The Relationship between Economic Uncertainty and Corporate Tax Rates

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Abstract

This paper investigates the relationship between economic uncertainty and corporate tax rates in the panel dataset of 126 countries over the period 2003–2018. We use the new index so-called the "World Uncertainty Index" to measure the level of economic uncertainty. We utilise various estimation techniques and find that a one-way causality that runs from economic uncertainty to corporate tax rates. Specifically, a rise in economic uncertainty leads to higher corporate tax rates. We also discuss potential implications.

Keywords: corporate taxation; economic uncertainty; uncertainty shocks; business cycles; panel data estimation techniques

JEL Codes: G38; D81; F44; C23

1. Introduction

Corporate tax rates, like other regulations in the market economy, affect the decision on investments, revenues of the government, and the costs of production. There are various papers on the determinants of corporate tax rates, and corporate taxation is one of the leading issues in politics (Mourmans, 2016; Slemrod, 2004; Swank, 2016). Despite the primary role of corporate taxation in economics and politics, the relationship between economic uncertainty and corporate tax rates are widely unknown (Hanlon and Heitzman, 2010). Especially, uncertainty about future policy decisions om economy has received almost no attention (Li et al., 2018).

Since the Great Global Recession (henceforth GGR) of 2008–2009, national governments have implemented various economic policies to minimise the effects of the GGR on domestic economic performance. However, different economic policies have increased the level of economic policy uncertainty, which can be measured by the index of economic policy uncertainty (EPU) introduced Baker et al. (2016), both at the country and global level. After the introduction of the EPU, various papers have observed that the EPU shocks have the economically and statistically significant effects on various economic and financial indicators, such as banking credits, employment, inflation, investments, output, stock returns, tourism development, and so on.[1]

In here, we can define the "economic uncertainty" as the unpredictability regarding government policy or regulatory shifts due to economic conditions that can affect corporate tax rates (Julio and Yook, 2012). Theoretically, during the boom times, governments tend to decrease the corporate tax rates since they can collect higher taxes and the budget deficit is not a significant problem. However, during the times of economic slowdown, obtaining taxes revenues can be a significant problem; and therefore, governments tend to increase the

[1] For details, refer to e.g., Aye et al. (2019), Baker et al. (2016), Balcilar et al. (2017), Bekiros et al. (2016), Caldara et al. (2016), Castelnuovo et al. (2017), Dang et al. (2019), Gozgor and Ongan (2017), Handley and Limao (2015). Julio and Yook (2012), Kang et al. (2017), and the references therein.

corporate tax rates. At this stage, changing the corporate tax rates can also create additional uncertainty in the economy since corporate taxation not only affects the revenue of the government (thus the fiscal deficit) but also affects the costs of production (therefore the firms' profits) and firms' decision on new investments.

All in all, economic uncertainty can affect corporate taxation, but the inverse relationship is also possible. In this paper, we, therefore, aim to analyse the relationship between economic uncertainty and corporate tax rates. In so doing, we can determine the validity of two hypotheses. First, whether a change in the corporate tax rates can be a new outcome of uncertainty shocks that is corporate tax rates causes to economic uncertainty. Or second, the corporate tax rate can be used as a policy tool without creating an extra economic uncertainty; and actually, economic uncertainty affects the corporate taxation. In this paper, we obtain evidence on the validity of the latter hypothesis.

There are also several previous papers, which have a similar aim with the current article. For example, Chen et al. (2016) indicate that firms will increase tax avoidance by increasing the level of cash holdings during the times of higher political uncertainty. Using the election times as a measure of political uncertainty, Li et al. (2018) observe that corporate tax avoidance rises in the election years and reduces in the next year of the election. The evidence comes from the panel dataset of 103 national elections in 30 countries for the period from 1993 to 2008. In a more recent empirical study, Dang et al. (2019) use the panel dataset of the publicly listed firms in China for the period from 2003 to 2016, and they find that during the times of higher economic policy uncertainty, there is a more significant corporate tax burden. The impact of economic policy uncertainty on corporate tax burden is higher when the tax quotas are more substantial in the Chinese firms.

At this stage, the main contributions of the paper to the existing literature are as follows. Firstly, we use the new and novel measure of economic uncertainty, so-called the *World*

Uncertainty Index (WUI) introduced by Ahir et al. (2018). Secondly, to the best of our knowledge, this is the first paper in the empirical literature to investigate the relationship between economic uncertainty and corporate tax rates across the countries. In so doing, we use the panel dataset from 126 countries for the period from 2003 to 2018. Thirdly, to check the robustness of the benchmark findings, we utilise several econometric techniques and focus on the countries at different income levels. According to the results, there is a causal relationship that runs from economic uncertainty to corporate tax rates and economic uncertainty is positively associated with the corporate tax rates.

The rest of the paper is organised as follows. The following section explains the details of the model, data, and econometric estimation techniques. Section 3 provides the empirical findings, and Section 4 presents the concluding remarks.

2. Model, Data and Methodology

We estimate the following model using the Ordinary Least Squares (OLS) Fixed-Effects estimation technique while controlling for the country- and the time fixed-effects:

$$CTR_{i,t} = WUI_{i,t-k} + \delta_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

$$WUI_{i,t} = CTR_{i,t-k} + \delta_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

Where *CTR is corporate tax rates* for each country *i* at time *t* and *t-k*, *WUI* is the World Uncertainty Index, δ represents the country fixed-effect, and γ is the year fixed-effect. The variable CTR is obtained from the KMPG release of Corporate Tax Rates Table. The variable *WUI*, which is developed by Ahir et al. (2018), comes from the Policy Uncertainty Website (http://www.policyuncertainty.com/). The WUI index is created using various measures such as the Economist Intelligence Unit (EIU) media coverage and changes to legislation to generate a comparable measure of economic uncertainty across countries.[2] The panel data in this paper

[2] For details of the construction methodology the WUI, refer to Ahir et al. (2018) and the references therein.

cover 126 countries during the period of 2003-2018. The coverage period and the selection of countries are related to the availability of data. We provide a list of countries in the dataset in Appendix I.

Furthermore, we also group *CTR* and *WUI* into four equal quantiles and generate the indicator variables using the first quantile as a reference to re-estimate Eq. (1) and Eq. (2). This specification allows us to find possible differences across levels of the *CTR* and *WUI* measures. Similarly, estimating a Quantile regression with both the *WUI* and the quantile indicator variables to allow the effects to vary over levels of *CTR* and vice versa. Quantile regressions allow the independent variables to give specific responses related to various quantiles of *WUI* and *CTR* and whether these responses vary. We also utilise Panel Quantile Regressions and Quantile on Quantile Regression in different lags to assess potential differences across levels of *CTR* and *WUI* measures.

Finally, we interact with the *WUI* measure with the income level of each country as defined by the World Bank.[3] In here, the models become:

$$CTR_{i,t} = WUI_{i,t-k} + High_i + Upper\_Middle_i + WUI_{i,t-k} * High_i + WUI_{i,t-k} * Upper\_Midd_{\ i} + \delta_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

$$WUI_{i,t} = CTR_{i,t-k} + High_i + Uppe\_Middl_{\ i} + CTR_{i,t-k} * High_i + CTR_{i,t-k} * Upper\_Middle_i + \delta_i + \gamma_t + \varepsilon_{i,t} \quad (4)$$

In Eq. (3) and Eq. (4), where *High* and *Upper_Middle* are dummy variables for the high-income and the upper-middle-income countries with the low-income countries as the reference group.

[3] We also use an indicator variable for the OECD countries separately. The coefficient is positive but not significant, and this is similar to the evidence if we included a dummy variable for just the high-income countries.

3. Empirical Findings

The results in Table 1 Column 1 indicate that a lagged *WUI* positively increases corporate tax rates by 1.25 percentage points when it increases one unit. In Column 2, there is also similar evidence when we consider the second lag of *WUI*. Column 3 indicates that countries classified as the upper-middle-income level negatively affects *CTR* relative to low-income countries. In the model, the first lag of *WUI* is used, but similar results (in terms of magnitude and significance) is found for the second lag of the variable across the specifications (see Column 4).

The results in Table 2 provides the findings from four equal quantiles when we generate the indicator variables using the first quantile as a reference to re-estimate Eq. (1). We observe that there are no significant differences across levels of the *CTR* and *WUI* measures, and the impact of *WUI* on *CTR* is positive and statistically significant at all quantiles. These results are valid when we consider both the first lag and second lag of *WUI*. Thus the results are robust to run different specifications. In Appendix Tables 1 and 2, we report the findings of the panel quantile regressions (based on both the first lag and the second lag of *WUI)* and the panel quantile on quantile regression (based on both the first lag and the second lag of *WUI*), respectively. In here, we obtain similar results of positive relationship in most of the specifications, but the magnitude and statistical significance are different.

The findings in Table 3 Column 1 represents that a lagged *CTR* positively increases economic uncertainty, but the coefficient is not statistically significant. This evidence is valid when we use the second lag of *CTR* in Column 2. In Columns 3 and 4, we also find that countries classified as the upper-middle-income and the high-income levels do not significantly affect economic uncertainty relative to the low-income countries. Similar evidence is obtained for the second lag of the variable across the specifications.

The results in Table 4 reports the findings from four equal quantiles when we define the indicator variables using the first quantile as a reference to re-estimate Eq. (2). We find that the effects of *CTR* on *WUI* is still positive, but statistically insignificant at all quantiles and both in the first lag and the second lag of *CTR*. In Appendix Tables 3 and 4, we provide the results of the panel quantile regressions (based on both the first lag and the second lag of *CTR)* and the panel quantile on quantile regression (based on both the first lag and the second lag of *CTR*), respectively. At this stage, we observe the similar results of positive and statistically insignificant relationship in most of the specifications, but the magnitudes are different.

In short, there is a positive and statistically significant relationship that runs from economic uncertainty to corporate tax rates in the panel dataset of 126 countries for the period from 2003 to 2018. This evidence enhances the previous empirical findings of Dang et al. (2019) (who use the index of Economic Policy Uncertainty as a measure of uncertainty and focuses on the Chinese firms for the period from 2003 to 2016), and Li et al. (2018) (who consider national the election times as a measure of uncertainty and focuses on the data from 30 countries for the period from 1993 to 2008). Furthermore, a potential reverse causality, that is the causal relationship from corporate tax rates to economic uncertainty is found to be statistically insignificant.

4. Concluding Remarks

In this paper, we examined the relationship between economic uncertainty and corporate tax rates. A new index measured economic uncertainty, so-called the *WUI* introduced by Ahir et al. (2018). We considered the panel dataset from 126 countries for the period from 2003 to 2018. We use several econometric techniques, such as the fixed-effects estimations, fixed-effects estimations based on quantiles, panel quantile regressions, and panel quantile on quantile regression. We found that the WUI is positively associated with corporate tax rates. There is also a one-way causality that runs from economic uncertainty to corporate tax rates. In the light

of these findings, we can suggest that an increase in the corporate tax rates, which can lead to an economic slowdown, should be labelled as a new outcome of uncertainty shocks. Besides, changes in corporate tax rates do not significantly cause economic uncertainty. Therefore, policymakers should realise that uncertainty shocks lead to a rise in corporate tax rates, and this can lead to economic depression or worsen economic conditions. However, their decision on corporate tax rates does not lead to economic uncertainty, that is corporate tax rate can be used as a policy tool without creating an extra economic uncertainty.

References

Ahir, H., Bloom, N., & Furceri, D. (2018). *The World Uncertainty Index*. Stanford University, Stanford CA, Mimeo.

Aye, G.C., Gupta, R., Lau, C.K.M., & Sheng, X. (2019). Is There a Role for Uncertainty in Forecasting Output Growth in OECD Countries? Evidence from a Time-varying Parameter-Panel Vector Autoregressive Model. *Applied Economics*, 51 (33), 3624–3631.

Baker, S.R., Bloom, N., & Davis, S.J. (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, 131 (4), 1593–1636.

Balcilar, M., Gupta, R., & Jooste, C. (2017). Long Memory, Economic Policy Uncertainty and Forecasting US Inflation: A Bayesian VARFIMA Approach. *Applied Economics*, 49 (11), 1047–1054.

Bekiros, S., Gupta, R., & Majumdar, A. (2016). Incorporating Economic Policy Uncertainty in US Equity Premium Models: A Nonlinear Predictability Analysis. *Finance Research Letters*, 18, 291–296.

Caldara, D., Fuentes-Albero, C., Gilchrist, S., & Zakrajšek, E. (2016). The Macroeconomic Impact of Financial and Uncertainty Shocks. *European Economic Review*, *88*, 185–207.

Castelnuovo, E., Lim, G., & Pellegrino, G. (2017). A short Review of the Recent Literature on Uncertainty. *Australian Economic Review*, 50 (1), 68–78.

Chen, D.Q., Chen, Y.S., & Dong, Z. Y. (2016). Policy Uncertainty, Tax Collection and Management Intensity and Corporate Tax Evasion. *Management World*, 5, 151–163.

Dang, D., Fang, H., & He, M. (2019). Economic Policy Uncertainty, Tax Quotas and Corporate Tax Burden: Evidence from China. *China Economic Review*, 56, Article 101303.

Gozgor, G. & Ongan, S. (2017). Economic Policy Uncertainty and Tourism Demand: Empirical Evidence from the USA. *International Journal of Tourism Research*, 19 (1), 99–106.

Handley, K., & Limao, N. (2015). Trade and Investment under Policy Uncertainty: Theory and Firm Evidence. *American Economic Journal: Economic Policy*, 7 (4), 189–222.

Hanlon, M., & Heitzman, S. (2010). A Review of Tax Research. *Journal of Accounting and Economics*, 50 (2–3), 127–178.

Julio, B., & Yook, Y. (2012). Political Uncertainty and Corporate Investment Cycles. *The Journal of Finance*, 67 (1), 45–83.

Kang, W., Gracia, F., & Ratti, R. (2017). Oil Price Shocks, Policy Uncertainty, and Stock Returns of Oil and Gas Corporations. *Journal of International Money and Finance*, 70, 344–359.

Li, Q., Maydew, E.L., Willis, R.H., & Xu, L. (2018). Corporate Tax Behavior and Political Uncertainty: Evidence from National Elections around the World. *Vanderbilt Owen Graduate School of Management Research Paper,* No. 2498198.

Mourmans, N.J. (2016). What Drives the Decreasing Corporate Tax Rates? An Empirical Research on Tax Competition. *Research in Business and Economics*, MaRBLE Research Papers, Volume 2, 2016 Edition, 1–21.

Slemrod, D. (2004). Are Corporate Tax Rates, or Countries, Converging? *Journal of Public Economics*, 88 (6), 1169–1186.

Swank, D. (2016). Taxing Choices: International Competition, Domestic Institutions and the Transformation of Corporate Tax Policy. *Journal of European Public Policy*, 23 (4), 571–603.

Table 1
Results of the Fixed-Effects Estimations: Corporate Tax Rate (CTR)

Dependent Variable: CTR	**(1) CTR**	**(2) CTR**	**(3) CTR**	**(4) CTR**
WUI (t-1)	1.252**	-	3.031***	-
	(0.616)		(1.075)	
WUI (t-2)	-	1.342**	-	3.217***
		(0.667)		(1.052)
High Income	-	-	10.61***	9.230***
			(2.621)	(2.386)
Upper Middle Income	-	-	18.99***	17.90***
			(2.245)	(2.407)
WUI (t-k)*High Income	-	-	-0.758	-0.978
			(1.498)	(1.510)
WUI (t-k)*Upper Middle Income	-	-	-4.448***	-4.852***
			(1.286)	(1.297)
Country Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.830	0.844	0.812	0.845
Number of Countries	126	126	126	126
Observations	1523	1431	1523	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Table 2
Results of the Fixed-Effects Estimations: Quantiles (Based on First Quantile) Corporate Tax Rate (CTR)

Dependent Variable:	**(1)**	**(2)**
CTR	**CTR**	**CTR**
WUI (t-1) Second Quantile	0.533*	-
	(0.306)	
WUI (t-1) Third Quantile	0.856***	-
	(0.311)	
WUI (t-1) Fourth Quantile	0.862***	-
	(0.312)	
WUI (t-2) Second Quantile	-	0.819***
		(0.313)
WUI (t-2) Third Quantile	-	0.691**
		(0.309)
WUI (t-2) Fourth Quantile	-	0.845***
		(0.320)
Country Fixed-Effects	Yes	Yes
Year Fixed-Effects	Yes	Yes
Adjusted R^2	0.831	0.845
Number of Countries	126	126
Observations	1523	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Table 3
Results of the Fixed-Effects Estimations: World Uncertainty Index

Dependent Variable: WUI	**(1) WUI**	**(2) WUI**	**(3) WUI**	**(4) WUI**
CTR (t-1)	0.001	-	0.001	-
	(0.001)		(0.002)	
CTR (t-2)	-	0.001	-	0.001
		(0.001)		(0.002)
High Income	-	-	0.070	0.105
			(0.057)	(0.066)
Upper Middle Income	-	-	0.095	0.089
			(0.084)	(0.086)
CTR (t-k)*High Income	-	-	0.000	0.001
			(0.002)	(0.002)
CTR (t-k)*Upper Middle Income	-	-	-0.003	-0.003
			(0.003)	(0.003)
Country Fixed-Effects	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes
Adjusted R^2	0.394	0.400	0.812	0.845
Number of Countries	126	126	126	126
Observations	1523	1431	1523	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Table 4
Results of the Fixed-Effects Estimations: Quantiles (Based on First Quantile) (World Uncertainty Index)

Dependent Variable: **WUI**	**(1)** **WUI**	**(2)** **WUI**
CTR (t-1) Second Quantile	0.005	-
	(0.014)	
CTR (t-1) Third Quantile	0.011	-
	(0.018)	
CTR (t-1) Fourth Quantile	0.004	-
	(0.018)	
CTR (t-2) Second Quantile	-	0.002
		(0.014)
CTR (t-2) Third Quantile	-	0.014
		(0.018)
CTR (t-2) Fourth Quantile	-	0.004
		(0.019)
Country Fixed-Effects	Yes	Yes
Year Fixed-Effects	Yes	Yes
Adjusted R^2	0.395	0.400
Number of Countries	126	126
Observations	1523	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 1a
Results of Panel Quantile Regressions (Based on First Lag of WUI)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
CTR	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
WUI (t-1)	1.617	0.666	4.684**	-0.134	-1.647	-0.412	-0.511	2.105	2.610
	(2.919)	(2.096)	(1.998)	(2.526)	(1.454)	(2.013)	(1.700)	(2.736)	(3.086)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1523	1523	1523	1523	1523	1523	1523	1523	1523

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 1b
Results of Panel Quantile Regressions (Based on Second Lag of WUI)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
CTR	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
WUI (t-2)	1.647	0.958	4.184**	-0.134	-1.647	-0.412	-0.511	2.105	2.610
	(3.685)	(1.661)	(1.998)	(2.526)	(1.454)	(2.013)	(1.700)	(2.736)	(3.086)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1431	1431	1431	1431	1431	1431	1431	1431	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 2a
Results of Panel Quantile on Quantile Regression (Based on First Lag of WUI)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
CTR	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
WUI (t-1) Second Quantile	0.000	0.087	0.000	0.279	0.000	0.625	1.000	1.000	0.474
	(0.684)	(0.399)	(0.381)	(0.375)	(0.225)	(0.470)	(0.673)	(0.580)	(0.528)
WUI (t-1) Third Quantile	0.000	0.287	0.000	1.187**	0.562*	0.813*	1.000	1.165	0.478
	(0.581)	(0.470)	(0.628)	(0.574)	(0.293)	(0.451)	(0.868)	(0.602)	(0.525)
WUI (t-1) Fourth Quantile	1.000	0.241	0.500	0.973	0.000	0.395	1.000	0.000	0.631
	(0.914)	(0.568)	(0.559)	(0.713)	(0.293)	(0.546)	(1.189)	(0.836)	(0.759)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1523	1523	1523	1523	1523	1523	1523	1523	1523

Notes: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 2b
Results of Panel Quantile on Quantile Regression (Based on Second Lag of WUI)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
CTR	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
WUI (t-2) Second Quantile	0.556	0.140	-0.000	1.052**	-0.250	1.563***	0.710	0.062	0.214
	(1.224)	(0.596)	(0.503)	(0.501)	(0.320)	(0.515)	(0.536)	(0.532)	(0.438)
WUI (t-2) Third Quantile	0.556	0.062	-0.000	1.052	-0.250	0.656	0.308	0.263	1.056
	(1.042)	(0.387)	(0.564)	(0.663)	(0.373)	(0.463)	(0.435)	(0.513)	(0.659)
WUI (t-2) Fourth Quantile	1.479	0.219	0.500	0.922	-0.250	0.000	0.447	0.012	1.398
	(1.900)	(0.629)	(0.680)	(0.758)	(0.369)	(0.626)	(0.574)	(0.615)	(1.167)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1431	1431	1431	1431	1431	1431	1431	1431	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 3a
Results of Panel Quantile Regressions (Based on First Lag of CTR)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
WUI	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
CTR (t-1)	0.002**	0.001	0.003***	0.002***	0.002**	0.001	0.000	0.001	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1523	1523	1523	1523	1523	1523	1523	1523	1523

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 3b
Results of Panel Quantile Regressions (Based on Second Lag of CTR)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
WUI	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
CTR (t-2)	0.002	0.002*	0.003***	0.002***	0.001*	0.001	0.000	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1431	1431	1431	1431	1431	1431	1431	1431	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 4a
Results of Panel Quantile on Quantile Regression (Based on First Lag of CTR)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
WUI	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
CTR (t-1) Second Quantile	0.003	0.002	0.007	0.018	0.008	0.002	0.003	0.018	0.010
	(0.015)	(0.012)	(0.019)	(0.020)	(0.021)	(0.021)	(0.022)	(0.050)	(0.077)
CTR (t-1) Third Quantile	0.018	0.009	0.006	0.010	0.001	0.002	0.001	0.001	0.063
	(0.015)	(0.010)	(0.018)	(0.019)	(0.029)	(0.029)	(0.030)	(0.077)	(0.101)
CTR (t-1) Fourth Quantile	0.012	0.017	0.020	0.034	0.030	0.019	0.014	0.008	0.017
	(0.015)	(0.024)	(0.028)	(0.025)	(0.036)	(0.032)	(0.029)	(0.079)	(0.093)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1523	1523	1523	1523	1523	1523	1523	1523	1523

Notes: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix Table 4b
Results of Panel Quantile on Quantile Regression (Based on Second Lag of CTR)

Dependent Variable:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
WUI	**10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**
CTR (t-2) Second Quantile	0.011	0.010	0.032*	0.027	0.019	0.015	0.011	0.014	0.033
	(0.016)	(0.014)	(0.018)	(0.028)	(0.023)	(0.033)	(0.032)	(0.110)	(0.042)
CTR (t-2) Third Quantile	0.020	0.020	0.044**	0.024	0.012	0.005	0.011	0.003	0.022
	(0.015)	(0.021)	(0.021)	(0.033)	(0.030)	(0.040)	(0.048)	(0.181)	(0.048)
CTR (t-2) Fourth Quantile	0.005	0.018	0.070	0.041	0.034	0.031	0.008	0.027	0.022
	(0.021)	(0.039)	(0.039)	(0.041)	(0.037)	(0.038)	(0.041)	(0.198)	(0.045)
Country Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	126	126	126	126	126	126	126	126	126
Observations	1431	1431	1431	1431	1431	1431	1431	1431	1431

Note: Standard errors in parentheses; * p < .10, ** p < .05, *** p < .01.

Appendix I
List of Countries in the Dataset (126 Countries)

Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bangladesh, Belarus, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chile, China, Colombia, Congo DR, Costa Rica, Côte d'Ivoire, Croatia, the Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Finland, France, Gabon, the Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong SAR, Hungary, India, Indonesia, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea Republic, Kuwait, Kyrgyz Republic, Latvia, Lebanon, Libya, Lithuania, Macedonia, Madagascar, Malawi, Malaysia, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, the Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, the Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Taiwan, Tanzania, Thailand, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, the United Arab Emirates, the United Kingdom, the United States, Uruguay, Uzbekistan Venezuela, Vietnam, Yemen, Zambia, and Zimbabwe.