Volume 44, Issue 3

Diversity of uncertainty and corporate tax avoidance

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Abstract

We explore how corporate tax avoidance is influenced by the diversity of uncertainty- a unique dimension of economic policy uncertainty (EPU) that has been surprisingly overlooked. We find that firms facing multiple areas of uncertainty concurrently tend to face heightened risk, prompting them to take precautionary measures and preserve cash through increased tax avoidance strategies. Notably, the effect of EPU diversity on tax avoidance is distinct from the effect of the level of EPU itself. Our study usefully identifies a more nuanced impact of EPU on corporate tax avoidance, offering valuable insights for regulators, policymakers, corporate executives, and investors in general.

1. Introduction

Taxation represents the primary source of governmental fiscal revenue and constitutes a significant cost for individual firms. Within this context, tax avoidance emerges as a strategic approach employed by companies to retain cash resources within the company, which would otherwise be allocated to the government. This avoidance encompasses both legal tax planning and illegal tax evasion practices by firms (Wang et al., 2020). Tax avoidance is a critically significant area of research, and its importance has led to an extensive volume of studies in the literature (Dyreng et al., 2022; Shevlin et al., 2020; Dyreng et al., 2019; Guenther et al., 2019; Payne and Raiborn, 2018;Chatjuthamard et al., 2024; Wongsinhirun et al., 2023).

We explore how corporate tax avoidance is influenced by a unique aspect of economic policy uncertainty (EPU) that has been overlooked in the literature- diversity of uncertainty (or EPU diversity). Firms experience greater diversity of uncertainty when faced with multiple areas of uncertainty simultaneously, whereas a concentration of uncertainty in few areas results in lower EPU diversity. While prior research is replete with studies that examine EPU levels, EPU diversity has remained surprisingly unexplored. Recent research demonstrates that tax avoidance significantly increases in the presence of a higher level of EPU. During uncertain times, firms make every effort to retain cash as a precautionary measure, including avoiding taxes (Nguyen and Nguyen, 2022; Shen et al., 2021). We extend this line of research by focusing on EPU diversity, which we argue represents a separate and crucial dimension of EPU.

We advance two competing hypotheses. First, *the risk exacerbation hypothesis* suggests that facing multiple dimensions of uncertainty simultaneously increases risk for firms. Each dimension of EPU represents a distinct source of uncertainty, such as regulatory changes, trade policy uncertainty, or monetary policy uncertainty. Managing multiple dimensions of EPU introduces heightened unpredictability and potential volatility into the business environment. This elevated uncertainty makes it challenging for firms to accurately forecast future revenues, costs, and investment opportunities. Consequently, to mitigate the risks associated with this increased uncertainty, firms tend to adopt a more cautious approach to preserve cash, leading to more tax avoidance. In summary, this hypothesis predicts that greater EPU diversity leads to increased tax avoidance.

Conversely, *the risk diversification hypothesis* posits that when firms encounter multiple sources of EPU, the interaction and interplay between these uncertainties can lead to a diversification effect, altering the overall risk exposure for firms. Different sources of uncertainty may exhibit distinct patterns and outcomes, and their combined effect may not simply be an accumulation of risks but rather a complex interplay that can yield mitigating factors. Firms may perceive this diversification effect as reducing their overall risk exposure, leading to a decrease in tax avoidance. In summary, this hypothesis predicts that greater EPU diversity results in lower tax avoidance.

Using an extensive sample comprising nearly 150,000 observations over 34 years, our analysis provides compelling evidence supporting the risk exacerbation hypothesis. We find that greater EPU diversity results in significantly more tax avoidance. Importantly, the impact of EPU diversity on tax avoidance persists even after accounting for the overall level of EPU, indicating that it constitutes a distinct and independent dimension within the broader context of EPU. This

highlights the need for separate and focused investigation into the influence of EPU diversity on corporate behaviors.

Our results are not particularly vulnerable to endogeneity as EPU diversity is measured at the macro level, beyond the control of individual firms, and is presumably exogeneous. However, we still execute additional analysis to further mitigate endogeneity. Both propensity score matching (PSM) and entropy balancing robustly corroborate the results, suggesting that endogeneity is unlikely, and our findings probably reflect a causal influence, rather than a mere association.

Our research significantly enriches the literature on tax avoidance and economic policy uncertainty (EPU) by highlighting that the diversity of uncertainty is a distinct and influential aspect of EPU, significantly impacting corporate tax avoidance. Prior studies have focused mainly on the level of EPU, neglecting its diversity (Benkraiem et al., 2022; Kang and Wang, 2021; Shen et al., 2021; Nguyen and Nguyen, 2020; Dang, Fang, He, 2019). Our study adeptly fills this gap in the literature, enhancing our understanding of the effects of EPU on corporate outcomes. Our study offers vital insights for policymakers, regulatory bodies, corporate executives, and investors. It underscores the need for nuanced economic policies, underscoring how increased diversity in economic policy uncertainty (EPU) can lead to more aggressive corporate tax avoidance, affecting government fiscal revenues.

2. Sample formation and data description

2.1. Sample construction

We begin by accessing data on tax avoidance and relevant firm characteristics for all firms in the COMPUSTAT database, ensuring comprehensive coverage. EPU data from Baker et al. (2016) is utilized. The final sample comprises 147,106 firm-year observations, spanning from 1987 to 2021. We follow the literature and use the cash effective tax rate as our measure of tax avoidance. This is the most direct measure of the firm's tax burden and is widely adopted in the literature (Edwards et al., 2016). It is computed as the cash taxes paid divided by pre-tax book income before special items.

2.2. EPU diversity

To construct the EPU index, Baker et al. (2016) utilize advanced machine learning algorithms and sophisticated textual analysis techniques. This comprehensive index captures the frequency of EPU-related phrases in ten prominent US newspapers. Importantly, Baker et al. (2016) create a specific index for each category of EPU, providing a nuanced understanding of its diverse dimensions.

We adopt the widely used Herfindahl Index to measure diversity, where higher values indicate less diversity. With the EPU index divided into eleven distinct categories (e.g., monetary policy, taxes, fiscal policy, government spending), we calculate the Herfindahl index using the index value for each category.[1] To ease interpretation, we take the reciprocal of the Herfindahl

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[1] The eleven sub-categories of the EPU index are as follows: (1) monetary policy, (2) taxes, (3) fiscal policy, (4) government spending, (5) health care, (6) national security, (7) entitlement programs, (8) regulation, (9) financial regulation, (10) trade policy, (11) sovereign debt and currency crises.

index, where higher values signify more diversity. Consequently, our EPU diversity index indicates greater diversity as its value increases. Notably, our study is one of the first to explicitly recognize the diverse composition of the EPU index.

$$EPU\ Diversity\ Index = \frac{1}{Herfindahl\ Index} \qquad\qquad (1)$$

2.3. Additional variables

We account for several firm-specific characteristics that may influence tax avoidance. Specifically, our analysis includes controls for firm size (natural logarithm of total assets), profitability (EBIT divided by total assets), leverage (total debt divided by total assets), capital investments (capital expenditures/total assets), cash holdings (cash holdings divided by total assets), intangible assets (research and development (R&D) expenses divided by total assets, and advertising expenses divided by total assets), asset tangibility (fixed assets divided by total assets), dividend payouts (total dividends divided by total assets), and discretionary spending (selling, general, and administrative (SG&A) expenses divided by total assets).

To differentiate the level of EPU from EPU diversity as distinct constructs, we include the EPU index as a control variable. As all firms experience the same level of EPU diversity within each year, year fixed effects are not feasible. Instead, we introduce a time trend variable that incrementally increases by one unit for each successive year. This approach captures the evolving nature of tax avoidance over time, addressing temporal variations in tax avoidance despite the absence of year fixed effects. The descriptive statistics for the variables are shown in Table I.

3. Results

Table II presents the regression results. Standard errors are clustered by firm. Model 1 includes industry fixed effects based on the first two digits of SIC. Model 2 incorporates firm fixed effects to control for time-invariant firm-specific characteristics that may be omitted in the model. The coefficients of EPU diversity in both Model 1 and Model 2 are significantly negative, suggesting that firms are more aggressive in avoiding taxes when faced with greater EPU diversity. Our results corroborate the notion that greater EPU diversity imposes additional risk and thus induces firms to adopt more tax avoidance to conserve cash. Notably, the coefficients of the EPU index (EPU levels) are significantly negative in both Model 1 and Model 2. Therefore, the effect of EPU diversity on tax avoidance is above and beyond the effect of the level of EPU, indicating that EPU diversity is a distinct and independent aspect of EPU.

Furthermore, we perform additional analysis to validate the results. First, we execute propensity score matching (PSM). We classify firms where the value of EPU diversity is in the top quartile (greatest EPU diversity) as our treatment group. For each firm in the treatment group, we identify a firm form the rest of the sample that is most similar using ten firm-specific attributes (the ten control variables in the regression analysis). Our treatment and control firms are thus comparable in every observable aspect, except for EPU diversity. The coefficient of EPU diversity in Model 3 is significantly negative. In Model 4, we perform entropy balancing, where we adjust the weight of each variable such that the means, variances, and skewness of the treatment and control groups are similar. EPU diversity still exhibits a significantly negative coefficient in Model 4. Because our PSM and entropy balancing results are consistent, our findings appear to be robust to endogeneity and probably reflect a causal effect, not just a correlation.

4. Conclusions

Our study explores the influence of EPU diversity, an overlooked dimension of EPU, on corporate tax avoidance. We show that greater EPU diversity brings about increased tax avoidance. Firms grappling with multiple areas of uncertainty adopt more tax avoidance strategies as a means of safeguarding their resources amid heightened risks.

Our results offer several important practical implications. Our findings are crucial for policymakers and regulatory bodies who aim to understand and potentially regulate corporate tax behaviors. For government entities, our study suggests the need for more nuanced approaches when designing and implementing economic policies. The fact that firms increase tax avoidance in response to increased EPU diversity implies that policy volatility and uncertainty can have unintended consequences on government fiscal revenues. Policymakers should consider the potential ripple effects of introducing multiple economic policies simultaneously or in rapid succession, as these could inadvertently incentivize firms to seek more aggressive tax avoidance strategies.

From a corporate governance perspective, our findings provide valuable insights for company executives and board members. The understanding that greater EPU diversity leads to increased tax avoidance can inform strategic financial planning and risk management. Firms might need to balance the benefits of tax avoidance against potential reputational risks and long-term sustainability concerns, especially in an era where corporate transparency and ethical practices are increasingly valued by stakeholders. For investors and financial analysts, our research highlights the importance of considering a firm's exposure to diverse economic uncertainties as a factor in evaluating its financial behavior and risk profile. The findings suggest that firms with higher EPU diversity might exhibit more aggressive tax planning, which could impact their cash flow and, ultimately, investment returns.

Finally, our study contributes to the academic discourse by identifying EPU diversity as a separate and significant dimension of EPU that warrants focused investigation. By demonstrating that EPU diversity is not merely a subset of the overall EPU level but an independent factor influencing corporate behavior, we open new avenues for future research in the areas of corporate finance and economic policy analysis.

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Appendix

Table I: Summary statistics

	Mean	SD	25th	Median	75th
Cash Effective Tax Rate	0.192	0.197	0.003	0.152	0.321
EPU Diversity Index	0.092	0.014	0.090	0.097	0.100
EPU Index	1.063	0.322	0.821	1.041	1.146
Ln (Total Assets)	5.245	2.861	3.485	5.363	7.205
EBIT/Total Assets	-0.140	1.137	0.023	0.076	0.126
Total Debt/Total Assets	0.338	0.648	0.037	0.220	0.395
Capital Expenditures/Total Assets	0.061	0.077	0.014	0.037	0.076
Cash Holdings/Total Assets	0.165	0.212	0.020	0.077	0.227
Advertising/Total Assets	0.011	0.033	0.000	0.000	0.003
R&D/Total Assets	0.038	0.123	0.000	0.000	0.021
Dividends/Total Assets	0.017	0.041	0.000	0.000	0.017
SG&A/Total Assets	0.378	0.879	0.039	0.177	0.381
Fixed Assets/Total Assets	0.535	0.460	0.163	0.423	0.820

Table II: The effect of EPU diversity on corporate tax avoidance

	(1)	(2)	(3)	(4)
	Industry Fixed Effects	Firm Fixed Effects	PSM	Entropy Balancing
	Cash ETR	Cash ETR	Cash ETR	Cash ETR
EPU Diversity	**-0.108***	**-0.065**	**-0.176***	**-0.103***
	(-3.265)	**(-2.077)**	**(-2.859)**	**(-3.053)**
EPU Index	-0.004**	-0.006***	-0.003	-0.004**
	(-2.410)	(-3.769)	(-1.107)	(-2.271)
Ln (Total Assets)	0.022***	0.023***	0.023***	0.024***
	(51.261)	(26.755)	(18.954)	(24.719)
EBIT/Total Assets	0.009***	-0.003***	-0.000	-0.002**
	(7.254)	(-4.006)	(-0.147)	(-2.109)
Total Debt/Total Assets	-0.014***	0.001	-0.000	-0.001
	(-12.556)	(1.614)	(-0.143)	(-0.878)
Capital Expenditures/Total Assets	-0.046***	0.046***	0.064***	0.066***
	(-4.845)	(5.689)	(4.829)	(7.050)
Cash Holdings/Total Assets	-0.012***	-0.004	0.000	-0.005
	(-2.923)	(-1.045)	(0.038)	(-0.977)
Advertising/Total Assets	0.020	0.034	0.069*	0.040
	(0.747)	(1.162)	(1.664)	(1.215)
R&D/Total Assets	-0.116***	-0.018***	-0.015**	-0.015***
	(-20.490)	(-3.963)	(-2.112)	(-2.854)
Dividends/Total Assets	0.076***	0.047***	0.051*	0.042**
	(3.741)	(2.769)	(1.898)	(2.202)
SG&A/Total Assets	0.022***	0.008***	0.010***	0.009***
	(13.935)	(9.465)	(7.168)	(8.424)
Fixed Assets/Total Assets	0.004	-0.005*	-0.007*	-0.007**
	(1.469)	(-1.937)	(-1.897)	(-2.431)
Time Trend	-0.004***	-0.004***	-0.004***	-0.004***
	(-34.150)	(-25.171)	(-19.159)	(-23.173)
Constant	0.161***	0.150***	0.155***	0.149***
	(31.612)	(25.460)	(15.982)	(23.231)
Industry Fixed Effects	Yes	No	No	No
Firm Fixed Effects	No	Yes	Yes	Yes
Observations	147,106	144,712	69,439	144,712
Adjusted R-squared	0.188	0.414	0.435	0.430

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1