Determinants of the Number of Anti-Government Demonstrations: Evidence from OECD Countries

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Abstract

This paper studies the causal effects of several social, economic, and political variables on the number of anti-government demonstrations in a country. The dataset used is a panel of 36 OECD countries from the years 1996 to 2019. A negative binomial model is used, and the equation uses economic variables to control for a country's level of wealth. Estimates from the negative binomial model show that an increase in the unemployment rate, GDP per capita, and percentage of population that uses the Internet, predicts an increase in the number of anti-government demonstrations. On the other hand, an increase in the primary school completion rate and the level of democracy predict a decrease in the number of demonstrations. All of the variables are statistically significant at the 5% level.

1 Introduction

The Internet has been touted as revolutionary in being able to connect people with one another, regardless of physical location. With this growing interconnectedness, news and ideas are shared at lightning speed and people can connect with each other over shared interests. However, the nature of these shared interests varies widely from region to region, and person to person. Oftentimes, opinion on the internet can be shaped, formulated, and skewed by biased data and/or the opinions of other people. Most people tend to want to conform to a certain ideal, and thus, opinions shared on the internet tend to the extreme rather than settle for moderation.

The internet, however, is just one phenomenon that is believed to be a causal factor in producing political instability or turmoil within a country. There has been a lot of research done to try to find the determinants of political instability, but results have been inconclusive due to conflicting evidence and the difference between studies in defining what political instability is and how it is to be measured. Therefore, this lack of conclusiveness in determining both a proper cause and definition of political instability necessitates further study on the determinants of political instability.

It is curious that only some countries experience political instability within their nation while others do not. Why do some countries have more anti-government demonstrations than other counties? Is it due to growing inequality, higher internet usage, or some other factors? Although there is no clear method to predicting the level of political instability within a country due to numerous factors and the subjectivity in defining political instability, this paper focuses on economic, social, and political determinants of political instability that may cause the number of anti-government demonstrations to be higher within a given country.

The question I will try to answer in this paper is: "What factors affect the number of anti-government demonstrations in a country?" Specifically, I will be looking at economic, social, and political determinants of the number of anti-government demonstrations, which is a measure of political instability that I use. My hypothesis is that the number of anti-government demonstrations in a country is higher if there is greater internet usage, the country is less democratic, there is a lower GDP per capita, a higher unemployment rate, and lower education levels. To test my research question, I regress the number of anti-government demonstrations in a country on different economic, social, and political variables across countries and across time.

2 Literature Review

In the literature regarding political instability, there are conflicting results due to diverse approaches taken in studying the causality of political instability. There is also subjectivity in defining what political instability is and choosing a dependent variable to represent political instability. There are many papers that choose to focus on the direction of causality of the effects of political instability, some focus on the effects that have a causal impact on political instability, and other papers have looked at both in order to establish the direction of causality. Some papers, such as Miljkovic and Rimal (2008) consider a change in government as a sign of political instability. Whereas others such as, Londregan and Poole (1990) and Blanco and Grier (2009) use more numerically defined events such as the number of coups, death rate, etc. that focus on society's reaction to the government as a sign of political instability.

Londregan and Poole (1990) isolate the influence of income and a country's past history of coups, and also look at the interdependence of income growth and coups.

They found that a high level of income significantly decreases the presence of coups. When determining the direction of causality, they found that while there was a significant effect of economic performance on the probability of coups, the opposite was not true – a country's history of coups had little effect on its economy. To address the joint endogeneity that exists in the relationship between income and coups, Londregan and Poole (1990) use a simultaneous equations framework. They use a pair of simultaneous equations to jointly determine the propensity for a coup and the rate of economic growth. One equation uses current growth rate as the dependent variable and regresses growth rate on current coup propensity and some other predetermined variables, while the other equation uses current coup propensity as a dependent variable. The equations used allow for correlation of the disturbance terms between the coup and growth rate equations, and also allow for simultaneous feedback between coup propensity and the rate of growth. The methods used allow the authors to establish that failing economic conditions causes an increase in the number of coups.

In the paper "Long Live Democracy: The Determinants of Political Instability in Latin America" Blanco and Grier (2009) measure political instability as the principal component of major events that threaten a country's governmental structure (coups, revolutions, etc.), events that reveal citizen discontent (general strikes, riots etc.), and extreme violent actions (guerilla warfare, assassinations, etc.). They restrict their study to 18 Latin American countries and use OLS to regress the weighted conflict index they created on macroeconomic factors, inequality, neighborhood instability, democracy, and other socio-demographic factors. Blanco and Grier (2009) find that countries with higher levels of democracy, low income inequality, higher urbanization, higher trade openness, and higher investment as a percentage of GDP have lower levels of political instability.

In the paper "The Impact of Socio-Economic Factors on Political Instability: A Cross-Country Analysis," Miljkovic and Rimal measure political instability as a slow-down in development within a country. The dependent variable they use in their study is frequency of irregular and regular government changes. They use a Poisson regression model where they regress regular and irregular government changes on economic and social variables, and they find that income growth rate, initial income level, the nature of political regime, and other socio-economic factors affect political instability (Miljkovic and Rimal, 2008).

These papers have good insight as to what could be some potential determinants of political instability. My paper is different from the papers mentioned and from previous literature in that it uses a different measure of political instability (number of anti-government demonstrations) and uses different models (Poisson and negative binomial) due to the nature of the outcome variable being a count variable.

3 Data

The data used in this study is a strongly balanced panel. The dependent variable of interest is the number of anti-government demonstrations in 36 OECD countries (countries listed in Table 5) during the years 1996 – 2019, which is used as a measure of political instability. This data came from the World Bank website.

I use economic, social, and political variables as independent and control variables to account for the determinants of political instability within a country. This paper includes GDP per capita (in current US$) and the total unemployment rate (% of total labor force) as economic variables to control for a country's level of wealth.

Both of these economic variables are from the World Bank website. The social variables included are the % of a country's population using the internet and the gross primary school completion rate, and these variables are also found on the World Bank website. From the World Bank website, it is defined that the gross primary school completion rate measures the "ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown." In the dataset, some values of gross primary school completion rate are over 100 due to older children who enter primary school late and under-aged children who enter primary school early and/or repeat grades. So, it is not the case that a higher primary school completion rate is necessarily "better" because that means a good percentage of students had to repeat a grade. The political independent variable included in this study is an electoral democracy index. This variable comes from the website "V-Dem" (Varieties of Democracy), and the codebook describes the components of this variable as measuring:

> "The core value of making rulers responsive to citizens, achieved through electoral competition for the electorate's approval under circumstances when suffrage is extensive; political and civil society organizations can operate freely; elections are clean and not marred by fraud or systematic irregularities; and elections affect the composition of the chief executive of the country. In between elections, there is freedom of expression and an independent media capable of presenting alternative views on matters of political relevance."

The electoral democracy index ranges from 0 to 1, where 0 indicates that there is low electoral democracy in a country, and a score of 1 means that the country has high electoral democracy. I also include a log-transformed variable of the electoral democracy index in my model.

4 Empirical Strategy

To determine the effects of the different social, political, and economic variables on the number of anti-government demonstrations, I use a negative binomial model and a Poisson model. The dependent variable (number of anti-government demonstrations) is a count variable that is in the space of integers, and in this study I am treating the dependent variable as a random variable, so the Poisson and negative binomial distributions are used to represent the distribution of the number of anti-government demonstrations. Additionally, the variances of the outcome variable within a country are higher than the means within each county (Table 6) which suggests that over-dispersion is present, and this would mean that a negative binomial model would be the appropriate model to use here. In figure 1, it can be seen that there are a lot of zeros for the value of the number of anti-government demonstrations, which leads to the variance being greater than the mean.

In this paper, I restrict the dataset to OECD countries as these countries have similar goals and policies. Generally, OECD countries are high-income countries that are regarded as developed countries. OECD members collaborate on key global issues at the local, regional, and national levels, and their goal is to "shape policies that foster prosperity, equality, opportunity and well-being for all" (OECD). This paper restricted the study to OECD countries to limit the differences in entities in the panel so that the regression could capture subtle differences that lead to a causal effect of the dependent variable.

In this study, I run three regressions, one with a negative binomial model, and two with a Poisson model. The form of the model equation is the same for both the

Poisson model and the negative binomial mode, so the equation I will be estimating is:

$$\begin{aligned} log(anti\_govt) =& \beta_0 + \beta_1 gdppercapita_{it} + \beta_2 unem\_rate_{it} + \beta_3 per\_internet_{it} \\ &+ \beta_4 democracy_{it} + \beta_5 school_{it} + \alpha_{it} + \epsilon_{it} \end{aligned} \tag{1}$$

The equation for the regressions is log-linear, where i represents one of the OECD countries and t is a year between 1996 to 2019.

To test the robustness of my results, I run a regression with only GDP per capita as an independent variable to see the effect of it on the outcome variable and to control for a country's level of wealth. This is the equation I will be estimating as a robustness check:

$$log(anti\_govt) = \beta_0 + \beta_1 gdppercapita_{it} + \alpha_{it} + \epsilon_{it} \tag{2}$$

5 Results and Discussion

When running the regressions, only 35 countries were included because Japan was dropped from the regression due to having missing values for the primary school completion rate variable. There were a few other countries that had some missing values for the primary school completion rate variable, so I decided to fill in the missing values with the mean completion rate value of a country. The coefficients of the key regressions are displayed below in Table 1.

For the negative binomial model that I estimate (Table 1, column 1), I regress the number of anti-government demonstrations on all of the independent/control variables mentioned previously (GDP per capita, unemployment rate, % of population that uses

Table 1: Negative Binomial and Poisson Regressions

VARIABLES	(1) anti_govt	(2) anti_govt	(3) anti_govt
gdppercapita	1.25e-05***	3.02e-05***	2.60e-05***
	(3.72e-06)	(4.65e-06)	(4.50e-06)
unem_rate	0.0689***	-0.000520	0.000170
	(0.0135)	(0.00910)	(0.00891)
per_internet	0.0409***	0.0471***	0.0472***
	(0.00283)	(0.00210)	(0.00207)
democracy	-5.248***	-1.836***	-2.167***
	(0.748)	(0.522)	(0.507)
school	-0.0552***	-0.0416***	-0.0380***
	(0.0140)	(0.0113)	(0.0110)
/lnalpha			0.536**
			(0.208)
Constant anti_govt			2.940**
			(1.204)
Constant	7.168***		
	(1.534)		
Observations	840	840	840
Number of country_id	35	35	35

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

the Internet, primary school completion rate, and level of electoral democracy). For the negative binomial model, I use a population-averaged model. For this model, all five variables are statistically significant at the 5% level and have a p-value of 0. GDP per capita, unemployment rate, and percentage of the population that uses the Internet all have positive coefficients, while the level of electoral democracy and the primary school completion rate both have negative coefficients. Interpreting the coefficients: a $1 increase in GDP per capita increases the percentage of anti-government demonstrations by 0.00125%, a 1% increase in the unemployment rate increases the percentage of demonstrations by 6.89%, a 1% increase in the % of people in a country that use the Internet increases the percentage of demonstrations by 4.09%, a 1 unit increase in the index that measures a country's level of electoral democracy decreases the percentage of demonstrations by 524%, a 1% increase in a country's primary school completion rate decreases the percentage of demonstrations by 5.52%. This model has a variable called _cons which is an estimate when all variables in the model are equal to 0, and is regarded as the intercept, β_0. Here, _cons has a positive coefficient and is statistically significant.

The signs of the coefficients for the negative binomial model are consistent with my hypothesis with the exception of GDP per capita. I hypothesized that GDP per capita would have a negative coefficient but from this model, evidence suggests the contrary. However, the evidence supports my hypothesis for the other variables – an increase in the unemployment rate, and the percentage of the population who use the Internet, predict an increase in the number of demonstrations, while an increase in the level of democracy and primary school completion rate predict a decrease in the number of anti-government demonstrations.

The magnitudes of the coefficients of the independent variables all seem reason-

able except for the index of electoral democracy. This is the case because the electoral democracy index ranges from a value of 0 to 1 so when looking at the regression results, a one-unit increase in the index is outside the range, so therefore it overestimates a decrease of 524% in the number of anti-government demonstrations. I re-ran the regression with a log-transformed variable of the level of democracy and there was a decrease in the coefficient of the electoral democracy index variable. For the log-transformed variable, the new interpretation is that a 1% increase in the level of electoral democracy predicts a 299% decrease in the number of anti-government demonstrations (Table 2, column 1). The log-transformed variable of the level of democracy is still significant at the 5% level with a p-value of 0. In the regression with the log-transformed variable, the coefficient of _cons decreases, but is still positive, and _cons is no longer statistically significant.

For the Poisson models, I use the same outcome variable and regress the same variables as I did for the negative binomial model and run the regressions a second time with the log-transformed democracy index. For the first Poisson model (Table 1, column2), I use a Poisson model with fixed effects. For this model, all of the variables except for the unemployment rate are statistically significant at the 5% level. GDP per capita and percentage of the population that uses the Internet both have positive coefficients, while unemployment rate, level of democracy, and primary school completion rate all have negative coefficients. When I replace democracy index with its log-transformed value, the variable becomes statistically insignificant with a p-value of 0.151 and has a negative coefficient (Table 2, column 2). Adding the log-transformed value also causes the p-value of the unemployment rate to decrease from 0.954 to 0.473.

For the second Poisson model (Table 1, column 3), I use a Poisson model with random effects. Similar to the previous Poisson model with fixed effects, all

variables are statistically significant except for the unemployment rate. GDP per capita, unemployment rate, and percentage of population that use the Internet all have a positive coefficient, while primary school completion rate and level of democracy have a negative coefficient. These results mimic the results of the negative population-averaged binomial regression model. In this model, _cons (intercept) is positive and statistically significant. Replacing the democracy index with the log-transformed value changes the model results in that now the unemployment rate has a negative coefficient (Table 2, column 3). Additionally, the p-value of the unemployment rate decreases, and _cons is no longer statistically significant.

In the Poisson model with random effects, there is an 'alpha' term that is the estimate of the dispersion parameter. In this model, the coefficient of alpha equals 1.71 and chibar2(01) is non-zero, which means that alpha is significantly greater than 0. When alpha is greater than 0 this means that the data is over-dispersed and that a negative binomial model would better fit the data compared to a Poisson model. Taking this into account, out of the three regression, the negative population-averaged binomial model fits the data the best and is the most appropriate model to use.

As a robustness check, I ran a regression with a population-averaged negative binomial model with only GDP per capita as an independent variable to control for a country's wealth and to gauge the solitary effect of GDP per capita on the number of anti-government demonstrations. The coefficient of GDP per capita is close to zero and is statistically significant at the 5% level. This evidence suggests that, by itself, GDP per capita has no effect on the number of anti-government demonstrations. After adding in political, social, and economic variables to the regression, the GDP per capita continues to have a coefficient close to zero and is statistically significant which gives support that there is no omitted variable bias.

Table 2: Negative Binomial and Poisson Regressions with Log-Transformed Democracy Index

VARIABLES	(1) Negative Binomial, PA	(2) Poisson, FE	(3) Poisson, RE
gdppercapita	1.08e-05***	2.95e-05***	2.52e-05***
	(3.68e-06)	(4.69e-06)	(4.55e-06)
unem_rate	0.0629***	-0.00642	-0.00668
	(0.0134)	(0.00894)	(0.00875)
per_internet	0.0421***	0.0488***	0.0488***
	(0.00293)	(0.00211)	(0.00209)
log_dem	-2.989***	-0.434	-0.631**
	(0.454)	(0.302)	(0.294)
school	-0.0548***	-0.0424***	-0.0383***
	(0.0139)	(0.0114)	(0.0112)
/lnalpha			0.603***
			(0.207)
Constant anti_govt			1.077
			(1.184)
Constant	2.139		
	(1.438)		
Observations	840	840	840
Number of country_id	35	35	35

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusion

This paper takes a different approach from previous approaches in that the number of anti-government demonstrations is used as a measure of political instability. Due to the dependent variable being a count variable, this paper uses a negative binomial and Poisson model to find the determinants of anti-government demonstrations. After running Poisson and negative binomial models, I find that my data is over-dispersed and therefore the negative binomial model best fits my data. The negative binomial model find that all variables are statistically significant at the 5% level. The variables GDP per capita, unemployment rate, and percentage of the population that uses the Internet all have positive coefficients, while the level of electoral democracy and the primary school completion rate both have negative coefficients.

I conclude by mentioning several possible extensions of this paper. First, in a future study a different measure of political instability can be used. Existing papers have used measures such as the number of coups and the death rate, and I think it would be interesting to use a measure such as a weighted conflict index or the number of protests and try a different model like OLS or simultaneous equations. A second extension would be to include the Gini coefficient to see the effect that income inequality has on political instability. Additionally, in this paper I only included OECD countries in my study but in future studies more countries could be included and grouped into income groups, geographical groups, etc. to see if there is a difference in effect based on the characteristics of a country. Lastly, a good extension of this paper would be to include a regression that compares a country's economic variables relative to the average of their neighboring countries. There are many theories that suggest that a person's happiness is derived in part by how they compare their income relative to others. Extending this idea, the implication is that political instability in a country is

affected by the state of the economy in the country relative to neighboring countries.

References

[1] Luisa Blanco and Robin Grier. "Long Live Democracy: The Determinants of Political Instability in Latin America". In: *The Journal of Development Studies* 45.1 (2009), pp. 76–95. DOI: 10.1080/00220380802264788. eprint: https://doi.org/10.1080/00220380802264788. URL: https://doi.org/10.1080/00220380802264788.

[2] *DataBank — The World Bank*. https://databank.worldbank.org/home.aspx.

[3] John B Londregan and Keith T Poole. "Poverty, the coup trap, and the seizure of executive power". In: *World Politics: A Quarterly Journal of International Relations* (1990), pp. 151–183.

[4] Dragan Miljkovic and Arbindra Rimal. "The impact of socio-economic factors on political instability: A cross-country analysis". In: *The Journal of Socio-Economics* 37.6 (2008), pp. 2454–2463.

[5] *Negative Binomial Regression — Stata Annotated Output*. https://stats.idre.ucla.edu/stata/output/negative-binomial-regression/.

[6] *Our global reach - OECD*. https://www.oecd.org/about/members-and-partners/.

[7] *V-Dem Dataset v11.1 — V-Dem*. https://www.v-dem.net/en/data/data/v-dem-dataset-v111/. 2020.

7 Appendix

Table 3: Data Dictionary

Variable Name	**Full Name**	**Description**
year	Year	Have yearly data from 1996 to 2019
gdppercapita	GDP Per Capita	Measured in current US dollars
unem_rate	Unemployment Rate	Total unemployment rate that is a percentage of the total labor force
per_internet	Percent of Population that uses the Internet	
anti_govt	Number of Anti-Government Demonstrations	
democracy	Electoral Democracy Index	Democracy score that range from 0 (low electoral democracy) to 1 (high electoral democracy)
school	Gross Primary School Completion Rate	Ratio of total enrollment that corresponds to the level of education shown
country_id	Numeric ID of Country	Converted country names of panel data to numeric id

Table 4: Summary Statistics

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
year	864	2,008	6.926	1,996	2,019
gdppercapita	864	31,826	21,374	2,328	118,824
unem_rate	864	7.666	4.100	1.805	27.47
per_internet	864	56.36	29.87	0.193	99.01
anti_govt	864	2.675	7.028	0	81
democracy	864	0.849	0.0775	0.292	0.924
country_id	864	18.50	10.39	1	36
school	840	102.1	4.453	78.36	128.6
log_dem	864	-0.169	0.113	-1.231	-0.079

Table 5: OECD Countries

Australia	Czech Republic	Germany	South Korea
Austria	Slovak Republic	Greece	Latvia
Hungary	Denmark	Iceland	Lithuania
Belgium	Estonia	Israel	Luxembourg
Canada	Finland	Italy	Mexico
Chile	France	Japan	Netherlands
United Kingdom	Sweden	Slovenia	New Zealand
Ireland	Switzerland	Spain	Poland
United States	Turkey	Norway	Portugal

Figure 1: Line Graph of Number of Anti-Government Demonstrations Over Time

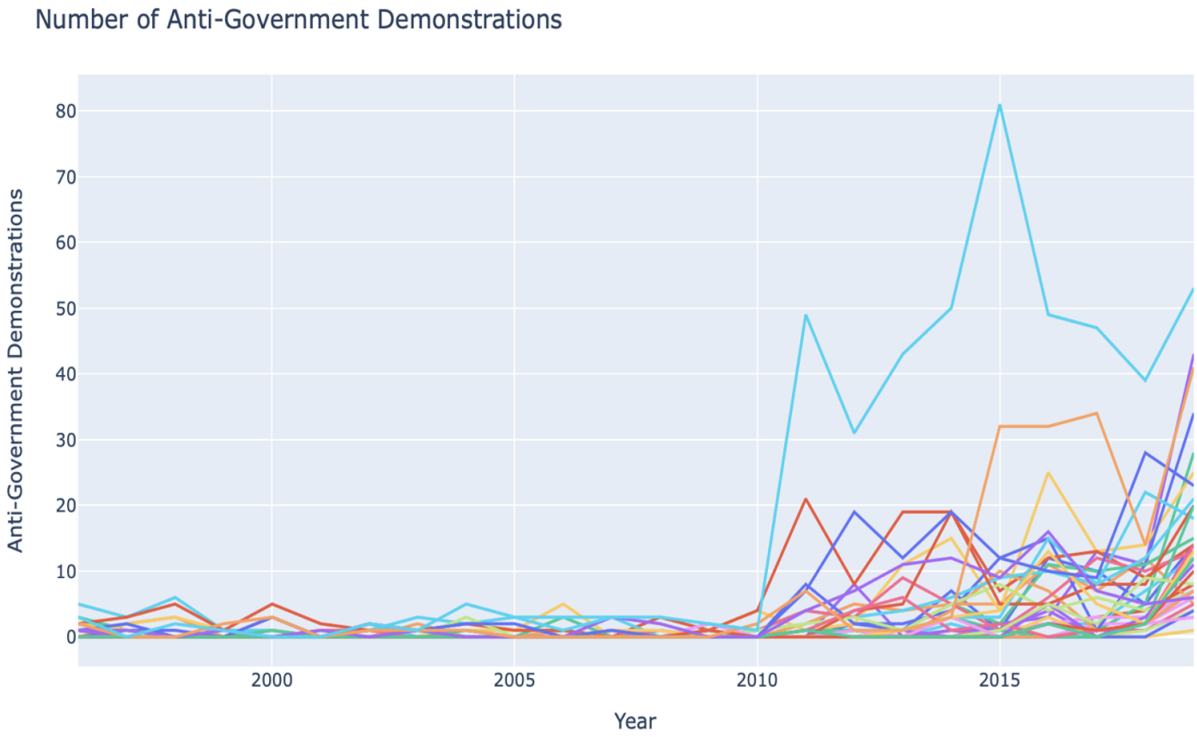

Table 6: Mean and Variance of Outcome Variable (Number of Anti-Government Demonstrations]

Country	Mean	Variance
Australia	2.208333	17.563406
Austria	0.875000	3.679348
Belgium	2.000000	32.260870
Canada	3.500000	83.739130
Chile	2.708333	11.954710
Czech Republic	1.083333	7.731884
Denmark	0.375000	1.114130
Estonia	0.250000	0.717391
Finland	0.458333	1.737319
France	5.416667	58.166667
Germany	3.875000	59.940217
Greece	5.458333	51.215580
Hungary	2.500000	19.913043
Iceland	0.625000	2.679348
Ireland	1.750000	10.804348
Israel	4.916667	29.036232
Italy	2.791667	17.302536
Japan	1.833333	6.318841
Latvia	0.791667	2.693841
Lithuania	0.166667	0.405797
Luxembourg	0.166667	0.666667
Mexico	4.083333	28.514493
Netherlands	1.083333	16.514493
New Zealand	0.875000	6.027174
Norway	0.416667	2.166667
Poland	2.791667	30.954710
Portugal	1.333333	9.449275
Slovak Republic	1.166667	6.579710
Slovenia	0.458333	0.954710
South Korea	2.041667	13.259058
Spain	6.375000	69.809783
Sweden	0.666667	4.318841
Switzerland	0.708333	6.128623
Turkey	3.625000	20.853261
United Kingdom	7.375000	167.809783
United States	19.541667	614.085145

Table 7: Robustness Check

VARIABLES	(1) anti_govt
gdppercapita	6.53e-05***
	(2.66e-06)
Constant	-0.823***
	(0.149)
Observations	864
Number of country_id	36

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1