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Contemporaneous and lagged connectedness among international categorical economic policy uncertainty and ASEAN-5 stock markets: Do policy uncertainty sources and determinants matter?

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Abstract

We explore the spillover among ASEAN-5 stock markets (Malaysia, Singapore, Thailand, the Philippines, and Indonesia) and the categorical economic policy uncertainty (EPU) of three major economies (China, Japan, and the United States), employing an R^2 decomposed connectivity approach. Our empirical findings depict significant connectedness among ASEAN-5 stock markets and the categorical EPUs of three major economies, where instantaneous temporal spillovers are greater than lagged spillovers. We find that most categorical EPUs are shock receivers, whereas the ASEAN-5 stock markets are shock transmitters. Chinese monetary and exchange rate policy uncertainties, along with Japanese fiscal policy uncertainty, act as net shock transmitters. However, the roles of categorical EPUs and ASEAN-5 stock markets vary across total, contemporaneous, and lagged transmissions. We also find that the GFC, the Euro debt crisis, the U.S.–China trade war, COVID-19, and the Russia–Ukraine conflict caused dynamic fluctuations in shock transmission. We also show that oil price changes, global financial stress, climate change, and gold market ups and downs are key factors that link economic policy uncertainties and the ASEAN-5 markets in different time frames. Hence, our empirical results provide valuable insights for managing risks and formulating strategies for addressing economic policy uncertainty and world crisis events.

Keywords: Economic policy uncertainty, Stock markets, Connectedness, Global risk factors

JEL Classification: G11, G15, G2

Introduction

Economic policy uncertainty (EPU) has increased globally, particularly since the COVID-19 pandemic, as governments worldwide have had to respond to unprecedented health crises, supply chain disruptions, and inflationary pressures (Phan et al. 2024). These challenges have been exacerbated by heightened geopolitical risks in regions such

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as the Middle East and Europe, leading to increased commodity prices and runaway inflation (Aizenman et al. 2024; Bouri et al. 2023; Yang et al. 2023). Consequently, both developed and developing economies have adopted contractionary monetary policies to mitigate inflation (Ascari et al. 2024). Notably, the aggressive interest rate hikes implemented by the U.S. Federal Reserve contributed to significant liquidity risks, culminating in the collapse of major U.S. banks in 2023, including the failure of Silicon Valley Bank, marking the largest such event since the 2008 financial crisis (Erer and Erer 2024). However, as the global economy strives to tame inflation, policy reversals are becoming evident, particularly in the Western world.

The economic policy uncertainty that arises from one country is not contained within the geographical territory. In highly integrated global financial markets, it can spillover to the economic and financial activities of another country (Colombo 2013; Baker et al. 2016; Bernal et al. 2016; Liow et al. 2018). However, the effects of EPU shocks on financial markets, particularly in emerging economies, are not homogeneous, as market structure, informational efficiency, and investor behavior play crucial roles in determining how quickly stock markets respond to uncertainty (Baker et al. 2016; Bernal et al. 2016; Colombo 2013; Dogah 2021; Julio and Yook 2016; Liow et al. 2018; Xu et al. 2021). For instance, stock markets in developed countries receive or transmit effects faster than those in emerging countries since developed markets are characterized as efficient markets. On the other hand, the markets of emerging countries take time to respond and react to uncertainty due to informational inefficiency. Additionally, the economic situation itself does not always impact stock market returns directly because other factors, such as market structure and investor behaviors, could also influence fund allocation and investment decisions.

The ASEAN-5 countries (Indonesia, Singapore, Malaysia, Thailand, and the Philippines) are influential economies of Southeast Asia with a combined GDP of $ 3.05 trillion in 2022. The United States, China and Japan, which represent the three largest economies in the world, have a significant influence on global economies because of their considerable size,[1] wide-ranging trade relationships, and access to financial markets (Lean et al. 2024). The EPUs of these countries arising from various policy domains, including fiscal, monetary, trade and foreign exchange rates, appear to spill over to other economies through various channels, notably currency translation, foreign direct investment (FDI), allocation of funds, and market fundamentals (Chen et al. 2020; Choi et al. 2020; Dogah 2021; Gulen and Ion 2015; Julio and Yook 2016; Pastor and Veronesi 2012).

China's dominance in Asia has increased significantly since the inception of the One Belt and One Road (OBOR) (Sun and Hou 2019). China is now one of the largest trading partners of ASEAN economies; e.g., bilateral trade between China and ASEAN countries reached $878 billion in 2022 (Lean et al. 2024). Foreign direct investment from Chinese companies has also increased significantly in the recent past. For instance, Singapore received 51% of Chinese FDI in 2023 (Li and Lu 2018). ASEAN countries such as Vietnam, Malaysia, and Thailand are deeply integrated into China's supply chain, making them highly sensitive to Chinese trade and monetary policy uncertainty (Dogah

[1] Combined GDP of three countries was more than $49 Trillion in 2023 which was approximately 50% of the global GDP.

2021). In response to China's growing economic and political influence in Asia, the Trans-Pacific Partnership (TPP), a multilateral trade agreement covering 40% of the global economy, was signed in February 2016 among 12 countries in the Asia–Pacific region. However, President Donald Trump withdrew from the US in 2017. Later, the Biden Administration launched the "Indo-Pacific Economic Framework" in 2022. Donald Trump's recent reelection could further increase U.S. and global policy uncertainty. The ongoing U.S.–China trade war has played a role in amplifying trade policy uncertainty and creating volatility in ASEAN markets, particularly Indonesia and Malaysia, which are key players in the global supply chains of both economies (Colombo 2013; Lean et al. 2024). Japan has also grown as an economic partner in the region, contributing significantly to both trade and investment flows. Japan's monetary policy of maintaining ultralow interest rates and engaging aggressively in bond-buying programs in response to domestic economic stagnation has had spillover effects on ASEAN markets (Lean et al. 2024). Uncertainty in Japanese yen exchange rate policy also impacts ASEAN economies, especially Thailand and Singapore, which are sensitive to fluctuations in yen due to strong trade relationships and investments (Xu et al. 2021). Thailand and Indonesia are the major recipients of Japanese FDI in the region. Consequently, Japanese monetary and fiscal policies play a pivotal role in regional financial markets (Keddad 2024). Additionally, Japanese exchange rate policy has a significant effect on the Malaysian and Indonesian stock markets through capital flows (Baker et al. 2016; Lean et al. 2024).

Hence, it is evident that ASEAN-5 countries are highly associated with the US, China and Japan. The close economic interconnections show that economic policy uncertainty originating from the U.S., China and Japan could be significant drivers of stock market volatility in the region. Increasing global financial integration has heightened volatility and international spillover effects on ASEAN stock markets, primarily through trade, foreign direct investment, and exchange rate movements (Ali et al. 2023a, b; Colombo 2013; Das et al. 2019; Dogah 2021; Hoque and Zaidi 2019; Hoque et al. 2020; Lean et al. 2024; Supachart et al. 2020; Xu et al. 2021). As a result, numerous papers have acknowledged the impacts of fiscal, monetary, trade and exchange rate policy uncertainty on ASEAN financial markets (Keddad 2024; Supachart et al. 2020; Thaker et al. 2020). However, collective findings indicate inconsistent spillovers that are not fully understood, especially when examining the differences between developed and emerging markets. Interestingly, Dogah (2021) finds that although the U.S. EPU remains significant, its effects on the ASEAN stock markets have declined significantly since 2013, as the Chinese EPU overtook the U.S. as the leading systemic risk contributor. Similarly, Keddad (2024) argues that the Chinese EPU exceeds the U.S. and that the Japanese EPU is the main driver of Asian stock market volatility. However, Lean et al. (2024) argue that while the US and Chinese EPUs have heterogeneous impacts on ASEAN countries, the impact of the U.S. EPU still dominates the ASEAN stock markets.

The aggregate economic policy uncertainty index, which combines fiscal, monetary, trade, and exchange rate uncertainties, has been widely used in the literature (Baker et al. 2016). However, the recent development of categorical EPU indices disaggregates different types of policy uncertainty into different categories, providing a more detailed picture of how specific policy actions—such as changes in trade tariffs, monetary tightening, exchange rate volatility, and fiscal uncertainty measures—can impact stock

markets. Our study revisits the spillover puzzle between developed economies' EPU and the ASEAN stock market by exploring the connectedness among the US, Chinese and Japanese categorical EPUs and the ASEAN-5 stock market. Moreover, as connectedness and spillover change with crisis and geopolitical events, we further investigate the interconnectedness during several crisis periods, such as the Global Financial Crisis (GFC), the EURO debt crisis, the USA–China trade war, the COVID-19 pandemic, and the Russia-Ukraine war. To examine the connectedness, we employed the R2 decomposed connectedness approach of Balli et al. (2023), which considers both contemporaneous and lagged connectedness. Our empirical findings depict significant connectedness and spillover among the ASEAN-5 stock markets and categorical economic policy uncertainty of three major economies, where the spillovers of instantaneous temporal dynamics are greater than those of lagged dynamics.

The findings reveal that most categorical economic policy uncertainties are receivers of shocks and that the ASEAN-5 stock markets are consistently shock transmitters. Importantly, the uncertainties of the Chinese monetary and exchange rate policy and Japanese fiscal policy act as consistent net shock transmitters to the system in contemporaneous and lag connectedness models. However, the role of categorical EPUs and the ASEAN-5 stock markets varies on the basis of transmission network connectivity—total, contemporaneous, or lagged. The analysis also reveals that major economic and geopolitical crises such as the global financial crisis, Euro debt crisis, the U.S.–China trade war, the COVID-19 outbreak, and the Russia-Ukraine conflict caused dynamic oscillations in both the interconnection network and transmission effects. Our empirical findings also demonstrate that risk factors, including oil shocks, global financial stress, world climate change, and gold market volatility, significantly affect the connectedness of categorical EPUs and that ASEAN-5 stock markets vary across different connectedness levels. The results provide investors, portfolio managers, and policymakers valuable insights into managing risks effectively and formulating strategies to address changing economic policy uncertainty and world events.

Our study contributes to the literature in many ways. First, the theoretical and empirical literature has indicated that there is a lack of consensus regarding findings on economic policy uncertainty and the stock market nexus. Although a growing body of research has revealed a negative effect of economic policy uncertainty on stock market returns and volatility, most of the earlier works have employed composite country-level EPU when measuring the impact of the EPU on stock markets in general and the ASEAN stock markets in particular (Dogah 2021; Lean 2024). Hence, our study contributes to the understanding of the spillover puzzle between developed economies' EPU and the ASEAN stock market by investigating the relationships in a comprehensive framework using categorical EPU indices, allowing for more targeted assessment of uncertainty than the aggregate EPU index does. The categorical EPU indices categorize uncertainty into various policy domains that can affect the economy, facilitating a deeper analysis of the impacts of EPU. Additionally, our study is slightly related to that of Keddad (2024), who considered categorical Chinese EPUs with composite country-level EPUs of the U.S., Japan and the European Union. Our study fills this gap by utilizing categorical Chinese, U.S., and Japanese EPUs. Moreover, our study extends Dogah (2021) and Lean

et al. (2024) in terms of the spillover effects of categorical EPUs of developed markets on ASEAN stock markets.

Second, we employed a novel method, the R2 decomposed connectedness approach, to investigate the connectedness and spillover effects. In this study, the contemporaneous connection quantifies the immediate effect of EPU shocks on stock market returns, reflecting the quick reaction of investors and market participants to changes in policy uncertainty. On the other hand, lagged connectivity refers to the delayed or sluggish response of stock markets to changes in EPU. By capturing both contemporaneous and lagged connectedness, the study provides a comprehensive analysis of the short-term and long-term implications of EPU spillovers on the ASEAN stock markets.

Third, unlike Keddad (2024) and Lean et al. (2024), we examine dynamic changes in connectedness and spillovers amid significant major global events and crises. Such empirical evidence extends and enhances past studies (e.g., Ha 2024; Lin et al. 2024; Rubbaniy et al. 2024; Yousfi et al. 2024). Fourth, considering that macro- and other global uncertainty factors drive financial market connectedness, we also examined the impacts of oil shocks, geopolitical risk, global financial stress, climate risk, and gold, enhancing the understanding of portfolio risk management.

The rest of the paper is structured as follows. Section 2 discusses the related literature. The following section introduces the empirical framework and data description. Section 4 describes the empirical findings and interpretations. Section 5 concludes the paper with several suggestions for investors and traders.

Literature review

Theoretical background

While the fundamental effect of uncertainty has been previously known, the post-global financial crisis period emphasized the impact of uncertainty on firms' irreversible investment decisions and economic outcomes, resulting in more thorough and relevant studies (Bernanke 1983). Pástor and Veronesi (2012) were among the first to provide a theoretical framework, presenting a general equilibrium model that considers investor welfare and political reactions to uncertainty regarding current government policies and the potential effects of new policies. They observed that stock prices typically decrease following policy announcements, with negative returns outweighing positive returns, as the latter are often anticipated by investors. In addition, Pástor and Veronesi (2013) expanded their study and reported that political uncertainty tends to increase stock volatility and interconnectedness, particularly during periods of economic weakness.

The current study is underpinned by several economic and financial theories. The first is the efficient market hypothesis (EMH), which holds that asset values rapidly change to reflect all new available information, implying informational efficiency in financial markets. This theoretical view questions the idea that active trading techniques or knowledge advantages allow investors to methodically create excess profits (Malkiel 1989). However, the presence of economic policy uncertainty may challenge the predictions of EMH and lead to deviations from efficient market outcomes because of investors' overreactions or underreactions to information during times of heightened uncertainty. Thus, EPU can lead to temporary market inefficiency resulting from the mispricing of asset values, contradicting the assumption of EMH.

Second, contagion theory suggests that financial and economic events in one country can spill over and affect the financial markets of other countries, creating further market disturbances (Allen and Gale 2000). In highly interconnected markets globally, the EPU of major economies can lead to spillover effects in other countries' economies through various channels, such as international trade, investment and capital flow.

Third, signaling theory posits that economic policy uncertainty can serve as a signal to investors about the state of the economy and the government's policy stance (Connelly et al. 2011). Thus, high levels of economic policy uncertainty may lead to decreased investor confidence and increased stock market volatility. Developed markets respond to uncertainty effects faster than emerging markets do because of their efficient market characteristics (Liu et al. 2020). The financial markets of emerging countries are slower to respond to and react to uncertainty due to informational inefficiency. Additionally, market structure and investor behavior influence investment decisions, impacting stock market returns (Parveen et al. 2020). However, global market interconnection contributes to strong economic relations among countries, leading to contagion effects during recessions and political instability (Guo et al. 2018). Consequently, recessions and political instability can lead to a contagion effect that affects multiple stock markets, but the extent of this effect depends on both the economic fundamentals of each market and the degree of economic relations between them.

Related empirical studies

Empirical studies on economic policy uncertainty (EPU) have increased significantly in recent years. The development of numerous categorical metrics of EPU (Kedad 2024; Lean et al. 2024) may help explain the increasing research on this topic. Building on the influential work of Baker et al. (2012), further research has broadened the research focus related to economic policy uncertainty. For example, Pástor and Veronesi (2013) reported that, especially in times of economic fragility, political uncertainty often accentuates stock market volatility and interconnection. Moreover, particularly in industries prone to policy changes, Baker et al. (2016) showed that increased EPU results in higher stock market volatility and lower investment. Additionally, numerous studies have reported a significant negative correlation between EPU and stock returns in various markets. For example, Sum (2013) reported that economic policy uncertainty in the U.S. negatively affects the returns on five ASEAN stock markets. Similarly, Arouri et al. (2016) reported that increased policy uncertainty significantly reduces stock returns, especially during extreme volatility periods. Das et al. (2019) argued that EPU and geopolitical risk exert negative effects on the stock returns of Asian emerging stock markets in different quantiles. Other studies have also examined the various effects of uncertainty on the dynamics of stock markets. Although they did not uncover long-term impacts, Bahmani-Oskooee and Saha (2019) reported that uncertainty had negative short-term effects on stock prices. Furthermore, Jiang et al. (2019) noted that bilateral trade flows, currency rates, and investor sentiment's main influences on cross-country spillovers between China and the United States. Liang et al. (2020) complemented these results by reporting a negative link between uncertainty and Asian stock market performance.

The economic policy uncertainty (EPU) impacts of large economies on the stock markets of both developed and underdeveloped nations have been investigated in a growing number of empirical studies. For example, Tsai (2017) discovered that, while U.S. EPU is less significant, Chinese EPU has become a major risk factor, with a contagion effect that impacts several regional markets, excluding the European market. Moreover, Das et al. (2019) reported varying impacts of U.S. economic policy uncertainty, geopolitical risk, and financial stress on 24 newly developed stock markets. In a study of the Gulf Cooperation Council (GCC), Istiak et al. (2019) reported that U.S. EPU negatively affects the GCC stock markets. Alqahtani and Martinez (2020) also showed that worldwide and U.S. EPU had major negative effects on stock prices in Bahrain and Kuwait but not in other GCC nations. Liang et al. (2020) investigated the impact of U.S. uncertainty on 11 Asian stock market indices over the 2000–2017 period, revealing a negative association between uncertainty and stock prices. With an emphasis on China's impact, Thaker et al. (2020) claimed that the market least vulnerable to changes in Chinese EPU was the Malaysian stock market, followed by Singapore, the Philippines, Thailand, and Indonesia. Building extensively on these results, Supachart et al. (2020) argued that the overall return of Thailand's stock market is closely connected with the EPU from Europe and China. Dogah (2021) reported that US and China trade policy and EPU have spillover effects on ASEAN regional systemic risk. Xu et al. (2021) also reported that Chinese EPU has significant effects on East Asian economies and financial uncertainty.

However, other researchers have called into doubt the validity of the link between stock market performance and economic policy uncertainty (EPU). Jurado et al. (2015) reasoned that true uncertainty has little bearing on much of the fluctuations observed in popular uncertainty proxies. Similarly, Asgharian et al. (2023) contended that if one considers the time-varying risk aversion index (RA) and economic uncertainty index (EU) built by Bekaert et al. (2022), the EPU does not provide helpful information for anticipating stock market volatility. They also clarified that some of the predictor variables are not accessible at daily frequency, partially because swings in uncertainty follow a much smoother path than changes in stock market volatility.

As a result, other studies have shown either more complex or unclear links between EPU and stock market performance. Li et al. (2016), for example, observed a modest correlation between the EPU and the stock market in China and India. Das et al. (2019) also recorded varying impacts of U.S. economic policy uncertainty, geopolitical risk, and financial hardship on 24 newly established stock markets. Furthermore, Liu et al. (2020) discovered that, while initially weak in the short term, U.S. economic policy uncertainty progressively became stronger over the long run for the Chinese and Indian stock markets.

Remarkably, a growing number of recent studies have investigated the linkages and interconnectedness between ASEAN stock markets and the economic policy uncertainty of Japan, China, and the United States. For example, Dogah (2021) discovered that while policy uncertainty shocks from the U.S. were formerly a key influence for ASEAN markets, their impacts started to fade in late 2013, and China's policy uncertainty has become the main source of systematic risk. More specifically, the trade policy uncertainty of China has the most severe contagion impact on the ASEAN markets. With the exception of South Korea and Hong Kong SAR, China, Kedad (2024) claimed that the

impacts of Chinese EPU have surpassed those of both Japanese and U.S. EPUs as key factors driving volatility in Asian stock markets. Moreover, particularly in most developed financial markets, Chinese policy-specific uncertainty indices—including monetary, fiscal, trade, and exchange rate policies—were shown to be quite influential. Lean et al. (2024), however, contended that American and Chinese EPUs had differing effects on ASEAN equity indices depending on the nation. They discovered that the relationship between U.S. EPU and ASEAN stock markets has been more robust than that of Chinese EPU since 2002. These contradictory results imply that the dynamics of policy uncertainty spillovers in the ASEAN region are multifarious and complex, with the relative importance of U.S., Chinese, and Japanese policy uncertainty changing across various ASEAN markets and time periods. The variation in these interactions emphasizes the need to understand the country-specific and policy-specific elements in comprehending the links between economic policy uncertainty and stock market performance in the ASEAN setting.

More recent studies have focused on the impact of recent black swan events such as the COVID-19 pandemic and the Russia–Ukraine war (Ha 2024; Lin et al. 2024; Rubbaniy et al. 2024; Yousfi et al. 2024). Yousfi et al. (2024) highlighted that increased market interconnectedness during the pandemic was driven by economic policy challenges and the occurrence of subsequent crises. Their study underscores the need for adaptive strategies in navigating economic uncertainties to mitigate systemic risk across global markets. Market correlations have intensified, reflecting synchronized downturns and recovery patterns. In addition, the study revealed that during the postpandemic period, fluctuations in market connectedness were linked to varied recovery speeds, policy responses, and emerging geopolitical tensions. Similar to Yousfi's (2024) findings, Rubbaniy et al. (2024) conclude that the crisis amplified market connectedness, reflecting global economic disruptions and recovery efforts. Their study explores the dynamic connectedness among various asset classes and the implications for portfolio performance. Ha (2024) and Lin et al. (2024) delve into the asymmetric spillover effects of the COVID-19 pandemic and the Russia–Ukraine crisis and report findings that are consistent with those of previous studies.

Theoretical and empirical studies have shown that the findings on the nexus between economic policy uncertainty and the stock market remain inconclusive. Although a growing body of literature has revealed a negative effect of economic policy uncertainty on stock market returns and volatility, most of the earlier works have investigated the use of only the composite country-level EPU to measure the impact on the stock market in general and the ASEAN stock in particular (Dogah 2021; Lean et al. 2024). While only Kedad (2024) has considered categorical Chinese EPUs, the study did not include categorical EPUs of the U.S. and Japan. Moreover, the recently constructed categorical EPU indices for the United States, China and Japan by Baker et al. (2016), Huang and Luk. (2020) and Arbatli et al. (2017), respectively, prompted us to examine the impacts of categorical EPUs on the stock market returns and volatility of ASEAN-5 markets. Our investigation focuses on the effects of EPU in the areas of fiscal, monetary, trade, and exchange rate policies. Henceforth, we aim to study the connectedness and spillover effects of the US, China and Japan categorical EPUs on the returns and volatilities of stock markets in the ASEAN-5 countries by employing the R2 decomposed

connectedness approach. By capturing both contemporaneous and lagged connectedness, the study provides a comprehensive analysis of the short-term and long-term implications of EPU spillovers on ASEAN stock markets. Most importantly, we have incorporated various crisis periods, including the global financial crisis (GFC), the EURO debt crisis, the USA–China trade war, the COVID-19 pandemic, and the Russia–Ukraine war, into the analysis to examine the connectivity and transmission effects.

Data and methods

We employ monthly categorical EPU indices for China, Japan and the U.S. The categorical EPU indices of the U.S., Japan and China were developed by Baker et al. (2016), Arbatli et al. (2017), and Huang and Luk (2020), respectively. The categorical EPU data were extracted from the Economic Policy Uncertainty website. Baker et al. (2016) constructed categorical economic policy uncertainty indices by analyzing prominent newspapers, resulting in a range of uncertainty measures, including fiscal, monetary, trade and exchange rate policy uncertainty. Unlike the aggregate EPU index, the categorical EPU approach breaks down the sources of economic policy uncertainty into specific policy categories (for example, monetary, fiscal, trade, and exchange rates), providing a more structured method to measure and analyze the complex nature of EPU. Since categorical EPUs divide uncertainty sources into different policy areas, the uncertainty impacts of each category can differ across different sectors of the economy, depending on their specific policy risk exposures. Thus, analyzing categorical EPU allows for a more specific and targeted uncertainty assessment, making categorical EPU more superior than aggregate EPU. Understanding the specific uncertainty nature of different policy areas of the categorical EPU allows for targeted policy interventions and risk management strategies.

In addition, several categorical economic policy uncertainty indices have been found to outperform the aggregate EPU in determining equity returns (Chen et al. 2023). Despite the advantage of tracking the uncertainty of different policy domains, the reliance of categorical EPUs on news coverage, which may not always be reliable, raises concerns regarding their validity and potential bias. Hence, several other alternative methods for analyzing policy uncertainty were compared with the economic policy uncertainty index to address these concerns. The EPU index, which is a news-based index, correlates well with other key indicators for measuring policy uncertainty, including market volatility, investment and employment data, substantiating its reliability empirically (Baker et al. 2016). Building on Baker et al. (2016), both Arbatli et al. (2017) and Huang and Luk. (2020) constructed Japanese and Chinese categorical EPU indices.

We selected MSCI Indonesia, MSCI Malaysia, MSCI Philippines, MSCI Thailand, and MSCI Singapore. The MSCI index of each market was accessed from the 'investing.com' website. We employed MSCI indices for maintaining uniformity, which ensure consistent criteria for inclusion on the basis of market size, liquidity, and free-float adjustments. On the other hand, the main indices sometimes vary in terms of construction criteria (e.g., sector weights, liquidity constraints), therefore complicating direct comparisons. Therefore, considering MSCI indices reduces methodological variability and consequently increases the validity of cross-country empirical investigations. We computed the stock market returns from the log difference in the index price. A similar approach

was adopted to assign the categorical EPU. Our data cover the period from 08:2004 to 03:2024, which is driven by MSCI index data availability.

R^2 decomposed connectedness approach

This new approach decomposes the overall connectivity into contemporaneous and lagged components, hence extending the commonly used connectedness concept introduced by Diebold and Yilmaz (2012, 2014). The R^2 decomposed connectedness approach, as described in Balli et al. (2023), can be represented in a VAR(p) model with contemporaneous effects:

$$\boldsymbol{y}_t = \sum_{i=0}^{p} \boldsymbol{B}_i \boldsymbol{y}_{t-i} + \boldsymbol{u}_t \boldsymbol{u}_t \sim N(0, \boldsymbol{\Sigma}) \tag{1}$$

At time t, the vectors $\boldsymbol{y}_t, \boldsymbol{y}_{t-i}$ and $\boldsymbol{u}_t$ all reflect K×1-dimensional demeaned vectors. Furthermore, t, and $\boldsymbol{B}_i$ and Σ are $K \times K$-dimensional matrices, where diag ($\boldsymbol{B}_0$) equals zero. This suggests that the variables on the left-hand side (LHS) are not factorable from the variables on the right-hand side (RHS). When p = zero, the contemporaneous R^2 decomposition method suggested by Naeem et al. (2023) is employed to simplify the model. The model may also be defined as $\boldsymbol{y}_{k,t} = \boldsymbol{b}_k \boldsymbol{x}_t + \boldsymbol{u}_{k,t}$, where $\boldsymbol{x}_t = \left[\boldsymbol{y}_t, \boldsymbol{y}_{t-1}, \ldots, \boldsymbol{y}_{t-i}, \ldots, \boldsymbol{y}_{t-p}\right]$ is an $K(p+1) \times 1$-dimensional vector and where $\boldsymbol{b}_k$ is an $1 \times K(p+1)$-dimensional vector with zero at the kth position.

If all of the independent variables on the right-hand side (RHS) are not connected with one another, the total R^2 value in bivariate linear regressions (BLRs) is exactly the R^2 goodness-of-fit measure in a multivariate linear regression (MLR). Under just one situation is this the case. Thus, it is necessary to find a mapping that is able to convert the linked series $\boldsymbol{x}_{k,t}{}^1$ into an orthogonal series. One may utilize principal component analysis (PCA) with the same number of latent components as the number of variables situated on the right-hand side (RHS). Henceforth, the following equations can be used to compute the R^2 decomposition:

$$\begin{aligned} \boldsymbol{R}_{xx} &= \boldsymbol{V}\boldsymbol{\Lambda}\boldsymbol{V}' = \boldsymbol{C}\boldsymbol{C}' \\ \boldsymbol{C} &= \boldsymbol{V}\boldsymbol{\Lambda}^{1/2}\boldsymbol{V}' \\ \boldsymbol{R}^{2,d} &= \boldsymbol{C}^2\left(\boldsymbol{C}^{-1}\boldsymbol{R}_{yx}\right)^2 \end{aligned} \tag{2}$$

For diagonal matrices, the elements of the matrices V and Λ are $\lambda_1, \ldots, \lambda_{K(p+1)-1}$. A variable representing a matrix with dimensions $[K(p+1)-1] \times [K(p+1)-1]$ is $\boldsymbol{R}_{xx}$. Three matrices capture the eigenvalue, the eigenvector, and the Pearson correlation. [K(p+1)/−1. Moreover, the R_yx and R^(2,d) vectors represent the [K(p+1) −1]×1 Pearson correlation and R^2 contribution vectors, respectively. $\boldsymbol{R}_{yx}$ reflects the Pearson correlation coefficients between the variables on the left-hand side (LHS) and the variables on the right-hand side (RHS), whereas $\boldsymbol{R}_{xx}$ shows the Pearson correlation coefficients among the variables on the right-hand side (RHS).

Whereas the values that remain indicate the contributions of R^2 that occur later, the initial K-1 values of $\boldsymbol{R}^{2,d}$ illustrate the concurrently occurring contributions of $\boldsymbol{R}^2$. In view of this, the total vector sum of $\boldsymbol{R}^{2,d}$ is somewhat similar to the MLR R^2 measure

used to assess the degree of goodness-of-fit. Next, we generate a K×K(p+1)-dimensional $\boldsymbol{R}^{2,d}$ decomposition matrix by aggregating the $\boldsymbol{R}^{2,d}$ contributions of K many linear regressions (MLRs), which is denoted as $\left[\boldsymbol{R}_0^{2,d}; \ldots; \boldsymbol{R}_i^{2,d}; \ldots \boldsymbol{R}_p^{2,d}\right]$.

where $\boldsymbol{R}_0^{2,d_2}$ represents the contemporaneous spillover $\left(\boldsymbol{R}_C^{2,d}\right)$, while $\left(\boldsymbol{R}_L^{2,d} = \boldsymbol{R}_1^{2,d} + \cdots + \boldsymbol{R}_i^{2,d} + \cdots + \boldsymbol{R}_p^{2,d}\right)$ (the sum of lagged values) represents the lagged spillover.

Diebold and Yilmaz (2012, 2014) proposed a connection strategy using $\boldsymbol{R}_C^{2,d}$ and $\boldsymbol{R}_L^{2,d}$ as complementing components to the scaled GFEVD matrix. Given this, the total connectedness index (TCI) is somewhat similar to the average R squared of the k MLRs, as the computation below shows:

$$TCI = \frac{1}{K}\sum_{k=1}^{K} R_k^2 \tag{4}$$

The range of R_k^2, which is between zero and one, also applies to the TCI, thereby addressing the issue of connectedness normalization (Lastrapes and Wiesen 2021; Chatziantoniou et al. 2022). Our proposed methodology enables the examination of both contemporaneous and lagged TCI.

$$\begin{aligned} TCI &= \tfrac{1}{K}\textstyle\sum_{k=1}^{K} R_k^2 \\ TCI &= \left(\tfrac{1}{K}\textstyle\sum_{k=1}^{K}\sum_{j=1}^{K} R_{C,k,j}^{2,d}\right) + \left(\tfrac{1}{K}\textstyle\sum_{k=1}^{K}\sum_{j=1}^{K} R_{L,k,j}^{2,d}\right) \\ TCI &= TCI^C + TCI^L \end{aligned} \tag{5}$$

where TCI^C is the term for the contemporaneous TCI and TCI^L for the delayed TCI. Apart from the net total directional connectedness measurements, one can also extend the described concept to include the total directional connection to and from other persons.

$$\begin{aligned} TO_j &= \sum_{k=1}^{K} R_{C,k,j}^{2,d} + \sum_{k=1}^{K} R_{L,k,j}^{2,d} \\ TO_j &= TO_j^C + TO_j^L \end{aligned} \tag{6}$$

$$\begin{aligned} FROM_j &= \sum_{k=1}^{K} R_{C,j,k}^{2,d} + \sum_{k=1}^{K} R_{L,j,k}^{2,d} \\ FROM_j &= FROM_j^C + FROM_j^L \end{aligned} \tag{7}$$

$$NET_j^C = TO_j^C - FROM_j^C \tag{8}$$

$$NET_j^L = TO_j^L - FROM_j^L \tag{9}$$

$$NET_j = NET_j^C + NET_j^L \tag{10}$$

The $TO_j\left(TO_j^C/TO_j^L\right)$ total directional connectedness measures the extent to which series j explains the overall variance in all left-hand side (LHS) variables, both contemporaneously and with a lag. On the other hand, the $FROM_j\left(FROM_j^C/FROM_j^L\right)$ total directional connectedness quantifies how much all right-hand side (RHS) variables explain the overall variance in series j, again considering both contemporaneous and lagged effects. This is equivalent to the R^2 of the multiple linear regression (MLR) model with k predictors. Here, a series can be defined as a net transmitter (receiver) of shocks if the net spillover index (NET_j) for a given series j is greater than zero. This implies that the series can better depict the fluctuations in other series than can the other series.

Determinants of connectedness

This study attempted to examine the variables affecting the lagged, contemporaneous, and total spillover measurements derived from the first evaluation. We examined asset market returns via a modified form of the traditional gravity model, which is usually used to investigate global trade dynamics. The theory was that in larger and more established markets, spillovers could be less noticeable. We also considered certain global factors as possible gravitational forces influencing the spillover repercussions. These factors included oil supply shocks (OSS), oil demand shocks (ODS), oil price risk shocks (ORS), the geopolitical risk index (GPR), the global financial stress index (GFS), the MSCI world climate change index (CLIMATE), and gold market volatility (GOLD). On the basis of the basic gravity model but modified to include these global index-related variables, this study used a pooled ordinary least squares (OLS) regression model. This method allows us to investigate how these global variables affect the lagged and contemporaneous spillover dynamics in the market under analysis, which is shown below.

$$TCI_{ij,t} = \alpha_0 + a * X_t + \varepsilon_{it} \tag{11}$$

The $TCI_{ij,t}$ dependent variable is created in three different ways, which include contemporaneous and lagged spillovers. We obtained the data from DataStream. X_t is a matrix that contains the determinants of return and volatility connectedness, such as oil price risk shocks, demand shocks, supply shocks, the geopolitical risk index (GPR), the global financial stress index (GFS), the MSCI world climate change index (CLIMATE) and gold market volatility (GOLD). We enlarged their dimensions to perform the pooled OLS.

Empirical results

Descriptive statistics

Table 1 shows the descriptive statistics for categorical economic policy uncertainty indices and the five ASEAN stock markets. Panels A, B and C display categorical economic policy uncertainty indices for China, Japan and the United States. Among the four Chinese economic policy uncertainty indices, trade policy uncertainty has the highest variance, whereas monetary policy uncertainty has the lowest variance. Exchange rate policy uncertainty demonstrates the greatest variability among the Japanese and U.S. categorical EPU indices, whereas fiscal policy uncertainty shows the least variability in both markets. All categorical economic policy uncertainty indices have distributions that are

Table 1 Summary statistics

		Mean	Variance	Skewness	Ex Kurtosis	JB	ERS	Q(10)	Q2(10)
	Panel A: Economic policy uncertainty of China								
Chinese fiscal policy uncertainty	CNFiscal	0.109	0.342	2.769***	12.384***	1802.100***	−4.419***	21.937***	0.460
Chinese monetary policy uncertainty	CNMonetary	0.046	0.109	1.282***	2.356***	118.735***	−2.035**	20.945***	1.541
Chinese trade policy uncertainty	CNTrade	0.161	0.509	2.158***	6.662***	617.024***	−3.376***	19.991***	1.216
Chinese exchange rate policy uncertainty	CNExr	0.098	0.255	2.011***	6.692***	596.946***	−4.433***	14.241***	1.932
	Panel B: Economic Policy Uncertainty of Japan								
Japanese fiscal policy uncertainty	JPFiscal	0.024	0.061	1.145***	2.953***	136.735***	−4.377***	16.616***	4.547
Japanese monetary policy uncertainty	JPMonetary	0.060	0.160	1.557***	3.791***	235.696***	−3.380***	20.672***	2.333
Japanese trade policy uncertainty	JPTrade	0.072	0.183	1.502***	3.657***	219.347***	−5.071***	29.081***	9.717*
Japanese exchange rate policy uncertainty	JPExr	0.117	0.390	2.944***	12.950***	1981.559***	−5.091***	10.941**	2.315
	Panel C: Economic policy uncertainty of United States								
United States fiscal policy uncertainty	USFiscal	0.061	0.143	1.345***	2.710***	142.768***	−8.148***	12.117**	14.304***
United States monetary policy uncertainty	USMonetary	0.134	0.489	2.612***	10.727***	1393.999***	−4.260***	18.194***	1.738
United States trade policy uncertainty	USTrade	0.313	1.243	2.416***	7.774***	820.430***	−4.711***	21.335***	1.807
United States exchange rate policy uncertainty	USExr	0.751	5.101	3.083***	14.060***	2308.047***	−7.476***	16.108***	1.738
	Panel D: Five ASEAN stock markets								
Indonesia	INDO	0.012	0.004	−0.645***	3.695***	149.969***	−2.409**	10.875**	28.080***
Malaysia	MALAY	0.003	0.001	−0.196	2.307***	53.638***	−3.472***	4.289	10.945**
Philippines	PHILLI	0.008	0.003	−0.496***	2.091***	52.443***	−1.510	5.411	5.715
Thailand	THAI	0.006	0.003	−0.589***	4.625***	223.005***	−4.950***	5.441	18.502***
Singapore	SING	0.003	0.003	−0.566***	4.704***	229.231***	−4.406***	3.298	27.488***

Under the null hypothesis of no autocorrelation, the Ljung-Box Q(10) and Q2(10) statistical tests, respectively exhibits if there is any autocorrelation in a given series and its squared series accordingly. Elliott-rothenberg-stock unit root test is ERS. Statistical significance at the 1% level is denoted by ***; at the 5% level by **; at the 10% level by *

skewed to the right. In addition, the statistical characteristics for the five ASEAN stock markets are shown in Panel D. All market returns are positive, with Indonesia having the highest mean of 0.012 and Malaysia and Singapore having the lowest mean of 0.003. The market returns for Indonesia, Malaysia, the Philippines, Thailand and Singapore indicate marginal variance, indicating that the variability of returns in these countries is relatively consistent. All the return distributions of the five ASEAN stock markets exhibit left skewness.

Moreover, kurtosis is present in all categorical economic policy uncertainty indices and ASEAN stock market returns. The Jarque–Bera values imply that all categorical economic policy uncertainty indices and the ASEAN stock market returns are not normally distributed. In general, the findings of the ERS unit root test indicate that categorical economic policy uncertainty and the returns series are stationary. Overall, both series demonstrate significant autocorrelations, as indicated by the values of the Ljung–Box Q(10) and Q2(10) statistics. Hence, employing a rolling-window vector autoregressive (VAR) model with contemporaneous effects is a suitable modeling approach.

Static connectedness

Table 2 presents the overall connectedness among categorical economic policy uncertainty and the five ASEAN stock markets. The results indicate that the overall connectedness index explains 73.21% of the variation for each variable in the network. This result reflects a higher level of spillover and connectedness between categorical economic policy uncertainty and the five ASEAN stock markets. These findings are supported by Hoque et al. (2023), Lean et al. (2024) and Keddad (2024). Additionally, Chinese monetary policy uncertainty consistently has the highest ranking among all categorical economic policy uncertainties based on the TO and FROM metrics. This reflects the distinctive impact of Chinese monetary policy uncertainty in triggering and enduring shocks throughout interconnected markets. The primary element contributing to market swings is the spillover effect caused by uncertainty in Japanese trade policy, accounting for a significant amount of 10.75%. Importantly, 59.04% of the shocks can be traced back to the transmission of Japanese trade policy uncertainty to different categories of economic policy uncertainty and the ASEAN stock markets. Moreover, 64.29% of the shocks are triggered by effects emanating from other sources.

The findings imply that Malaysia is the main net transmitter of shocks (10.38%), followed by Singapore (7.88%), Thailand (7.66%), the Philippines (6.39%) and Indonesia (2.9%). When examining the link between economic policy uncertainty and the ASEAN-5 stock markets, it is crucial to highlight that policy uncertainty in Chinese fiscal and Japanese exchange rates has the strongest influence on the Philippines. Chinese monetary, trade and exchange rate policy uncertainty, together with US exchange rate policy uncertainty, had the greatest impact on Singapore. Japanese fiscal and monetary policy uncertainty have a leading impact on Malaysia, whereas Japanese trade policy uncertainty has the greatest effect on Indonesia. In addition, Thailand is most affected by fiscal, monetary and trade policy uncertainty in the U.S. Conversely, the impact of U.S. trade policy uncertainty on Indonesia is minimal, whereas Malaysia is the least affected by Chinese monetary and trade policy uncertainty. The influence of uncertainty in Chinese and US exchange rate policies, together with Japanese monetary,

Table 2 Overall connectedness among categorical economic policy uncertainty and five ASEAN stock markets

	CNFiscal	CNMonetary	CNTrade	CNExr	JPFiscal	JPMonetary	JPTrade	JPExr	USFiscal
CNFiscal	8.13	19.9	4.7	9.15	4.26	3.12	1.39	2.11	5.99
CNMonetary	19.54	6.25	2.37	22.82	3.51	1.57	1.17	2.59	3.68
CNTrade	5.54	3.65	5.53	7.27	2.39	1.92	8.64	4.91	2.69
CNExr	10	23.62	5.77	3.85	3.41	1.86	1.69	3.05	2.89
JPFiscal	3.68	2.73	2.34	2.21	4.59	15.02	9.8	8.13	4.14
JPMonetary	2.69	1.97	2.11	2.56	15.17	6.07	6.17	15.27	2.76
JPTrade	3.85	3.88	7.71	3.7	9.12	3.16	10.75	2.27	4.98
JPExr	2.67	2.72	2.53	3.18	10.21	15.25	2.79	2.85	2.76
USFiscal	6.14	6.37	3.73	4.38	3.58	3.23	5.01	3.33	2.19
USMonetary	2.44	6.49	3.52	3.3	4.99	9.32	1.87	2.65	9.39
USTrade	2.67	4.47	8.77	2.99	4.51	4.72	9.58	2.81	4.38
USExr	3.6	2.93	2.22	10.07	3.44	2.53	1.66	4.67	2.75
INDO	2.25	1.81	1.96	1.61	3.65	3.36	2.38	2.29	2.9
MALAY	1.9	1.67	1.59	1.64	5.24	3.71	1.66	3.9	2.98
PHILLI	2.47	2.1	1.73	1.84	2.08	2.23	1.83	4.9	2.61
THAI	2.05	1.79	2.04	1.55	2.41	1.63	1.51	1.78	3.47
SING	1.72	2.14	2.2	4.14	3.44	1.86	1.91	3.77	2.74
TO	73.21	88.23	55.27	82.4	81.4	74.48	59.04	68.43	61.11
Inc.Own	81.34	94.48	60.8	86.26	85.98	80.55	69.79	71.28	63.3
NET	**−0.71**	**8.2**	**−10.1**	**3.25**	**4.83**	**−1.1**	**−5.24**	**−2.59**	**−8.79**

	USMonetary	USTrade	USExr	INDO	MALAY	PHILLI	THAI	SING	FROM
CNFiscal	3.23	3.56	3.85	3.29	1.81	2.46	3.2	1.89	73.92
CNMonetary	5.47	2.05	3.9	1.92	2.72	2.61	1.55	2.55	80.03
CNTrade	3.52	7.56	2.87	3	2.2	2.57	2.6	4.03	65.37
CNExr	2.84	2.72	8.68	2.14	2.15	2.49	1.64	4.21	79.15
JPFiscal	5.61	2.69	3.02	2.67	4.08	2.32	4.18	3.94	76.57
JPMonetary	6.97	2.13	2.67	2.76	3.93	2	2.59	3.84	75.58
JPTrade	1.4	9.69	1.27	2.22	2.83	2.95	2.7	2.55	64.29
JPExr	4.89	1.92	6.02	2.42	4.62	4.42	1.88	2.73	71.02
USFiscal	10.91	2.81	3.14	2.63	3.18	5.01	3.41	3.03	69.91
USMonetary	3.6	2.58	4.91	2.66	3.53	2.95	2.58	3.93	67.1
USTrade	2.38	6.06	2.42	2.47	5.22	3.23	2.77	2.43	65.81
USExr	4.88	2.47	6.9	3.56	4.08	4.55	3.87	3.9	61.18
INDO	1.97	1.6	3.61	1.65	10.6	14.89	14.85	10.58	80.31
MALAY	1.71	2.27	3.59	10.5	2.68	9.27	12.43	10.15	74.2
PHILLI	1.93	2.1	2.61	14.84	9.97	2.62	13.55	12.26	79.05
THAI	2.14	2.76	1.89	15.32	13.25	12.49	1.87	15.39	81.47
SING	1.68	2.43	3.78	10.78	10.39	11.22	15.35	2.95	79.54
TO	61.54	51.36	58.24	83.21	84.59	85.43	89.14	87.43	1244.5
Inc.Own	65.14	57.43	65.13	84.85	87.27	88.05	91	90.38	TCI
NET	**−5.56**	**−14.45**	**−2.95**	**2.9**	**10.38**	**6.39**	**7.66**	**7.88**	**73.21**

*R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10

trade and exchange rate policies, on Thailand is comparatively small. Furthermore, the Philippines is slightly affected by uncertainty in the fiscal policies of Japan and the US, whereas Singapore is least influenced by uncertainty in the fiscal policies of China and the monetary policies of the US. According to the NET measure, the majority of the categorical economic policy uncertainties are net recipients, except for Chinese monetary and exchange rate policy uncertainty and Japanese fiscal policy uncertainty, which are net transmitters. Figure 1a shows the network plots for the overall transmission among categorical economic policy uncertainty and the five ASEAN stock markets. The figure shows complementing outcomes to the results obtained from Table 2. These findings are consistent with those of Lean et al. (2024) and Keddad (2024), who reported that the uncertainty impact of Chinese, Japanese, and U.S. economic policies on ASEAN stock markets varies across different countries.

Tables 3 and 4 display the contemporaneous and lagged connectedness for categorical economic policy uncertainty and five ASEAN stock markets. The contemporaneous dynamics hold a vital weight, accounting for 40.90%, whereas the effect of lagged connectedness is moderate, generating just 32.30%. The comprehensive measure emphasizes the importance of immediate temporal dynamics in determining overall connectivity,

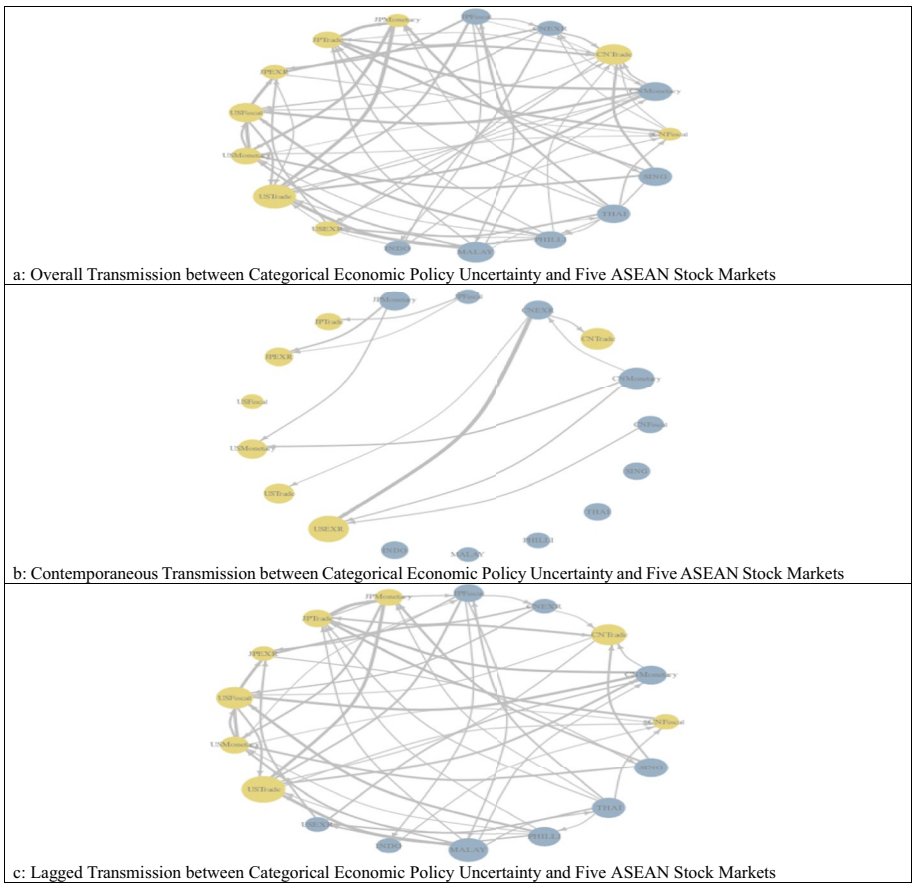

Fig. 1 Overall, Contemporaneous and Lagged Connectedness between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets. Note: *R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

Table 3 Contemporaneous connectedness among categorical economic policy uncertainty and the five ASEAN stock markets

	CNFiscal	CNMonetary	CNTrade	CNExr	JPFiscal	JPMonetary	JPTrade	JPExr	USFiscal
CNFiscal	0	16.5	2.69	7.19	1.69	1.46	0.41	0.64	3.2
CNMonetary	16.14	0	1.03	20.57	0.91	0.56	0.41	1.23	2.38
CNTrade	3.06	1.27	0	4.53	0.62	0.51	6.46	0.87	0.71
CNEXR	7.3	21	3.96	0	0.6	0.56	0.4	1.02	1.42
JPFiscal	1.66	0.92	0.5	0.63	0	13.09	6.69	6.74	1.97
JPMonetary	1.48	0.59	0.43	0.61	12.92	0	1.06	12.63	1.05
JPTrade	0.47	0.58	6.28	0.51	7.28	1.34	0	0.83	3.47
JPEXR	0.67	1.26	0.82	0.98	7.15	13.42	0.75	0	0.39
USFiscal	3.49	2.39	0.73	1.39	2.07	1.11	3.62	0.34	0
USMonetary	1.28	5	1.34	1.29	3	6.01	0.44	1.42	7.83
USTrade	0.92	1.28	5.01	1.4	0.96	1.12	7.54	0.44	0.94
USEXR	2.03	1.7	0.96	7.91	0.95	0.61	0.27	2.39	1.27
INDO	0.49	0.38	0.95	0.57	0.97	0.61	0.44	0.51	0.47
MALAY	0.56	0.53	0.28	0.4	2.47	1.88	0.44	2.09	0.71
PHILLI	0.26	0.51	0.69	0.43	0.77	0.7	0.57	2.17	0.57
THAI	0.38	0.28	0.56	0.42	1.3	0.53	0.43	0.5	0.73
SING	0.53	1.11	1.43	2.99	2.06	0.59	0.9	1.27	1.16
TO	40.7	55.3	27.64	51.81	45.73	44.11	30.82	35.09	28.27
Inc.Own	40.7	55.3	27.64	51.81	45.73	44.11	30.82	35.09	28.27
NET	**1.35**	**3.22**	**−2.82**	**1.87**	**0.66**	**2.2**	**−1.32**	**−1.69**	**−0.42**

	USMonetary	USTrade	USExr	INDO	MALAY	PHILLI	THAI	SING	FROM
CNFiscal	1.16	0.68	1.46	0.51	0.55	0.27	0.41	0.53	39.36
CNMonetary	4.23	0.91	1.08	0.38	0.48	0.45	0.26	1.06	52.08
CNTrade	1.35	4.95	0.91	1.27	0.42	0.99	0.86	1.69	30.46
CNEXR	1.23	1.01	6.4	0.65	0.42	0.46	0.52	2.98	49.94
JPFiscal	2.8	0.83	0.8	1.11	2.5	0.9	1.63	2.3	45.07
JPMonetary	5.46	0.9	0.46	0.65	1.85	0.68	0.51	0.62	41.9
JPTrade	0.49	7.59	0.26	0.5	0.47	0.63	0.43	1	32.13
JPEXR	1.4	0.34	2.24	0.64	2.26	2.42	0.6	1.42	36.78
USFiscal	7.68	0.92	1.17	0.52	0.73	0.6	0.75	1.18	28.69
USMonetary	0	1.31	3.08	0.39	0.5	0.28	0.53	0.5	34.18
USTrade	1.28	0	0.92	0.45	1.17	0.56	0.72	0.51	25.25
USEXR	3.15	1.01	0	0.64	1.89	1.33	0.44	0.78	27.33
INDO	0.37	0.28	0.49	0	8.28	13.23	12.98	9.15	50.17
MALAY	0.47	1.04	1.66	8.3	0	7.36	10.35	7.36	45.9
PHILLI	0.23	0.43	1.09	13.25	7.44	0	11.14	9.58	49.84
THAI	0.48	0.52	0.32	13.22	9.99	11.06	0	13.1	53.81
SING	0.42	0.37	0.71	9.11	7.34	9.35	13.09	0	52.43
TO	32.21	23.11	23.06	51.6	46.29	50.59	55.22	53.76	695.31
Inc.Own	32.21	23.11	23.06	51.6	46.29	50.59	55.22	53.76	TCI
NET	**−1.97**	**−2.14**	**−4.27**	**1.43**	**0.39**	**0.76**	**1.4**	**1.33**	**40.90**

*R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10

Table 4 Lagged connectedness among categorical economic policy uncertainty and the five ASEAN stock markets

	CNFiscal	CNMonetary	CNTrade	CNEXR	JPFiscal	JPMonetary	JPTrade	JPEXR	USFiscal
CNFiscal	8.13	3.4	2.01	1.96	2.57	1.66	0.99	1.47	2.79
CNMonetary	3.4	6.25	1.35	2.25	2.61	1.02	0.76	1.37	1.29
CNTrade	2.48	2.38	5.53	2.74	1.77	1.41	2.18	4.04	1.98
CNEXR	2.7	2.62	1.81	3.85	2.81	1.29	1.29	2.03	1.48
JPFiscal	2.02	1.81	1.85	1.59	4.59	1.93	3.11	1.39	2.17
JPMonetary	1.21	1.38	1.68	1.95	2.25	6.07	5.11	2.64	1.71
JPTrade	3.39	3.29	1.43	3.19	1.85	1.82	10.75	1.44	1.52
JPEXR	1.99	1.46	1.71	2.2	3.05	1.83	2.03	2.85	2.37
USFiscal	2.66	3.98	2.99	2.99	1.51	2.12	1.39	2.99	2.19
USMonetary	1.16	1.49	2.18	2.02	1.99	3.31	1.44	1.24	1.56
USTrade	1.75	3.19	3.76	1.59	3.55	3.6	2.04	2.37	3.43
USEXR	1.58	1.23	1.26	2.16	2.49	1.92	1.39	2.28	1.48
INDO	1.75	1.43	1	1.04	2.68	2.74	1.94	1.78	2.44
MALAY	1.34	1.14	1.31	1.24	2.76	1.83	1.23	1.8	2.27
PHILLI	2.21	1.59	1.04	1.41	1.31	1.53	1.26	2.73	2.04
THAI	1.67	1.51	1.48	1.13	1.11	1.1	1.08	1.28	2.74
SING	1.2	1.03	0.77	1.15	1.38	1.27	1	2.5	1.58
TO	32.5	32.93	27.62	30.59	35.67	30.37	28.23	33.34	32.85
Inc.Own	40.63	39.18	33.15	34.45	40.25	36.44	38.97	36.19	35.04
NET	**− 2.06**	**4.98**	**− 7.28**	**1.38**	**4.17**	**− 3.3**	**− 3.93**	**− 0.9**	**− 8.37**

	USMonetary	USTrade	USEXR	INDO	MALAY	PHILLI	THAI	SING	FROM
CNFiscal	2.08	2.88	2.38	2.78	1.26	2.19	2.79	1.36	34.56
CNMonetary	1.24	1.14	2.82	1.54	2.24	2.16	1.28	1.5	27.95
CNTrade	2.17	2.61	1.96	1.73	1.78	1.58	1.74	2.34	34.9
CNEXR	1.6	1.71	2.28	1.49	1.72	2.03	1.12	1.23	29.21
JPFiscal	2.81	1.85	2.21	1.56	1.58	1.42	2.55	1.65	31.5
JPMonetary	1.51	1.23	2.21	2.1	2.09	1.32	2.08	3.22	33.67
JPTrade	0.92	2.1	1.01	1.72	2.35	2.31	2.27	1.55	32.15
JPEXR	3.49	1.59	3.78	1.78	2.37	2	1.28	1.3	34.24
USFiscal	3.24	1.89	1.97	2.12	2.45	4.41	2.66	1.85	41.22
USMonetary	3.6	1.27	1.83	2.27	3.04	2.66	2.04	3.43	32.92
USTrade	1.1	6.06	1.5	2.03	4.04	2.67	2.04	1.92	40.57
USEXR	1.73	1.46	6.9	2.93	2.19	3.21	3.43	3.12	33.85
INDO	1.6	1.33	3.13	1.65	2.32	1.66	1.87	1.43	30.14
MALAY	1.24	1.23	1.94	2.2	2.68	1.92	2.08	2.78	28.31
PHILLI	1.69	1.67	1.52	1.59	2.53	2.62	2.41	2.69	29.21
THAI	1.66	2.24	1.56	2.1	3.27	1.42	1.87	2.3	27.66
SING	1.25	2.06	3.08	1.67	3.06	1.87	2.26	2.95	27.11
TO	29.33	28.25	35.18	31.61	38.3	34.84	33.92	33.66	549.18
Inc.Own	32.93	34.32	42.07	33.26	40.98	37.46	35.79	36.62	TCI
NET	**− 3.59**	**− 12.31**	**1.33**	**1.47**	**9.99**	**5.63**	**6.26**	**6.55**	**32.30**

*R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10

whereas the impact of delayed effects is considerably less fundamental in explaining the differences. In Table 3, regarding the contemporaneous connectedness between categorical economic policy uncertainty and the ASEAN-5 stock markets, Chinese and Japanese fiscal and monetary policy uncertainty, along with the unpredictability of the U.S. trade and exchange rate policy, have the most severe effects on Malaysia. The most significant impact on Singapore is caused by the uncertainty surrounding Chinese trade and exchange rate policies, Japanese trade policies and U.S. fiscal policies. Moreover, the Philippines and Thailand are most affected by uncertainty about Japanese exchange rate policy and US monetary policy, respectively. In contrast, Malaysia is least affected by the uncertainty surrounding Chinese trade and exchange rate policies, whereas Indonesia is least affected by the uncertainty involving US fiscal and trade policies. The impacts of fiscal policy uncertainty in China and Japan, along with U.S. monetary policy uncertainty, have the least influence on the Philippines. Additionally, Thailand is least influenced by uncertainties in Chinese monetary policy and Japanese monetary, trade and exchange rate policy, together with US exchange rate policy. On the basis of the NET value, more than half of the categorical economic policy uncertainties play a role as net receivers, whereas Chinese fiscal, monetary and exchange rate policy uncertainties with Japanese fiscal and monetary policy uncertainties are net transmitters. Figure 1b displays the network plots for the contemporaneous transmission among categorical economic policy uncertainty and five ASEAN stock markets. The figure indicates that stock markets are not significantly affected by shocks from categorical economic policy uncertainty.

Turning to the lagged connectedness between categorical economic policy uncertainty and the five ASEAN stock markets in Table 4, the Philippines is most significantly affected by the policy uncertainty surrounding the Chinese fiscal, monetary and exchange rates, along with uncertainties in Japanese exchange rate policy and US monetary policy. Furthermore, the most significant impact on Thailand is exerted by uncertainty in Chinese trade policy and in U.S. fiscal and trade policy. Malaysia is most influenced by uncertainty in Japanese fiscal policy, whereas Indonesia is most impacted by Japanese monetary and trade policy uncertainty together with U.S. exchange rate policy uncertainty. In contrast, Singapore is least affected by the uncertainties in Chinese fiscal, monetary and trade policies, together with the uncertainty in Japanese trade policy and US fiscal policy. Thailand, on the other hand, is least affected by uncertainties in Japanese fiscal, monetary and exchange rate policies. Malaysia is not particularly impacted by uncertainty in US monetary and trade policies, whereas Indonesia is least hampered by uncertainty in the Chinese exchange rate policy. In terms of the NET value, the majority of categorical economic policy uncertainties are net receivers, whereas Chinese monetary and exchange rate policy ambiguity, along with Japanese fiscal and US exchange rate policy uncertainty, are net transmitters. Notably, the five ASEAN stock markets are net transmitters, which is consistent with the findings in Table 3. Figure 1c presents the network plots for the lagged transmission between categorical economic policy uncertainty and five ASEAN stock markets. The figure displays results that are consistent with the findings shown in Table 4.

The contemporaneous measures of overall connection between FROM and TO differ significantly from their respective lagged equivalents, with the exceptions of Japanese trade and exchange rate policy uncertainty, U.S. monetary policy uncertainty and

Chinese trade policy uncertainty, as shown in Tables 3 and 4. With respect to Japanese trade policy uncertainty, the lagged FROM measure (32.15%) is slightly greater than the contemporaneous FROM measure (32.13%), whereas the contemporaneous TO measure (30.82%) slightly outperforms the lagged TO measure (28.23%). Given the insecurity of the Japanese exchange rate policy, the contemporaneous measure of FROM (36.78%) is higher than the lagged measure of FROM (34.24%), whereas the contemporaneous measure of TO (35.09%) is greater than the lagged measure of TO (33.34%). With respect to US monetary policy ambiguity, the contemporaneous TO measure (32.21%) exceeds the lagged TO measure (29.33%), whereas the lagged FROM measure (32.92%) trails the contemporaneous FROM measure (34.18%). Additionally, the contemporaneous TO measure (27.64%) is marginally higher than the lagged TO measure (27.62%) for Chinese trade policy uncertainty. Significant disparities between the lagged and contemporaneous values highlight the temporal dynamics encompassing shock dispersion in the system. Importantly, all contemporaneous measures of connectedness between categorical economic policy uncertainty and the five ASEAN stock markets demonstrate a significant decrease relative to their lagged counterparts, signifying unique attributes in temporal dynamics resulting from interrelated connections. The discrepancies may be attributed to various factors, such as the economic climate, investor behaviors, intrinsic sophistication of the integrated systems and duration of information processing. These findings highlight the complex nexus among categorical economic policy uncertainty and the five ASEAN stock markets. The lagged metrics reflect a subtle interaction that is shaped by components that are multifarious and temporally distinctive.

Dynamic connectedness

Figure 2 presents the dynamic connectedness among categorical economic policy uncertainty and five ASEAN stock markets. The overall and contemporaneous connectedness reveal comparable trends that align with the findings of Balli et al. (2023). The contemporaneous connectedness is more robust than the lagged connectedness is, inferring an elevated degree of interaction across the measures. The overall, contemporaneous and

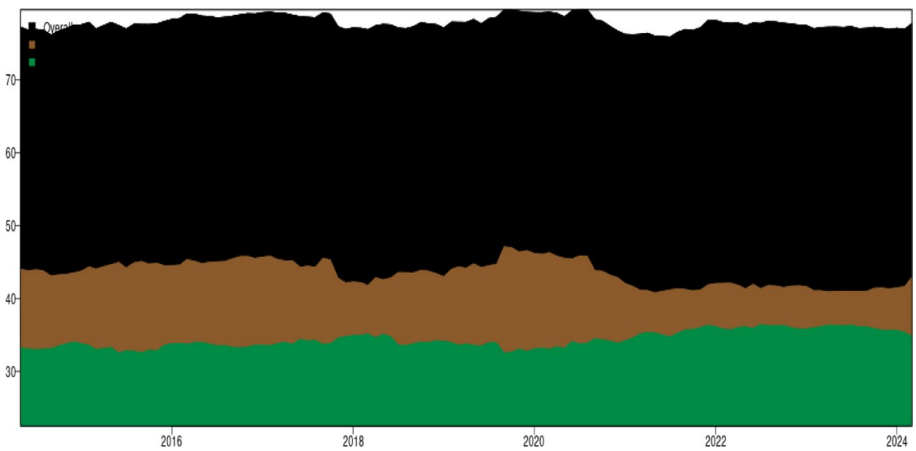

Fig. 2 Dynamic Connectedness among Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets. Note: The areas shaded in black, brown, and green indicate overall, contemporaneous and lagged component connectedness, respectively

lagged connectivity index that soared during market uncertainty was partly prompted by the Chinese economic slowdown from 2015 to 2016. Owing to the global economic downturn and massive stock sales sparked by negative economic development in China, the world's stock markets experienced an enormous decline at the beginning of 2016. In addition, several signals pointed to a looming economic slump, accompanied by a large and rapid decline in the interest rate. The change in the Chinese yuan fixing operation that transpired during the period when the Chinese yuan faced pressure against the US dollar in 2015 also led to a spike in the connectedness index. The Brexit referendum intensified market volatility and had a damaging impact on global stock markets. In addition, there was a gradual increase in connectivity starting in 2018 due to heightened trade tensions involving the US and the emergence of trade protectionism. The COVID-19 pandemic was the primary catalyst for a sizeable spike in both the overall and contemporaneous connectedness indices in 2020. The COVID-19 outbreak in early 2020 and subsequent worldwide lockdown caused a profound negative effect on ASEAN capital markets, resulting in a precipitous and large decline in stock prices (Hasan et al. 2021).

The magnitude of contemporaneous connectedness was remarkably high compared with the lagged connectedness during the COVID-19 pandemic, indicating that the immediate adverse impacts generated by the deadly disease disrupted the ASEAN stock markets (Ali et al 2023a, b). These observations corroborated the findings of Yousaf et al. (2024) and Lean et al. (2024) that total spillover effects are greatest during major events, including the COVID-19 crisis and the Chinese stock market meltdown. In addition, the ongoing dispute between Russia and Ukraine that began in 2022 caused detrimental effects on supply chains, leading to a massive spillover effect and interconnection (see Lin and Wang 2024). The magnitude of the lagged connectedness spiked significantly, although not as prevalently, as contemporaneous connectedness during the war. The evidence implies that the impact of the Russia–Ukraine conflict on the five ASEAN stock markets occurred immediately and progressively manifested across an extended time period. This evidence supports the findings of Lin and Wang (2024) that the Russia–Ukraine conflict leads to significant volatility spillovers. Furthermore, contagion theory posits that markets experience greater integration and connection during periods of extreme market conditions. According to Chatziantoniou et al. (2022), herding behavior in financial markets increases interdependence during extreme market events, resulting in higher levels of interconnectedness in tail markets. A few studies have shown that global economic and crisis events cause the connectedness between uncertain and emerging stock markets to increase significantly (Adjei et al. 2025; Ha et al. 2024; Lean et al. 2024; Lin et al. 2024; Marín-Rodríguez et al. 2025; Rubbaniy et al. 2024; Yousfi et al. 2024).

Figure 3 displays the net directional connectedness of categorical economic policy uncertainty and the five ASEAN stock markets. It reveals the time-varying net patterns for Chinese, Japanese and U.S. economic policy uncertainty and the stock markets of Indonesia, Malaysia, the Philippines, Thailand, and Singapore. Consistent with our prior results, the five ASEAN stock markets operate mainly as persistent shock transmitters, whereas most of the categorical economic policy uncertainties are shock recipients. In addition, other categorical economic policy uncertainties consistently alternate between

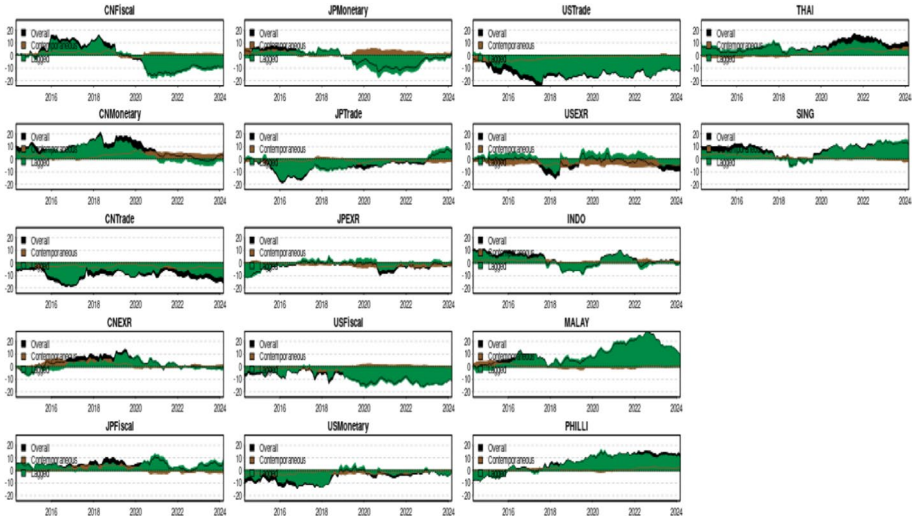

Fig. 3 Net Directional Connectedness of Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets. Note: The areas shaded in black, brown, and green indicate overall, contemporaneous and lagged component connectedness, respectively

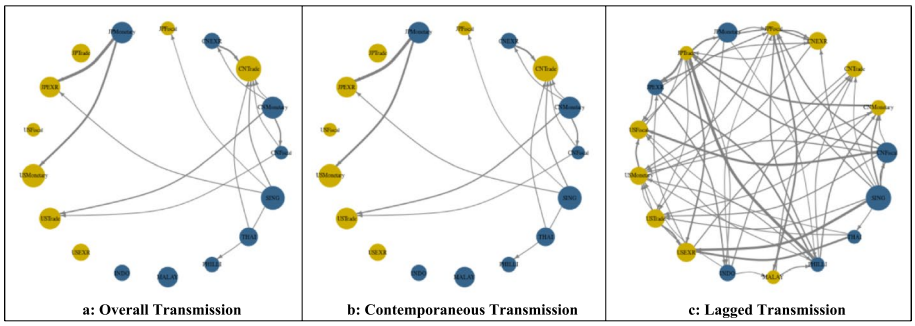

Fig. 4 Overall, Contemporaneous and Lagged Transmissions between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets During Global Financial Crisis. Note: *R2* decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

acting as net receiver transmitters and acting as receivers. The categorical economic policy uncertainty and the five ASEAN stock markets exhibit strong transmission and reception of spillover effects throughout significant events. Specifically, there was a notable rise in net spillovers for the five ASEAN stock markets at the beginning of 2020, coinciding with the onset of the COVID-19 pandemic (see Yousaf et al. 2024; Lean et al. 2024). Moreover, net lagged spillovers are generally more prominent, and asymmetries exist among all the measures. Since then, the role of emerging markets in net shock transmission has changed with crisis periods (Adjei et al. 2025; Lean et al. 2024; Marín-Rodríguez et al. 2025).

Connectedness during crisis periods

Figure 4 displays the overall, contemporaneous and lagged transmissions between categorical economic policy uncertainty and five ASEAN stock markets during the global financial crisis. The findings imply that the shock transmissions are distributed

asymmetrically. Specifically, uncertainty in Chinese fiscal policy and Japanese monetary policy served as constant net shock transmitters, whereas Chinese trade, Japanese fiscal and trade policy uncertainties were persistent net shock receivers in the overall, contemporaneous and lagged connectivity network during the global financial crisis.

Moreover, both Chinese monetary and exchange rate policy uncertainty act as channels for transmitting shocks in overall and contemporaneous linkage networks, whereas they play their roles as net recipients of shocks in lagged connectedness networks during the global financial crisis. In the meantime, Japanese exchange rate policy uncertainty was a net shock recipient in the overall and contemporaneous connectivity networks but a net shock transmitter in the lagged connectedness network during the global financial crisis. Interestingly, all U.S. categorical economic policy uncertainties were dominant net shock receivers across all connectedness networks during the global financial crisis. The linkages among the five ASEAN stock markets are net shock transmitters in all the connectedness networks, except for Malaysia, which acted as a net shock receiver in the lagged connectedness network during the global financial crisis. Nearly all ASEAN-5 stock markets function as conduits for economic disruptions, enabling the transmission of shocks across markets. This phenomenon may arise through several mechanisms, including foreign investment, policy uncertainty and investor sentiment, where shocks are transmitted across countries. While Malaysia did not significantly contribute to the shock transmission of the global financial crisis, it absorbed the shocks after some time, indicating that the market assimilates the detrimental consequences of the crisis with a delay. Investors may withdraw their investments and unload securities if they are concerned about the financial climate in globally interconnected markets.

Figure 5 presents the overall, contemporaneous and lagged transmissions between categorical economic policy uncertainty and five ASEAN stock markets during the Euro debt crisis. The findings indicate that Chinese fiscal and exchange rate policy uncertainty along with Japanese monetary policy uncertainty serve as pervasive net shock transmitters, whereas Chinese trade policy uncertainty and US fiscal, trade and exchange rate policy uncertainty are consistently net shock receivers in overall, contemporaneous and lagged connectivity networks during the Euro debt crisis. Furthermore, Chinese monetary policy uncertainty serves as a pathway for transmitting shocks in both the overall and contemporaneous linkage networks. However, it functions as a net

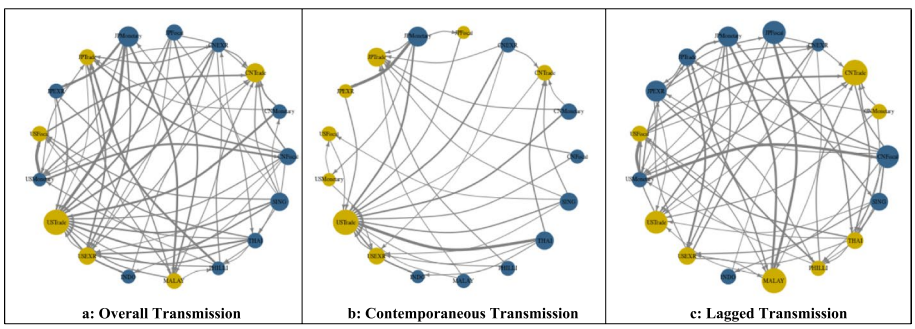

Fig. 5 Overall, Contemporaneous and Lagged Transmissions between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets During Euro Debt Crisis. Note: *R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

shock recipient in the lagged connectedness network during the Euro debt crisis. Moreover, Japanese fiscal and exchange rate policy uncertainty alongside U.S. monetary policy uncertainty are net shock transmitters in the overall and lagged connectivity networks, but they operate as net shock receivers in the contemporaneous connectedness network during the Euro debt crisis. In addition, Japanese trade policy uncertainty is a significant net shock receiver in all connectivity networks except for the lagged connectedness network during the Euro debt crisis. Considering the interconnection between the five ASEAN stock markets, these stock markets play their roles as net shock transmitters, except for Malaysia, which functions as a net shock receiver in the overall connectivity network during the Euro debt crisis. In the contemporaneous connectivity network, all five ASEAN stock markets were net shock transmitters during the Euro debt crisis. In addition, Indonesia and Singapore transmit shocks, whereas Malaysia, the Philippines and Thailand receive shocks in the lagged connectedness network during the Euro debt crisis.

Figure 6 shows the overall, contemporaneous and lagged transmissions between categorical economic policy uncertainty and five ASEAN stock markets during the U.S.–China trade-war crisis. Chinese fiscal and exchange rate policy uncertainty are constantly net shock receivers, whereas Japanese and US monetary policy uncertainty are robust net shock transmitters in overall, contemporaneous and lagged connectedness networks during the U.S.–China trade war crisis. In addition, uncertainties in Chinese monetary and trade policy, Japanese trade policy and U.S. fiscal policy display similar patterns, as they serve as net shock transmitters in overall and contemporaneous connectedness networks, whereas they play their roles as net shock recipients in the lagged connectedness network during the U.S.–China trade war crisis. Moreover, Chinese exchange rate policy uncertainty was a net shock receiver in the overall and lagged connectedness networks, whereas it was a net shock transmitter in the contemporaneous connectedness networks during the U.S.–China trade war crisis. Additionally, policy uncertainty in Japanese fiscal and US trade transmitted shocks in the overall and lagged connectivity networks, whereas both received shocks in the contemporaneous connectedness network during

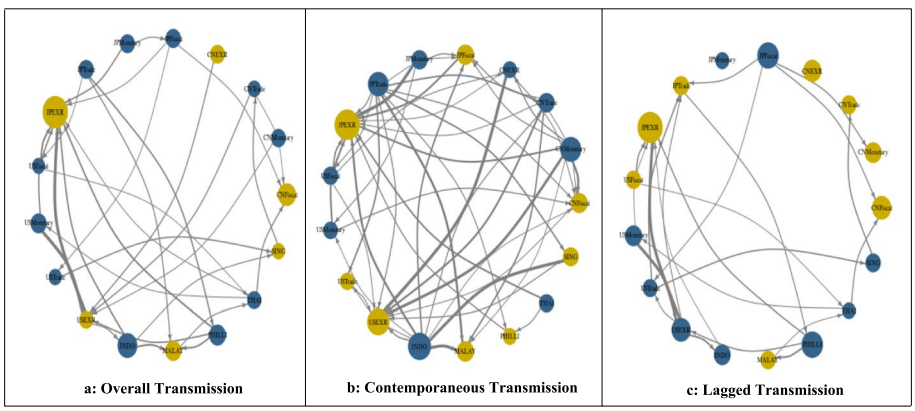

Fig. 6 Overall, Contemporaneous and Lagged Transmissions between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets During US–China Trade War Crisis. Note: *R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

the U.S.–China trade-war crisis. US exchange rate policy uncertainty acts as a channel to receive shocks in overall and contemporaneous connectedness networks, while it is a net shock transmitter in lagged connectedness networks during the U.S.–China trade war crisis. In addition, Thailand and Indonesia were constant net shock transmitters, whereas Malaysia was a dominant net shock receiver in all connectedness networks during the U.S.–China trade war crisis. Singapore and the Philippines alternated between being recipients and transmitters in several connectedness networks during the U.S.–China trade war crisis.

Figure 7 shows the overall, contemporaneous and lagged transmissions between categorical economic policy uncertainty and five ASEAN stock markets during the COVID-19 pandemic. Chinese fiscal and trade policy uncertainty, along with Japanese and U.S. exchange rate policy uncertainty, have consistently experienced net shocks, whereas Japanese and U.S. monetary policy uncertainty has regularly diffused net shocks in overall, contemporaneous and lagged connectivity networks during the COVID-19 crisis. Chinese monetary policy uncertainty and U.S. fiscal policy uncertainty demonstrate parallel trends, as they act as channels for transmitting net shocks in overall and simultaneous interconnectedness networks, but they function as recipients of net shocks in the lagged interconnectedness network during the COVID-19 crisis. In addition, Chinese exchange rate policy uncertainty and Japanese trade policy uncertainty are net shock receivers in overall and lagged connectedness networks, whereas both are net shock transmitters in contemporaneous connectedness networks during the COVID-19 pandemic. The uncertainty of Japanese fiscal policy and US trade policy changed between being a receiver and a transmitter in different connectedness networks during the COVID-19 crisis. Interestingly, the overall, contemporaneous and lagged connectivity networks during the COVID-19 pandemic exhibited similar trends in terms of the spread of shock transmission. Specifically, the five ASEAN stock markets serve as channels for transmitting shocks, except for Malaysia, which receives shocks in all the connectedness networks. Overall, the transformed impact of COVID-19 on the EPU and ASEAN stock market is also supported by Ali et al. (2023a, b), who reported that COVID-19 has impacted ASEAN Islamic equity markets.

Figure 8 presents the overall, contemporaneous and lagged transmissions between categorical economic policy uncertainty and the five ASEAN stock markets during the

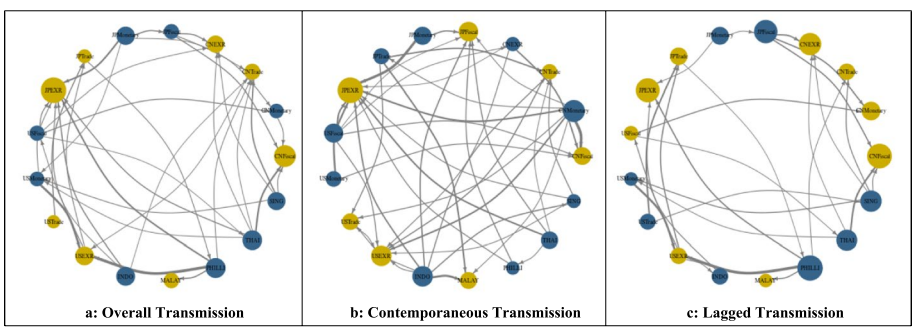

Fig. 7 Overall, Contemporaneous and Lagged Transmissions between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets During COVID-19 Crisis. Note: *R2* decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

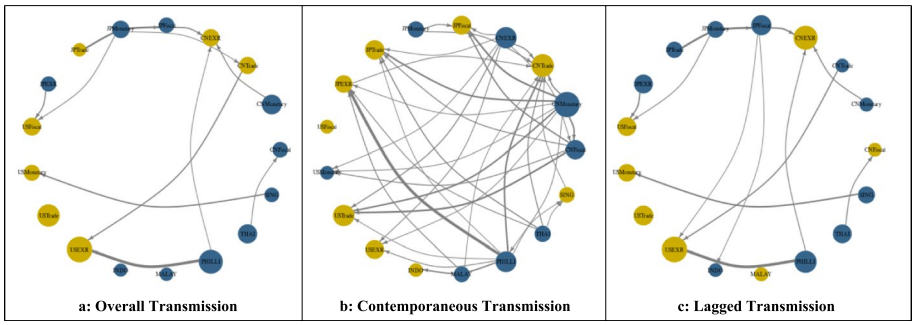

Fig. 8 Overall, Contemporaneous and Lagged Transmissions between Categorical Economic Policy Uncertainty and Five ASEAN Stock Markets During Russia-Ukraine War Crisis. Note: *R*2 decomposed measures are based on a 120-month rolling-window VAR model with a lag length of order three (AIC) and H Step 10. Blue (yellow) nodes illustrate the net transmitter (receiver) of shocks

Russia–Ukraine war crisis. Notably, all U.S. categorical economic policy uncertainties, with the exception of U.S. monetary policy uncertainty, act as net receivers of shocks in all connectivity networks during the Russia–Ukraine war crisis. Uncertainties in the monetary policy of China and Japan were net shock transmitters in the overall, contemporaneous and lagged connection networks during the Russia–Ukraine war crisis. Moreover, while Chinese and US trade policy uncertainties exhibit parallel trends as net shock receivers in overall and contemporaneous connectedness networks, both function as net shock transmitters in lagged connectedness networks throughout the Russia–Ukraine war crisis. Japanese fiscal and exchange rate policy uncertainties are net shock transmitters in the overall and lagged connectedness networks, whereas both policies are net shock receivers in the contemporaneous connectedness network. Chinese fiscal and exchange rate policy uncertainty have distinct functions in transmitting and receiving net shocks within connectivity networks. The five ASEAN stock markets were net shock transmitters in the overall connectedness network during the Russia–Ukraine war crisis. These markets continue to be net shock transmitters, except for Indonesia and Singapore and Malaysia in the contemporaneous and lagged connectedness networks, respectively. These stock markets remain net shock transmitters, apart from Indonesia and Singapore and Malaysia across the contemporaneous and lagged connectedness networks, respectively. Taken together, the evidence from the connectedness network indicates that there is a dynamic variation that evolves across time and is dependent on the type of crisis. Notably, Japanese monetary policy uncertainty and US exchange rate policy uncertainty are the most dominant net shock transmitters and receivers, respectively, across major events. Philippines and Thailand are constant net shock transmitters in overall and contemporaneous connectedness networks, whereas Indonesia is also a pervasive net shock transmitter in overall connectedness networks across major events. In the lagged connectedness networks, Indonesia and Singapore are robust net shock transmitters, whereas Malaysia is a robust net shock receiver across major crises.

Collectively, the results underline the dynamic and complex nexus between the ASEAN-5 stock markets and the economic policy uncertainties of major economies. Financial globalization increases the connectedness of financial markets among the ASEAN-5 countries. This interdependence triggers spillovers, whereby shocks from a specific country may promptly disrupt other countries. The US, Japan and China are

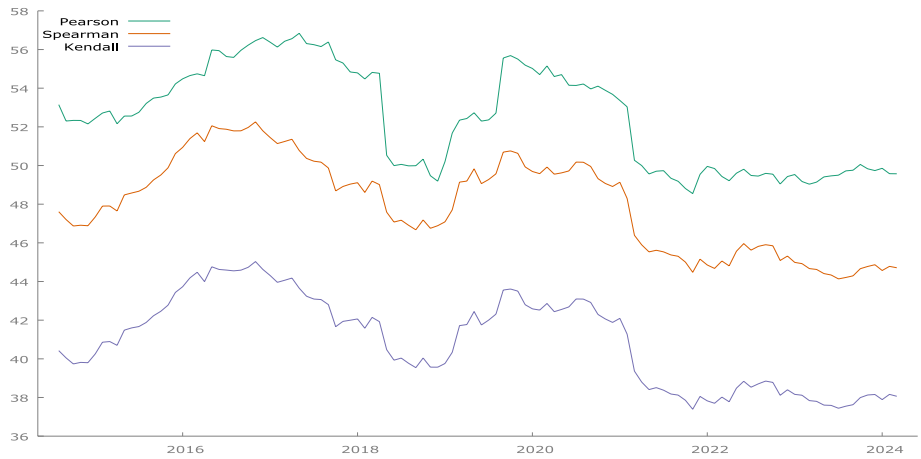

Fig. 9 Robustness testing via overall dynamic total connectedness via the Pearson, Spearman and Kendall rank correlation coefficients

leading economies that play pivotal roles in the global market, and their fiscal, monetary, trade and exchange rate policies may have broad ripple impacts (Lean et al 2024). For example, the ASEAN-5 markets are poised to respond swiftly to uncertainties in the US trade policies surrounding increased tariffs, monetary policies concerning interest rate cuts, fiscal policies regarding higher government expenditure and lower corporate taxes (Dogah et al. 2021; Hoque et al. 2024; Kedad et al. 2024). The economic policy uncertainty of the U.S., Japan and China can lead to far-reaching consequences, affecting the world's financial markets, including the ASEAN-5 countries, due to the strong linkage with global markets (Adjei et al. 2025; Lean et al. 2024; Marín-Rodríguez et al. 2025; Mo et al. 2024). Information asymmetry and transmission pace may account for the distinct responses of the immediate and lagged spillovers. During times of heightened uncertainty, investors are quick in adjusting their investment positions, leading to rapid market responses. Capital flight from riskier ASEAN-5 markets to safe haven markets may explain the role of the ASEAN-5 markets as net transmitters of shocks. The economic policy uncertainty of major economies often triggers capital flights, and emerging markets such as ASEAN-5 countries are especially vulnerable to this uncertainty, as they are highly reliant on global trade and foreign investments. Capital withdrawal from ASEAN-5 countries has negative impacts on their stock markets, further exacerbating negative shocks across countries. Furthermore, the diverse roles of fiscal, monetary, trade and exchange rate policy uncertainties as shock transmitters and receivers during the global financial crisis, Euro debt crisis, US–China trade war, COVID-19 pandemic and Russia–Ukraine war imply that the impact of the EPU is context dependent and can change rapidly in response to major world events or changes in global conditions (Lean et al 2024; Mo et al. 2024). The uncertainty surrounding future economic policies is not only dynamic but can also arise from various factors. Hence, the use of categorical EPUs in our study allows a deeper understanding of how different sources or categories of economic policy uncertainty impact economic outcomes in guiding policy decisions and business and portfolio investments.

Robustness test of connectedness

Figure 9 presents an illustration of robustness testing using overall dynamic total connectedness based on the Pearson, Spearman and Kendall rank correlation coefficients. Consistent with Fig. 2, the dynamic total connectedness based on Spearman and Kendall rank correlations revealed that the degree of spillover changed with economic and crisis events such as the Chinese economic slowdown, the US–China Trade War, the BREXIT, the COVID-19 pandemic, and the Russia-Ukraine conflict. All three lines show that the TCI peaked in 2017 and 2020 and was lowest in 2019 and 2022. They remained stable during 2023. Overall, these illustrations exhibit consistent patterns, implying that our research results are reliable.

Determinants of connectedness

Tables 5, 6 and 7 show the regression results on the impact of determinants (oil price risk shocks, demand shocks, supply shocks, geopolitical risk index, global financial stress index, world climate change index and gold market volatility) on the dynamics of the overall, contemporaneous and lagged return connectivity among the ASEAN stock markets, respectively. Bivariate regression analyses are executed for each factor, followed by a multivariate regression analysis incorporating all factors. In Table 5, the influences of demand shocks, global financial stress and gold market volatility on the dynamics of the overall return connectedness among the ASEAN-5 stock markets are statistically significantly negative. The findings indicate that increases in demand shocks, global financial stress and gold market volatility contributed to a decline in the dynamic of the overall return connectedness of the ASEAN-5 stock markets. Compared with the

Table 5 Determinants of dynamic overall return spillovers

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
OIL RISK SHOCK	0.153							−0.115***
	(0.104)							(0.083)
OIL DEMAND SHOCK		−16.373***						17.316
		(2.266)						(2.147)
OIL SUPPLY SHOCK			−3.478					0.995
			(5.541)					(4.612)
GPR				−0.078				−0.133
				(0.289)				(0.179)
GFS					−4.440***			−11.453***
					(1.163)			(2.745)
CLIMATE						0.001		−0.012***
						(0.001)		(0.002)
GOLD							−0.188***	−0.218***
							(0.032)	(0.076)
R^2 (%)	23.34	30.20	29.00	30.3	28.07	29.80	28.00	48.00

Standard errors are printed in parentheses. *, ** and *** indicate that the relevant coefficient is significant at the 10%, 5% and 1% levels, respectively. The dependent variable $TSI(\tau)$ is defined as total, short-, medium- and long-term tail risk spillovers. Moreover, the term X_{it} contains the drivers of connectedness, including oil price risk shocks, demand shocks, supply shocks, the geopolitical risk index (GPR), the global financial stress index (GFS), the MSCI world climate change index (CLIMATE) and gold market volatility (GOLD)

Table 6 Determinants of dynamic contemporary return spillovers

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
OIL RISK SHOCK	−0.391***							−0.200**
	(0.164)							(0.106)
OIL DEMAND SHOCK		8.740***						16.697***
		(4.422)						(2.588)
OIL SUPPLY SHOCK			−5.067					−0.028
			(8.604)					(5.673)
GPR				−0.008				−0.125
				(0.436)				(0.211)
GFS					0.607			−22.865***
					(2.029)			(3.532)
CLIMATE						−0.012***		−0.031***
						(0.002)		(0.002)
GOLD							0.334***	0.501***
							(0.055)	(0.100)
R^2(%)	33.34	24.20	31.00	32.3	26.07	31.80	29.00	64.45

Standard errors are printed in parentheses. *, ** and *** indicate that the relevant coefficient is significant at the 10%, 5% and 1% levels, respectively. The dependent variable $TSI(\tau)$ is defined as total, short-, medium- and long-term tail risk spillovers. Moreover, the term X_{it} contains the drivers of connectedness, including oil price risk shocks, demand shocks, supply shocks, the geopolitical risk index (GPR), the global financial stress index (GFS), the MSCI world climate change index (CLIMATE) and gold market volatility (GOLD)

Table 7 Determinants of dynamic lagged return spillovers

Coefficient	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
OIL RISK SHOCK	0.239***							0.086***
	(0.088)							(0.040)
OIL DEMAND SHOCK		7.632***						0.620
		(2.804)						(0.998)
OIL SUPPLY SHOCK			1.590					1.023
			(5.196)					(1.945)
GPR				−0.070				−0.007
				(0.297)				(0.086)
GFS					−5.047***			11.412***
					(1.383)			(1.162)
CLIMATE						0.011***		0.019***
						(0.001)		(0.001)
GOLD							0.145***	−0.284***
							(0.036)	(0.037)
R^2(%)	13.34	24.20	21.00	31.3	25.07	27.80	25.00	84.19

Standard errors are printed in parentheses. *, ** and *** indicate that the relevant coefficient is significant at the 10%, 5% and 1% levels, respectively. The dependent variable $TSI(\tau)$ is defined as total, short-, medium- and long-term tail risk spillovers. Moreover, the term X_{it} contains the drivers of connectedness, including oil price risk shocks, demand shocks, supply shocks, the geopolitical risk index (GPR), the global financial stress index (GFS), the MSCI world climate change index (CLIMATE) and gold market volatility (GOLD)

bivariate regressions in Models 1 to 7, the multivariate regression in Model 8 produces slightly diverse findings. Specifically, oil price risk shocks and the world climate change index significantly affect the overall return connectedness of the ASEAN-5 stock market, whereas global financial stress and gold market volatility remain crucial in impacting this dynamic. The coefficient of determination, a metric that assesses the predictive power of the model, is 48%, inferring that the model has strong explanatory ability in relation to the overall connectedness. The decline in the return interconnectedness of the ASEAN-5 stock markets is driven by a combination of external shocks, generating volatility and unpredictability, including oil price risk, global financial stress, climate change and gold market volatility. These factors interfere with the conventional return movement across markets, as investors gradually focus more on local risk than on global conditions. As a result, ASEAN-5 stock markets have become more fragmented, lessening their interconnectedness. Table 6 indicates that oil price risk shocks, world climate change, demand shocks, and gold market volatility consistently and significantly influence the dynamic contemporaneous return connectedness among the ASEAN-5 stock markets in both the bivariate and multivariate models. Additionally, global financial stress emerges as an important driver in the multivariate analysis. The coefficient of determination is 64.45%, indicating that the model has a robust ability to explain contemporaneous return spillovers. Table 7 implies that oil price risk shocks, demand shocks, global financial stress, gold market volatility and world climate change have significant power in explaining the lagged return spillovers for the ASEAN-5 stock markets in the bivariate analysis. These factors continue to be important, but there is a reversal in the signs of the connection between global financial stress and gold market volatility in the multivariate analysis. In addition, demand shocks become less influential in the multivariate model. The coefficient of determination is 84.19%, indicating that the model has greater explanatory power in explaining the lagged connectedness than in explaining the contemporaneous connectedness. Notably, oil price risk shocks, global financial stress, world climate change, and gold market volatility significantly affect the overall, contemporaneous and lagged return spillovers among the ASEAN-5 stock markets. Moreover, supply shocks and geopolitical risk have no significant effect on ASEAN-5 stock market connectedness. These findings are consistent with previous evidence that shocks from oil price risk, global financial stress, climate change and gold market volatility lead to varying degrees of connectedness among stock returns (Jiang et al. 2020; Mao et al. 2023; Hoque et al. 2024; Long et al. 2024; Mensi et al. 2024).

Conclusion

The ASEAN-5 economies are profoundly impacted by the economic policy uncertainty of leading economies, including the US, Japan and China. These uncertainties strongly impact international trade, foreign direct investment, investor confidence and stock market performance. These ASEAN-5 economies are deeply integrated and interconnected with major economies, making them highly responsive to changes in global economic policies, crises and geopolitical events. This paper applies an advanced R2

decomposed connectedness methodology established by Balli et al. (2023) to investigate the dynamic connection between different categories of economic policy uncertainties of major economies and the stock market returns of ASEAN-5 countries over the period from August 2004–March 2024, incorporating major global events, including the global financial crisis, the Euro debt crisis, the USA–China trade war, the COVID-19 health crisis and the Russia–Ukraine war. In addition, several other uncertainty factors contributing to spillover repercussions are investigated.

The findings show the presence of connectedness and spillovers between categorical economic policy uncertainties of three major economies and the ASEAN-5 stock markets. Specifically, the five ASEAN stock markets, namely, Malaysia, Singapore, Thailand, the Philippines and Indonesia, are consistently the net shock transmitters in the overall, contemporaneous and lagged connectedness networks. This implies that ASEAN-5 countries are significantly affected by the policy uncertainty of leading economies and, at the same time, transmit and amplify shocks to other countries. In addition, the majority of the categorical EPUs, including Chinese trade policy, Japanese trade and exchange rate policies, and US fiscal, monetary and trade policies, are net shock receivers, whereas uncertainties in Chinese monetary, exchange rate and Japanese fiscal policies are net shock transmitters in all the connectedness networks. Moreover, the impacts of policy uncertainty on Chinese fiscal, Japanese monetary and US exchange rates vary depending on the type of connectedness network. The impacts of contemporaneous spillovers are more evident than those of lagged spillovers are, highlighting the significance of immediate temporal dynamics in shaping total connectedness.

Moreover, the findings demonstrate that the dynamic variations that evolve over time were triggered by significant crises and global events. The level of connectedness, transmission routes and role of each market and categorical economic policy uncertainties vary amid major crises, ranging from the global financial crisis to the Euro debt crisis, the USA–China trade war, the COVID-19 health crisis and the Russia-Ukraine war. Importantly, several uncertainty factors, including oil shock, global financial stress, world climate change and gold market volatility, significantly impact the overall, contemporaneous and lagged return connectedness across the five ASEAN stock markets.

The empirical findings have several important implications. The findings that ASEAN-5 stock markets act as persistent net shock transmitters of EPU uncertainty from China, Japan and the US suggest that ASEAN-5 countries are exposed to policy shifts in large economies because they are highly reliant on global trade and investments. The implications are the outflow of capital investment from the ASEAN-5 countries as investors fled from emerging markets and multinational corporations relocated their operations elsewhere, further transmitting the impacts of policy uncertainty to other countries. Investors and portfolio managers with substantial stock investment in ASEAN-5 stock markets may be more susceptible to transmitted shocks. Therefore, it is important that they diversify their investments across different markets to minimize risks. The findings that the majority of the categorical EPUs of China, Japan and the U.S. are net shock receivers suggest that

these large economies are significantly impacted by the EPU uncertainty of each other's policy areas. For example, the U.S.–China trade war and US tariff imposition on Chinese goods led to stock return volatility in both the U.S. and the Chinese stock markets. Hence, to mitigate trade policy risk, both the U.S. and China can diversify the pool of their trading partners. In addition, given the diverse roles of categorical economic policy uncertainty across the overall, contemporaneous and lagged connectedness networks, it is crucial for investors to employ dynamic asset allocation strategies in managing various policy risks. To manage portfolio risk, managers may rebalance their portfolios on the basis of the level of economic policy unpredictability. By closely assessing the price reactions of stock portfolios to uncertainty in various policy areas, including trade, monetary, fiscal and foreign exchange rates, managers can minimize exposure to stock holdings of riskier companies that are more vulnerable to policy shifts. Instead, they can channel funds into safe-haven assets to shield them from declining stock markets in times of heightened uncertainty. Facing the prospect of regular and sudden policy shifts arising from high economic policy uncertainty, managers must constantly keep themselves updated with regulatory changes to respond swiftly to potential policy shifts. Thus, establishing a system to monitor changes in various policy areas and assess their impacts on different sectors or industries could be an effective strategy for managing policy risk.

Furthermore, the findings on the dynamic changes in connectedness and spillovers amid significant major global events and crises imply the need for policymakers to formulate strategies to address the global impacts of economic uncertainty in various policy domains during major economic and geopolitical crises. Additionally, identifying the key drivers contributing to dynamic return spillovers is essential for devising a comprehensive risk evaluation mechanism that incorporates broader economic and geopolitical aspects.

Like any other study, this study has several limitations that could direct future research. For example, this study focuses only on five ASEAN markets. Hence, future research can expand the scope to include a broader range of markets and investigate additional determinants of the dynamic overall, contemporaneous and lagged return spillovers, strengthening the overall comprehension of decomposed connectedness among categorical economic policy uncertainties and the global stock markets. Additionally, since the R^2 connectedness approach does not separately capture bull and bear market conditions, future research should consider examining the connectedness specifically during these distinct market phases to gain a more nuanced understanding of market dynamics.

Appendix

See Table 8.

Table 8 Variables to determine the spillovers

Variable	Description
Oil risk shocks	Oil risk shocks are defined as oil price changes that may be abrupt, and which could lead to a materialization of various economic and financial impacts. These shocks can be due to geopolitical factors, supply chain disruptions or global demand changes. These fluctuations are likely to raise costs to businesses and consumers because of inflation and constrain the overall economy's growth, besides generating instability in the financial market, which requires policy changes
Oil demand shocks	Oil demand shocks are changes in demand for oil, which cause fluctuations in prices and the general economy. These shocks can, therefore, result from changes in consumer behavior, growth or decline in the economy, changes in energy policies, the emergence of other forms of energy, or other world events that affect movement, including but not limited to pandemics. Positive demand shock refers to increased demand for oil, which increases its price and production activity and has the potential to increase overall revenue for oil-producing countries. However, negative demand shock results in less demand for oil, which in turn causes its price to go down, reduces its production activity and thus has the potential to cause some oil-producing countries to lose their overall revenue and slow economic growth
Oil supply shocks	Oil supply shocks refer to sudden and significant disruptions in the availability of oil, often caused by geopolitical events, natural disasters, production cuts, or changes in demand. These shocks can lead to abrupt changes in oil prices, creating ripple effects throughout the economy and impacting various sectors that rely on oil as an essential input. The resulting volatility can affect both energy and broader financial markets, influencing everything from inflation rates to currency values and the performance of investment portfolios. Essentially, oil supply shocks highlight the critical role oil plays in the global economy and the far-reaching implications of its fluctuations
GOLD	GVZ is an estimation regarding the anticipated 30-day volatility of returns on the SPDR Gold Shares ETF (GLD)
GFS	The GFS is, therefore, a composite based on several indicators that measure the level of stress in the world's financial system; it includes measures such as equity market volatility, credit spread and liquidity measures. Hence, its goals are drawn to offer an understanding of the position and stability of the world's financial markets, which may pose threats and weaknesses that can distort the global economic climate to policymakers and investors. Hence, by tracking the motion in the GFSI, stakeholders will be able to decipher the motion socially regarding the susceptibility to the forces of financial stress and proceed to make their own conclusions
CLMT	The MSCI World Climate Change Index (CLMT) is the market-cap Version; if assigned to the MSCI World Index, it is a relative index majoring in considerable and mid-cap stocks from 23 developed regions. The index is designed to approximate the performance of an approach that adjusts the weights of securities regarding the prospects and vulnerability of sectors regarding decarbonization, although it seeks to eliminate exceptions from the relative index

Abbreviations

EPU	Economic policy uncertainty
CNFiscal	Chinese fiscal policy uncertainty
CNMonetary	Chinese monetary policy uncertainty
CNTrade	Chinese trade policy uncertainty
CNExr	Chinese exchange rate policy uncertainty
JPFiscal	Japanese fiscal policy uncertainty
JPMonetary	Japanese monetary policy uncertainty
JPTrade	Japanese trade policy uncertainty
JPExr	Japanese exchange rate policy uncertainty
USFiscal	United States fiscal policy uncertainty
USMonetary	United States monetary policy uncertainty
USTrade	United States trade policy uncertainty
USExr	United States exchange rate policy uncertainty
INDO	Indonesia
MALAY	Malaysia
PHILLI	Philippines
THAI	Thailand
SING	Singapore
GPR	The geopolitical risk index
GFS	The Global Financial Stress Index
Climate	The MSCI World Climate Change Index

Gold	Gold market volatility

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Declarations

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References

Adjei ANK, Tweneboah G, Owusu Junior P (2025) Economic policy uncertainty and spillovers in selected emerging market economies: time-and frequency-domain approach. J Financ Econ Policy 17(1):1–28
Aizenman J, Lindahl R, Stenvall D, Uddin GS (2024) Geopolitical shocks and commodity market dynamics: new evidence from the Russia-Ukraine conflict. Eur J Polit Econ 85:102574
Ali F, Sensoy A, Goodell JW (2023b) Identifying diversifiers, hedges, and safe havens among Asia Pacific equity markets during COVID-19: new results for ongoing portfolio allocation. Int Rev Econ Finance 85:744–792
Ali M, Khattak MA, Khan S, Khan N (2023a) COVID-19 and the ASEAN stock market: a wavelet analysis of conventional and Islamic equity indices. Stud Econ Finance 40(4):687–707
Allen F, Gale D (2000) Financial contagion. J Polit Econ 108(1):1–33
Alqahtani A, Martinez M (2020) US economic policy uncertainty and GCC stock market. Asia-Pac Finan Markets 27(3):415–425
Arbatli EC, Davis SJ, Ito A, Miake N (2017) Policy uncertainty in Japan (No. w23411). National Bureau of Economic Research
Arouri M, Estay C, Rault C, Roubaud D (2016) Economic policy uncertainty and stock markets: long-run evidence from the US. Finance Res Lett 18:136–141
Ascari G, Bonam D, Smadu A (2024) Global supply chain pressures, inflation, and implications for monetary policy. J Int Money Finance 142:103029
Asgharian C, Hou A (2023) The effect of uncertainty on stock market volatility and correlation. J Bank Finance 154:106929
Bahmani-Oskooee M, Saha S (2019) On the effects of policy uncertainty on stock prices. J Econ Finance 43(4):764–778
Baker SR, Bloom N, Davis SJ (2012) Has economic policy uncertainty hampered the recovery? Becker Friedman Institute for Research in Economics Working Paper (2012-003)
Baker SR, Bloom N, Davis SJ (2016) Measuring economic policy uncertainty. Q J Econ 131(4):1593–1636
Balli F, Balli HO, Dang THN, Gabauer D (2023) Contemporaneous and lagged R2 decomposed connectedness approach: new evidence from the energy futures market. Finance Res Lett 57:104168
Baltussen G, Van Bekkum S, Van Der Grient B (2018) Unknown unknowns: uncertainty about risk and stock returns. J Financ Quant Anal 53(4):1615–1651
Bekaert G, Engstrom EC, Xu NR (2022) The time variation in risk appetite and uncertainty. Manage Sci 68(6):3975–4004
Bernal O, Gnabo JY, Guilmin G (2016) Economic policy uncertainty and risk spillovers in the Eurozone. J Int Money Finance 65:24–45
Bernanke BS (1983) Irreversibility, uncertainty, and cyclical investment. Q J Econ 98:85–106
Bouri E, Gabauer D, Gupta R, Kinateder H (2023) Global geopolitical risk and inflation spillovers across European and North American economies. Res Int Bus Finance 66:102048
Chatziantoniou I, Abakah EJA, Gabauer D, Tiwari AK (2022) Quantile time–frequency price connectedness between green bond, green equity, sustainable investments and clean energy markets. J Clean Prod 361:132088
Chen J, Ma F, Qiu X, Li T (2023) The role of categorical EPU indices in predicting stock-market returns. Int Rev Econ Finance 87:365–378
Chen X, Le CHA, Shan Y, Taylor S (2020) Australian policy uncertainty and corporate investment. Pac Basin Finance J 61:101341
Choi S, Furceri D, Yoon C (2020) Policy uncertainty and foreign direct investment. Rev Int Econ. https://doi.org/10.1111/roie.12495
Colombo V (2013) Economic policy uncertainty in the US: does it matter for the Euro area? Econ Lett 121(1):39–42
Connelly BL, Certo ST, Ireland RD, Reutzel CR (2011) Signaling theory: a review and assessment. J Manage 37(1):39–67

Das D, Kannadhasan M, Bhattacharyya M (2019) Do the emerging stock markets react to international economic policy uncertainty, geopolitical risk and financial stress alike? North Am J Econ Finance 48:1–19
Diebold FX, Yilmaz K (2012) Better to give than to receive: Predictive directional measurement of volatility spillovers. Int J Forecast 28(1):57–66
Diebold FX, Yılmaz K (2014) On the network topology of variance decompositions: Measuring the connectedness of financial firms. J Econometrics 182(1):119–134
Dogah KE (2021) Effect of trade and economic policy uncertainties on regional systemic risk: evidence from ASEAN. Econ Model 104:105625
Erer E, Erer D (2024) The domino effect of silicon valley Bank's bankruptcy and the role of FED's monetary policy. Borsa Istanbul Rev 24(3):573–591
Gulen H, Ion M (2015) Policy uncertainty and corporate investment. Rev Financ Stud 29(3):523–564
Ha LT (2024) A wavelet analysis of dynamic connectedness between geopolitical risk and renewable energy volatility during the COVID-19 pandemic and Ukraine-Russia conflicts. Environ Sci Pollut Res 31(12):17994–18009
Hasan MB, Mahi M, Hassan MK, Bhuiyan AB (2021) Impact of COVID-19 pandemic on stock markets: conventional vs Islamic indices using wavelet-based multi-timescales analysis. North Am J Econ Finance 58:101504
Hoque ME, Al Mahi M, Tee LT, Bilgili F, Kew SR, Billah M (2024) Quantile-frequency connectedness among climate change stocks: the roles of climate change attention and global uncertainties. J Clean Prod 476:143719
Hoque ME, Hassan MK, Zaidi MAS, Brodmann J (2020) Global shocks, monetary policy, and financial market: evidence from a transition economy. Int J Econ Manag 14(3)
Hoque ME, Soo-Wah L, Uddin MA, Rahman A (2023) International trade policy uncertainty spillover on stock market: evidence from fragile five economies. J Int Trade Econ Dev 32(1):104–131
Hoque ME, Zaidi MAS (2019) The impacts of global economic policy uncertainty on stock market returns in regime switching environment: evidence from sectoral perspectives. Int J Financ Econ 24(2):991–1016
Huang Y, Luk P (2020) Measuring economic policy uncertainty in China. China Econ Rev 59:101367
Jiang Y, Tian G, Mo B (2020) Spillover and quantile linkage between oil price shocks and stock returns: new evidence from G7 countries. Financ Innov 6:1–26
Jiang, Y., Zhu, Z., Tian, G., & Nie, H. (2019). Determinants of within and cross-country economic policy uncertainty spillovers: Evidence from US and China. *Finance Research Letters*, *31*.
Julio B, Yook Y (2016) Policy uncertainty, irreversibility, and cross-border flows of capital. J Int Econ 103:13–26
Jurado K, Ludvigson SC, Ng S (2015) Measuring uncertainty. Am Econ Rev 105(3):1177–1216
Keddad B (2024) Asian stock market volatility and economic policy uncertainty: the role of world and regional leaders. J Int Finan Markets Inst Money 91:101928
Lean HH, Alkhazali OM, Gleason K, Yeap XW (2024) Connectedness and economic policy uncertainty spillovers to the ASEAN stock markets. Int Rev Econ Finance 90:167–186
Li W, Liu X (2018) China's increasing economic linkages with ASEAN and the potential spillover effects, WP/18–03, pp 1–18
Li XL, Balcilar M, Gupta R, Chang T (2016) The causal relationship between economic policy uncertainty and stock returns in China and India: evidence from a bootstrap rolling window approach. Emerg Mark Finance Trade 52(3):674–689
Liang CC, Troy C, Rouyer E (2020) US uncertainty and Asian stock prices: Evidence from the asymmetric NARDL model. North Am J Econ Finance 51:101046
Lin X, Meng Y, Zhu H (2024) Exploring hedging potentials of green bonds against oil price shocks: evidence from quantile-on-quantile connectedness measures. Financ Res Lett 65:105640
Lin Y, Wang Y (2024) The impact of the Russia-Ukraine war on volatility spillovers. Int Rev Financ Anal 93:103194
Liow KH, Liao WC, Huang Y (2018) Dynamics of international spillovers and interaction: evidence from financial market stress and economic policy uncertainty. Econ Model 68:96–116
Liu M, Choo WC, Lee CC (2020) The response of the stock market to the announcement of global pandemic. Emerg Mark Finance Trade 56(15):3562–3577
Long TQ, Nguyen LH, Morgan PJ (2024) Dynamic connectedness of financial stress across advanced and emerging economies: evidence from time and frequency domains. Singapore Econ Rev 69(02):751–791
Malkiel BG (1989) Efficient market hypothesis. Finance, 127–134
Mao X, Wei P, Ren X (2023) Climate risk and financial systems: a nonlinear network connectedness analysis. J Environ Manage 340:117878
Marín-Rodríguez NJ, González-Ruíz JD, Botero S (2025) Dynamic spillovers of economic policy uncertainty: a TVP-VAR analysis of Latin American and Global EPU indices. Economies 13(1):11
Mensi W, Ziadat SA, Al Rababa'a AR, Vo XV, Kang SH (2024) Oil, gold and international stock markets: extreme spillovers, connectedness and its determinants. Q Rev Econ Finance 95:1–17
Mo T, Huangmei M, Chen H, Li K, Ouyang Y (2024) Tail risk spillovers between economic policy uncertainty and stock market returns: evidence based on TENET approach. Financ Res Lett 69:106204
Parveen S, Satti ZW, Subhan QA, Jamil S (2020) Exploring market overreaction, investors' sentiments and investment decisions in an emerging stock market. Borsa Istanbul Rev 20(3):224–235
Pástor L, Veronesi P (2012) Uncertainty about government policy and stock prices. J Finance 67:1219–1264
Pástor L, Veronesi P (2013) Political uncertainty and risk premia. J Financ Econ 110:520–545
Phan NH, Bui VD, Nguyen LTQ (2024) How economic policy uncertainty affects foreign direct investment inflows: implications for the post-Covid-19 pandemic period. Int J Soc Econ 51(2):282–296
Rubbaniy G, Maghyereh A, Cheffi W, Khalid AA (2024) Dynamic connectedness, portfolio performance, and hedging effectiveness of the hydrogen economy, renewable energy, equity, and commodity markets: insights from the COVID-19 pandemic and the Russia-Ukraine war. J Clean Prod 452:142217
Sum V (2013) The ASEAN stock market performance and economic policy uncertainty in the United States. Econ Pap A J Appl Econ Policy 32(4):512–521
Sun J, Hou JW (2019) Monetary and financial cooperation between China and the One Belt One Road countries. Emerg Mark Finance Trade 55(11):2609–2627

Supachart W, Chaisongkram K, Abbasi K (2020) Foreign economic policy uncertainty: does it matter to Thailand's financial market? Am J Econ 10(5):305–310
Thaker HMT, Thaker MAM, Prima MR, Sakti AAP, Sifat IM Economic policy uncertainty of China and investment opportunities: a tale of ASEAN stock markets
Tsai IC (2017) The source of global stock market risk: A viewpoint of economic policy uncertainty. Econ Model 60:122–131
Xu B, Rahman MU, Yu H (2021) Forecasting Chinese EPU based on financial uncertainty in emerging market economies (EMEs): evidence from six selected East Asian economies. Econ Res-Ekon Istraž 34(1):628–649
Yang T, Dong Q, Du M, Du Q (2023) Geopolitical risks, oil price shocks and inflation: evidence from a TVP–SV–VAR approach. Energy Econ 127:107099
Yousaf I, Mensi W, Vo XV, Kang S (2024) Spillovers and connectedness between Chinese and ASEAN stock markets during bearish and bullish market statuses. Int J Emerg Mark 19(10):2661–2690
Yousfi M, Farhani R, Bouzgarrou H (2024) From the pandemic to the Russia-Ukraine crisis: dynamic behavior of connectedness between financial markets and implications for portfolio management. Econ Anal Policy 81:1178–1197

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