatory variable, and it also includes the summary index (avgefwng), which is calculated without Area 1. Excluding the size of government, economic freedom is shown to have a negative and significant relationship with economic volatility. Controlling for the other components of freedom, government size does not have a significant relationship with volatility in Model 3.

Model 4 in Table 5 includes a squared term for both Area 1 of the index and the summary index (calculated without including government size). The coefficient for Area 1 (avg1) is positive and the coefficient for its squared term (avg1sq) is negative, and both are statistically significant. This says that a decrease in government size is associated with an increase in volatility for those countries that have large governments and high taxes. However, a decrease in government size and taxes is associated with a decrease in volatility for those countries with relative small governments and low taxes. The coefficient on the summary index (avefwng) is negative and the coefficient on its squared term (avgefwngsq) is positive. Both are significant at about the 10% level. This is evidence that volatility tends to diminish for those countries with higher levels of freedom (not including government size and taxes), but the returns to increasing freedom are diminishing.

Figure 2 shows the nonlinear relationship between the general freedom index (avgefw) and the standard deviation of annual growth rates. The highest GDP volatility occurs in those countries with little economic freedom. Volatility tends to diminish for those countries with higher levels of freedom, but the returns are diminishing. At high levels of freedom, an increase in freedom seems to be associated with either no decrease in volatility or a small increase in volatility.

3. Conclusion

This paper examined the relationship between economic freedom and economic volatility. Since economic theory suggests EF can increase or decrease volatility, an empirical study is warranted. However, the amount of literature that has examined economic freedom and volatility has been relatively thin. Two exceptions are the studies by Lipford (2007) and Dawson (2010), which found that an increase in economic freedom, except for government size, is associated with decrease in volatility. Our results expand on those studies by examining the change in freedom within countries, and by considering a nonlinear relationship between freedom and volatility.

The results in this paper suggest that a general increase in economic freedom can lower economic volatility for those countries with poor property rights, poor legal structure, or poor access to sound money. One possible interpretation of this result is that countries that have poor property rights and legal structure and volatile inflation can have volatile savings and investment because of high uncertainty. As property rights and legal structure become clearer, investment can become more stable. For those countries with relatively high levels of economic freedom, changes in policy may not lower volatility, but it can possibly increase volatility. If property

rights and legal structure are already sound, then changes, even if they are improvements, may create volatility from an increase in uncertainty.

One exception to the rule is government size. Decreasing the size of government may increase volatility for those countries with large governments. A possible interpretation is that the government workforce may not adjust to economic conditions as swiftly as the private workforce. For those countries that do not have large governments or high taxes, decreasing the size of government may not increase volatility. One possible explanation for this result is that a market economy that is relatively stable and less dependent on the government than a country with a large government will not experience an increase in volatility if taxes are decreased from its already low level.

While this paper provides tests the empirical relationship between economic freedom and economic growth, there is room for further research in this area. The negative relationship between property rights and volatility can have multiple explanations, which can be further examined. The positive relationship between government size and volatility may also have multiple explanations, including the direction of causality. Governments may react to volatility in the market and then change policies that may affect freedom, and this may also be an important avenue of research. An alternative empirical approach may be to test lag freedom variables and its effect on volatility. Changes in government policies may affect economic growth, but with a lag of a few years.

Endnotes

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Table 1. Key

In general, there is one cross-section of either growth rates, differences, or average values of 113 countries between 1990 and 2005

SDgdp	Standard Deviation of Annual growth of Real GDP per capita 1990-2005 (PWT)
AbAggdp	absolute value of Average annual growth of real GDP per capita 1990-2005
EFW90	Economic Freedom of the World level, 1990 (Fraser Institute)
AvgKi	Real capital investment as a percent of real GDP, average between 1990 and 2005 (PWT)
gPop	Growth of population (%) between 1990 and 2005 (PWT)
avgore_metal	Average Metal and Ore exports (% of GDP) from World Development Indicators
avgopen	1990-2005 avg. openness in constant prices, measured by (imports+Exports)/GDP (PWT)
rgdpch90	Level of real GDP per capita, 1990 (PWT)
diff_1	1990 to 2005 difference in Area 1 of EFW report: "size of government"
diff_2	1990 to 2005 difference in Area 2 of EFW report: "legal system and property rights"
diff_3	1990 to 2005 difference in Area 3 of EFW report: "sound money"
diff_4	1990 to 2005 difference in Area 4 of EFW report: "freedom to trade internationally"
diff_5	1990 to 2005 difference in Area 5 of EFW report: "regulation"
diff_efw	1990 to 2005 difference in summary EFW index
avg1	1990 to 2005 average in Area 1 of EFW report: "size of government"
avg2	1990 to 2005 average in Area 2 of EFW report: "legal system and property rights"
avg3	1990 to 2005 average in Area 3 of EFW report: "sound money"
avg4	1990 to 2005 average in Area 4 of EFW report: "freedom to trade internationally"
avg5	1990 to 2005 average in Area 5 of EFW report: "regulation"
avgefw	1990 to 2005 average in summary EFW index
avgefwng	1990 to 2005 average of Areas 2 thru 5 in the EFW index

Table 2. Economic Freedom and Growth

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
		Dependent Variable: Standard Deviation of Economic Growth Rates (1990-2005)				
abaggdp	0.4**	0.44**	0.36*	0.42***	0.37*	0.39**
	1.97	*2.18*	*1.84*	*2.37*	*1.88*	*2.09*
efw90	-1.04***	-0.95***	-1.14***	-1.35***	-2.36***	-1.3***
	-4.16	*-3.86*	*-4.27*	*-4.56*	*-8.19*	*-4.22*
diff_1	-0.31					
	-0.78					
diff_1sq	0.12					
	0.91					
diff_2		-0.57***				
		-2.63				
diff_2sq		0.21*				
		1.74				
diff_3			-0.31*			
			-1.72			
diff_3sq			0.04			
			1.09			
diff_4				-0.72*		
				-1.84		
diff_4sq				0.05		
				0.34		
diff_5					-0.39	
					-0.44	
diff_5sq					0.09	
					0.39	
diff_efw						-1.46***
						-3.39
diff_efwsq						0.31
						1.3
_cons	9.26***	8.29	10.1***	11.4***	9.78***	11.7***
	5.54	*5.22*	*5.94*	*6.03*	*5.94*	*5.62*
N	112	108	112	109	112	112
r2	0.2	0.3	0.22	0.22	0.2	0.25
r2_a	0.17	0.27	0.19	0.19	0.17	0.22
F	5.41	7.35	6.13	5.63	5.42	8.62

Note: Robust standard errors are used in all models. T-statistics are in italics.

Table 3. Freedom and Volatility Robustness Check

Dependent Variable: Standard Deviation of growth rates (GDP 1990-2005)

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
abaggdp	0.27	0.28	0.21	0.32*	0.25	0.24
	1.45	*1.46*	*1.18*	*1.74*	*1.35*	*1.36*
efw90	-1.22***	-1.35***	-1.4***	-1.27***	-1.19***	-1.77***
	-3.2	*-3.59*	*-2.59*	*-2.62*	*-2.55*	*-3.45*
rgdpch1990	2.5E-05	3.8E-05	2.6E-05	2.0E-05	2.4E-05	3.8E-05
	0.53	*0.84*	*0.52*	*0.41*	*0.48*	*0.75*
gpop	-0.03*	-0.01	-0.03**	-0.03	-0.03	-0.03**
	-1.7	*-0.63*	*-1.96*	*-1.45*	*-1.56*	*-2*
avgki	-0.05	-0.01	-0.05	-0.06	-0.05	-0.03
	-1.18	*-0.23*	*-0.99*	*-1.38*	*-1.25*	*-0.74*
avgore_metal	0.07***	0.05*	0.07**	0.07**	0.07**	0.07**
	2.29	*1.67*	*2.22*	*2.11*	*2.24*	*2.28*
avgopen	0.01***	0.01***	0.02***	0.01***	0.03***	0.02***
	3.23	*3.37*	*3.41*	*3.41*	*3.24*	*3.39*
diff_1	-0.33					
	-0.89					
diff_1sq	0.1					
	0.87					
diff_2		-0.45**				
		-2.19				
diff_2sq		0.15				
		1.32				
diff_3			-0.27			
			-1.51			
diff_3sq			0.02			
			0.78			
diff_4				-0.42		
				-0.92		
diff_4sq				0.02		
				0.1		
diff_5					-0.05	
					-0.06	
diff_5sq					-0.04	
					0.18	
diff_efw						-1.05***
						-2.56
diff_efwsq						0.11
						0.62
_cons	10.5***	9.47***	11.7***	11.1***	10.3***	13.9***
	4.45	*4.88*	*3.93*	*3.81*	*3.83*	*4.67*
N	109	105	109	106	109	109
r2	0.3	0.36	0.31	0.3	0.3	0.33
r2_a	0.24	0.29	0.25	0.24	0.23	0.27
F	4.93	4.68	4.85	4.38	4.32	5.98

Note: Robust standard errors are used in all models. T-statistics are in italics.

Table 4. Average Economic Freedom and Volatility

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Dependent Variable: Standard Deviation of Growth Rates (GDP 1990-2005)					
abaggdp	0.26	0.32	0.35**	0.25	0.24	0.29
	1.48	*1.62*	*2.12*	*1.46*	*1.32*	*1.56*
efw90	-1.39***	-1.00**	-0.41	-1.00*	-1.21***	-0.44
	-3.08	*-2.39*	*-0.82*	*-1.88*	*-2.62*	*-0.71*
rgdpch1990	4.8E-05	8.6E-05	5.7E-05	4.0E-05	2.6E-05	4.9E-05
	0.86	*1.37*	*1.17*	*0.83*	*0.53*	*1.03*
gpop	-0.03*	-0.04**	-0.02	-0.03*	-0.03*	-0.03**
	-1.85	*-2.09*	*-1.54*	*-1.81*	*-1.66*	*-1.99*
avgki	-0.06	-0.05	-0.05	-0.05	-0.06	-0.04
	-1.31	*-1.15*	*-1.04*	*-1.05*	*-1.21*	*-0.82*
avgore_metal	0.07**	0.07**	0.06***	0.07**	0.07**	0.07**
	2.31	*2.27*	*2.54*	*2.24*	*2.28*	*2.32*
avgopen	0.01***	0.01 ***	0.01***	0.02***	0.02***	0.02***
	3.26	*2.96*	*2.78*	*3.69*	*3.41*	*3.53*
avg1	0.27					
	1.40					
avg2		-0.65				
		-1.63				
avg3			-0.87***			
			-3.76			
avg4				-0.58		
				-1.20		
avg5					-0.06	
					-0.19	
avgefw						-1.43**
						-2.20
_cons	9.81***	12.40***	11.60***	12.40***	10.80***	14.20***
	4.58	*4.47*	*4.88*	*4.67*	*4.41*	*5.44*
N	109	109	109	109	109	109
r2	0.31	0.33	0.39	0.32	0.30	0.34
r2_a	0.25	0.27	0.34	0.26	0.24	0.28
F	4.95	5.09	8.28	4.84	4.73	5.28

Note: Robust standard errors are used in all models. T-statistics are in italics.

Table 5. Nonlinear Freedom and Volatility

Variable	Dependent Variable: Standard Deviation of growth rates (GDP 1990-2005)			
	Model 1	Model 2	Model 3	Model 4
abaggdp	0.21	0.27	0.36**	0.28*
	1.32	*1.41*	*1.98*	*1.74*
efw90	-1.43***	-0.50	-0.44	-0.66
	-3.15	*-0.80*	*-0.70*	*-1.07*
rgdpch1990	5.1E-05	3.4E-05	1.0E-04*	6.7E-05
	0.94	*0.63*	*1.80*	*1.01*
gpop	-0.04**	-0.03**	-0.04**	-0.04**
	-2.08	*-1.98*	*-2.36*	*-2.38*
avgki	-0.06	-0.03	-0.04	-0.02
	-1.21	*-0.68*	*-0.94*	*-0.48*
avgore_metal	0.06**	0.07**	0.07**	0.07***
	2.27	*2.36*	*2.38*	*2.51*
avgopen	0.02***	0.01***	0.02***	0.02***
	3.40	*2.98*	*3.40*	*3.42*
avg1	2.50***		0.12	2.11**
	2.49		*0.59*	*2.06*
avg1sq	-0.19**			-0.16**
	-2.36			*-2.02*
avgefw		-5.99*		
		-1.89		
avgefwsq		0.37*		
		1.66		
avgefwng			-1.55***	-6.71*
			-2.62	*-1.85*
avgefwngsq				0.42*
				1.64
_cons	3.60	28.50***	14.10***	24.70**
	1.29	*3.03*	*5.33*	*2.14*
N	109	109	109	109
r2	0.32	0.36	0.38	0.42
r2_a	0.26	0.30	0.32	0.35
F	4.50	6.77	5.12	6.20

Note: Robust standard errors are used in all models. T-statistics are in italics.

Figure 1: Average Government Size and Volatility
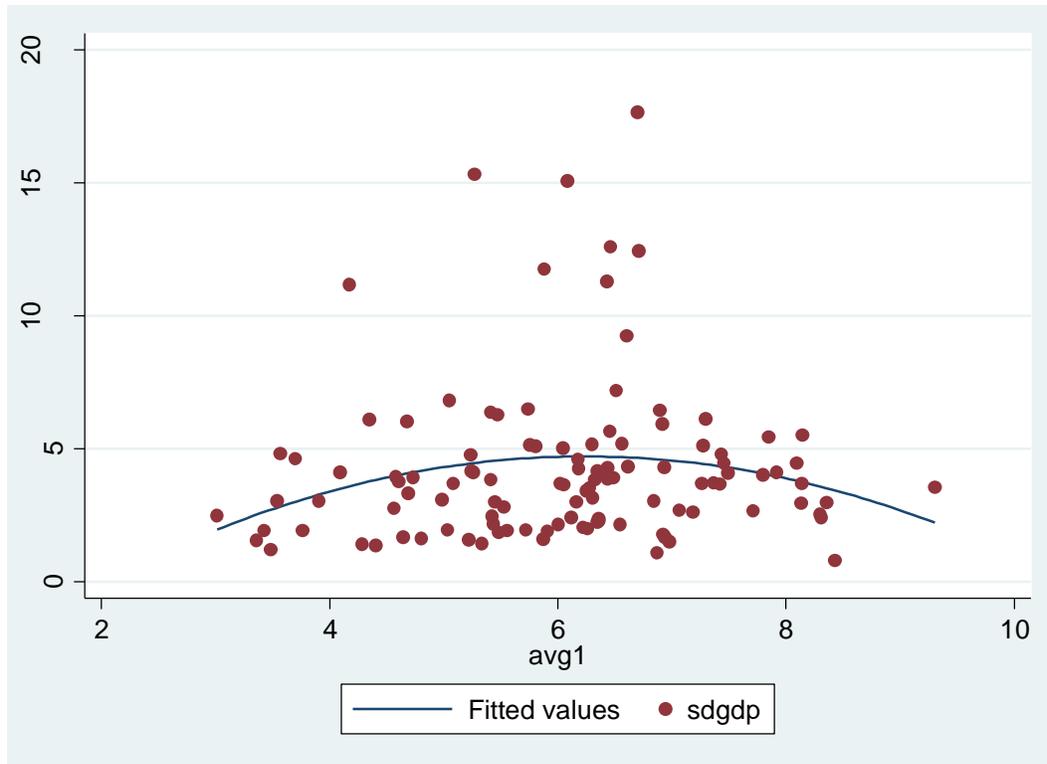
Note: The vertical axis represents the standard deviation of annual Real GDP growth rates between years 1990 and 2005 in a cross-country study. The horizontal axis is an index 0 to 10 from the Frasier Institute, averaged from the years 1990-2005, with 0 being a large government and 10 being a small government.

Figure 2: Economic Freedom and Volatility
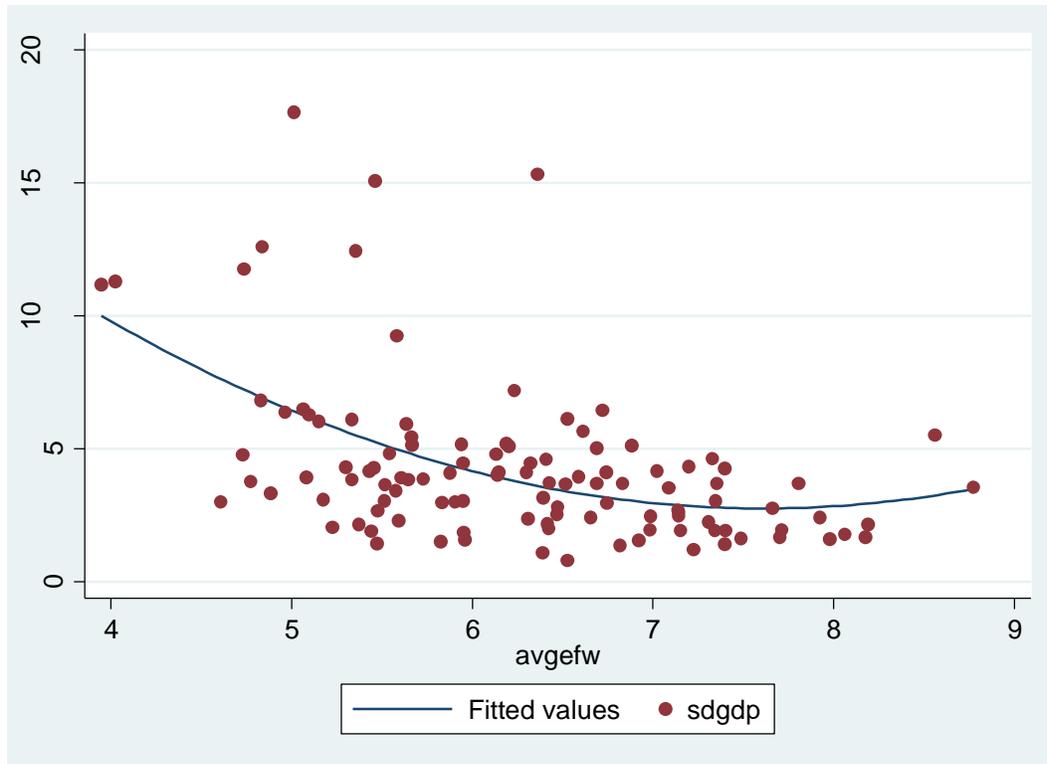
Note: The vertical axis represents the standard deviation of annual Real GDP growth rates between years 1990 and 2005 in a cross-country study. The horizontal axis is an index 0 to 10 from the Frasier Institute, averaged from the years 1990-2005, where an increase in the level corresponds to an increase in economic freedom.