



**THE EFFECTS OF GLOBAL
UNCERTAINTIES ON INTERNATIONAL
TRADE AND INVESTMENT FLOWS:
PANEL DATA ANALYSIS**

Master's Degree

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**THE EFFECTS OF GLOBAL UNCERTAINTIES ON INTERNATIONAL
TRADE AND INVESTMENT FLOWS: PANEL DATA ANALYSIS**

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ABSTRACT

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The aim of this dissertation is to investigate and estimate the impact of global uncertainties on international trade and foreign direct investment (FDI) with a panel data approach. In recent decades, the global economy has been increasingly exposed to unpredictable events such as financial crisis, geopolitical conflict and wars, pandemics, which have raised concerns about the stability and integration of global markets. Drawing on panel data covering a broad sample of countries over time, this study examines how fluctuations in global uncertainty, measured through indices such as Economic Policy Uncertainty (EPU) and World Uncertainty Index (WUI) which are significantly predictors of current contractions in trade openness and net FDI inflows. Our result underscores the profoundly disruptive impact of uncertain economic and policy environments on global economic integration.

Keywords: Global uncertainty, international trade, foreign direct investment (FDI), economic policy uncertainty (EPU), world uncertainty index (WUI).

ÖZET

KÜRESEL BELİRSİZLİKLERİN ULUSLARASI TİCARET VE YATIRIM AKIŞLARINA ETKİSİ: PANEL VERİ ANALİZİ

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Bu çalışma, panel veri yaklaşımını kullanarak küresel belirsizliklerin uluslararası ticaret ve doğrudan yabancı yatırımlar üzerindeki etkisini araştırmaktadır. Yakın geçmişte, küresel ekonomi artan bir ivmeyle istikrarı ve küresel piyasalara uyumu güçleştiren ekonomik krizler, bölgesel çatışmalar ve savaşlar, salgın hastalıklar gibi öngörülemeyen olaylara maruz kaldı. Bu çalışma, geniş bir zaman ve ülke örneğini kapsayan panel veri yaklaşımından yararlanarak ve Ekonomik ve Politik Belirsizlik Endeksi ile Dünya Belirsizlik Endeksini kullanarak küresel belirsizliklerdeki dalgalanmaların dış ticaret performansını ve doğrudan yabancı yatırım akışlarını incelemektedir. Sonuçlarımız belirsiz ekonomik ve politik ortamların küresel ekonomik entegrasyon üzerindeki derin ve yıkıcı etkisini işaret ediyor.

Anahtar Sözcükler: Küresel belirsizlik, uluslararası ticaret, doğrudan yabancı yatırım (DYY), ekonomik ve politik belirsizlik, dünya belirsizlik endeksi.

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GLOSSARY OF SYMBOLS AND ABBREVIATIONS

AIC	: Akaike Information Criterion
ARDL	: Auto Regressive Disputed Lag
BREXIT	: Britain Exit
BRICS	: Brazil, Russia, India, China and South Africa
CBOE	: Chicago Board Options Exchange
CD	: Cross-sectional Dependence
CDS	: Credit Default Swap
CEPR	: Centre for Economic Policy Research
CIPS	: Cross-sectional Augmented IPS
COVID-19	: Coronavirus Disease of 2019
CPU	: Climate Policy Uncertainty
D-H	: Dumitrescu-Hurlin
EPU	: Economic Policy Uncertainty
EU	: European Union
FDI	: Foreign Direct Investment
FED	: Federal Reserve System
FRED	: Federal Reserve Economic Data
G7	: Group of Seven
GDP	: Gross Domestic Product
GEPU	: Global Economic Policy Uncertainty
GPR	: Geopolitical Risk
HNC	: Homogeneous Non-Causality
NAFTA	: North American Free Trade Agreement
OECD	: Organisation for Economic Co-operation and Development
S&P 100 or 500	: Standard and Poor's 100 or 500
SVAR	: Structural Vector Auto Regression
TPU	: Trade Policy Uncertainty
UK	: United Kingdom

UNCTAD	: United Nations Conference on Trade and Development
US	: United States
VIX	: Volatility Index
WDI	: World Development Indicators
WUI	: World Uncertainty Index
WTO	: World Trade Organization



1 INTRODUCTION

Uncertainty has always found a place in the history of economic thought but great theoretical contributions to it in the early 1900s were made by Knight and Keynes. Even for decades uncertainty remained largely theoretical. Over the past decade, however, the publication of Baker et al. (2016) it has transformed it into an economic phenomenon¹. This remarkable academic innovation shifted uncertainty from a conceptual to an empirical domain, allowing researchers to quantify its macroeconomic effects. The renewed focus reflects not just academic interest but also the fragility of modern economies amid recurrent financial crises, political polarization, and global disruptions. Consequently, uncertainty today stands as both a theoretical construct and an observable force shaping global economic performance.

The rise of global uncertainty is linked to globalization. As trade networks have expanded, supply chains have lengthened, and financial markets have become more integrated, the economy of one country is rarely isolated from the rest of the world. This parallel trend indicates that just as global trade deepened interdependence among economies, the expansion of foreign direct investment (FDI) further intensified cross-border linkages, amplifying the transmission of external shocks and the shared exposure of national economies to global fluctuations, see, e.g. in Figure 1.1. More recently, it has been seen how the COVID-19 pandemic that originated in a single country and then spread across the world could disrupt trade, investment, and financial stability worldwide. Such events highlight that uncertainty is no longer merely a domestic issue but a global one, requiring an analytical perspective that accounts for international spillovers.

As expected, global uncertainty has many sources. Financial crises, geopolitical tensions, trade disputes, health emergencies, and natural disasters can all trigger sharp increases in uncertainty. Each of these sources affects the world economy in different ways, but what makes them *global* is their tendency to spread across borders. A banking crisis in one country can reduce investor confidence in many others. A trade dispute between two large economies can disrupt supply chains around the world. Political instability in one region can raise the price of energy or other commodities, affecting countries far removed from the conflict. Even technological disruptions, such as the rapid spread of digital platforms

¹ The study has received more than 15,000 citations since its publication.

or artificial intelligence, can create uncertainty by altering labor markets, competitive dynamics, and the distribution of economic gains. In short, the global economy is subject to many overlapping sources of uncertainty that interact with one another in complex ways.

The relations of uncertainty and politics are in complex manner. On one hand, uncertainty makes policy less effective. Households may save rather than spend when stimulus measures are announced, and firms may hold back on investment even when interest rates are low. So, policymakers may find their actions have smaller or slower effects than expected. On the other hand, policy itself can be a source of uncertainty. When governments' practices are unbalanced, change policies abruptly, or fail to provide clear communication, it increases uncertainty rather than reduce it. International coordination is also important. In a globalized world, unilateral actions, such as sudden tariffs, sanctions, or capital controls, can create waves of uncertainty far beyond national borders. Effective policies must therefore be not only credible and consistent but also coordinated across countries to minimize unintended spillovers.

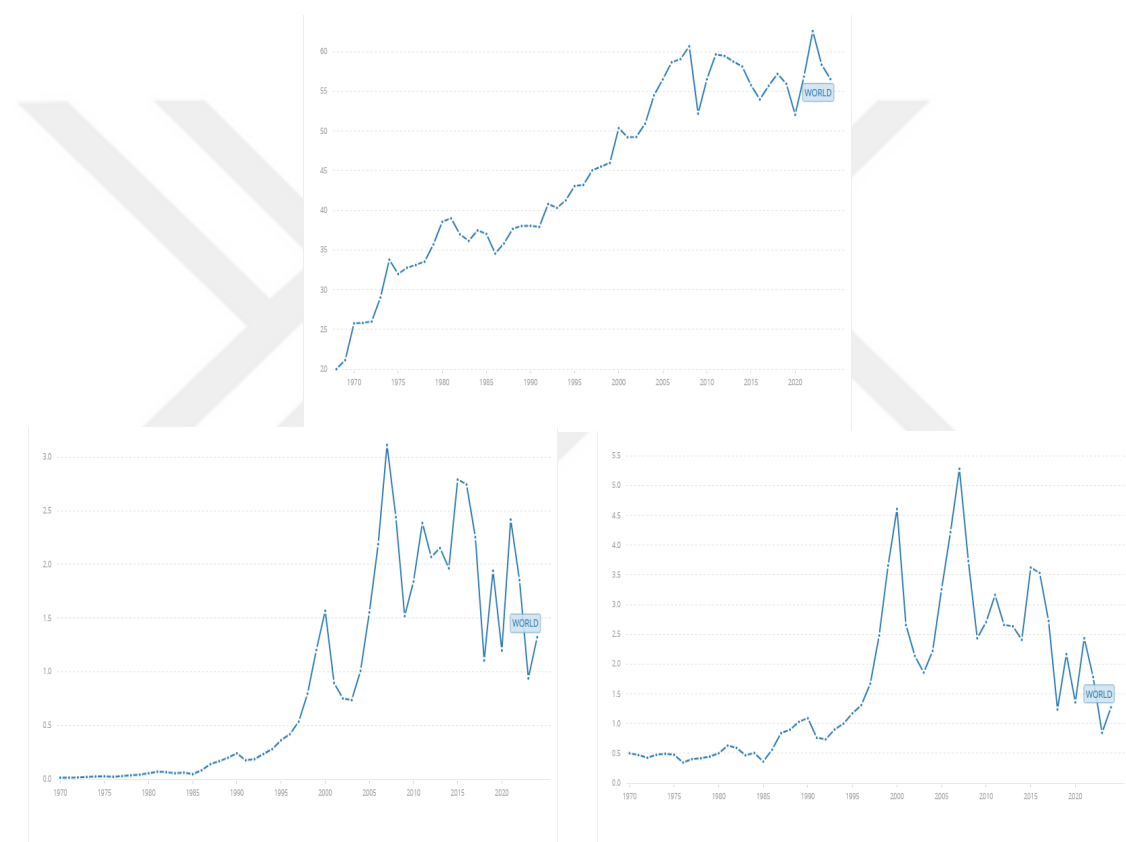
In addition to short-term or cyclical uncertainty, there are deeper structural uncertainties that will guide the global economy for the coming years. Rising temperatures, extreme weather events, and the transition to low-carbon energy systems create uncertainty about resource availability, agricultural productivity, and the costs of adjustment. Technological change, including automation, digitalization, and artificial intelligence, introduces uncertainty about the future of work, productivity growth, and inequality. Demographic shifts are also important. Aging populations in advanced economies raise questions about pensions, healthcare, and labor supply, while youth bulges in developing regions raise questions about employment opportunities and social stability. Geopolitical shifts add further uncertainty, as competition between major powers and changing alliances influence trade, investment, and global governance. These long-term uncertainties are not easily measured and cannot be resolved by short-term policies. These are the great importance in shaping the structure of the global economy.

A critical examination of the trend of global trade and net FDI in Figure 1.1 suggest that international trade increased rapidly and continuously from the 1970s until the Great Recession of 2008-9, transforming economies into structures that became increasingly influenced by developments beyond their domestic dynamics. Similarly, in the two

graphs below in the figure, a significant rise in the trajectory of FDI is observed from the mid-1990s onward, mirroring the pattern seen in trade. Taken together, it can be said that these trends in both international trade and investment flows have related to globalization and have had a significant impact on the increase in the number of research on uncertainty mentioned above.

Figure 1.1

Trade (% of GDP) and FDI, net inflows



Sources: World Bank WDI²

The channels through which global uncertainty influences economic outcomes are well established. Trade is one of the most direct mechanisms. When firms are uncertain about demand conditions or about the future of trade policy, they may reduce exports or imports.

² <https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS>
<https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD>
<https://data.worldbank.org/indicator/BX.KLT.DINV.WD.GD.ZS>

Another important channel is investment. Firms faced with high levels of uncertainty are reluctant to undertake large and irreversible projects. This is true not only at the domestic level but also for multinational corporations considering FDI. Portfolio investors, likewise, often withdraw funds from markets perceived as risky and move capital into low-risk precious metals like gold, or government bonds. This behavior can produce *sudden stops* in capital inflows to developing economies, leading to currency depreciation, higher borrowing costs, and sometimes financial crises.

Financial markets themselves are highly sensitive to global uncertainty. Increases in uncertainty typically raise stock market volatility, widen interest rate spreads, and intensify exchange-rate fluctuations. For countries that rely heavily on imports or exports, unstable exchange rates can be especially damaging, as they introduce additional unpredictability into pricing, revenues, and costs. The wealth effect also matters when asset prices decline due to uncertainty, households feel poorer and reduce consumption, which in turn lowers aggregate demand. Taken together, these transmission mechanisms show how global uncertainty can influence nearly every aspect of economic life, from trade and investment to financial stability and household spending.

Uncertainty has heterogeneous effects across countries because of differences in development levels. Developed countries often experience recessions or slower growth when uncertainty increases, but they usually possess stronger institutions and policy tools to manage the situation. Developing countries, by contrast, often face harsher effects. They are more dependent on external capital, and when uncertainty rises, investors frequently withdraw funds, leaving these countries with depreciating currencies and rising interest rates. Transition economies, which are still building market institutions and financial systems, may be even more vulnerable. For them, uncertainty often translates into sharp exchange-rate swings, loss of investor confidence, and disruptions to economic reforms.

The importance of studying uncertainty lies in its wide-ranging consequences. Uncertainty influences short-term behavior, such as household consumption and firm investment, but it also shapes long-term development paths. It explains why shocks spread so quickly across countries, why some economies are more resilient than others, and why confidence is such an important factor in economic performance. For researchers, global uncertainty provides a framework for linking domestic outcomes to

international dynamics. For policymakers, understanding uncertainty is essential for designing interventions that are credible, transparent, and effective in restoring confidence.

In conclusion, global uncertainty is not just a background condition but a central driver of modern economic outcomes. It arises from the interconnected nature of the modern economy, spreads through investment flows and financial markets, and produces asymmetric effects across countries. It complicates policy design, interacts with long-term structural changes, and raises questions about the future of globalization itself. As such, it deserves a central place in economic research and policymaking. Studying global uncertainty does not eliminate it, but it does help societies prepare for it, adapt to it, and reduce its most harmful consequences. In a world where shocks are frequent, unpredictable, and international in scope, the study of global uncertainty is not optional but necessary for understanding and managing the challenges of the twenty-first century.

This study assesses the relationship between global uncertainties and investment flows including trade across 27 countries, representing a diverse mix of advanced, emerging and transition economies from various geographical regions, including Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, France, Germany, Greece, Hong Kong SAR (China), India, Ireland, Italy, Japan, Mexico, the Netherlands, New Zealand, Poland, Russian Federation, Spain, Sweden, Türkiye, UK, and the US.

This study aims to contribute to relevant literature from 2005 to 2024 by analyzing the relationship between global uncertainties and investment flows covering selected countries using panel data analysis. The study consists of three chapters. First chapter gives the study's theoretical framework. Second chapter includes background of literature on the roles and effects of global uncertainties towards international trade, FDI and other economic activity. We explain the data and methodology in the third chapter and finally the empirical results of the study are evaluated in the conclusion section.

CHAPTER ONE

2 GLOBAL UNCERTAINTY

Uncertainty occupies a central and contested place in economic thought, influencing how individuals, firms, and governments make decisions under conditions of incomplete information. Traditionally distinguished from risk, uncertainty in economics refers to situations where the probability distribution of outcomes is unknown or unknowable. This concept was notably articulated by Knight, who emphasized that risk involves measurable probabilities, while uncertainty involves outcomes that cannot be expressed in such terms (Runde, 1998).

Even before Knight's formal treatment of uncertainty, Adam Smith's notion of the invisible hand can be interpreted to suggest that ambiguity-averse merchants tended to favor domestic markets, as they were perceived to be less risky and more predictable than foreign trade. This preference encouraging higher levels of spending, investment, employment, and overall economic activity at home. By concentrating their resources domestically, traders avoided the hazards of overseas commerce, such as storms at sea or pirate attacks (Brady, 2016).

John Maynard Keynes integrated uncertainty deeply into macroeconomic thought. Keynes (2022) viewed the economic future as fundamentally uncertain, particularly concerning investment and expectations. For him, probability could not be meaningfully assigned to many economic outcomes, leading to persistent liquidity preference and speculative behaviors. This concept of *animal spirits* highlighted psychological and institutional responses to uncertainty that shaped macroeconomic fluctuations.

Unlike models that assume rational agents with full access to information and probability functions, the Keynesian view suggests that economic behavior is driven by conventions, animal spirits, and shifting expectations. This makes uncertainty a critical concept for understanding investment decisions, financial markets, and macroeconomic fluctuations. In contemporary economics, particularly after the Great Recession of 2008-9, the distinction between risk and uncertainty has reemerged as a key consideration in both theory and policymaking.

In this chapter of the study, initially, was tried to be revealed the meaning and importance of the concept of uncertainty in the history of economic thought. Next, recent history has been the focus, and the factors affecting uncertainty, that is, the sources of uncertainty, were displayed. In doing so, theoretical and empirical evidence was presented. After showing the sources of uncertainty, economic and policy-related uncertainty was characterized as a contemporary approach and positioned inside a theoretical framework. Finally, attempts to quantify uncertainty and develop an index appropriate for statistical analysis were discussed in the literature.

2.1 Economic History of Uncertainty

Because individuals, businesses, and politicians frequently make decisions without knowing what the future holds, uncertainty is essential to economic research. Knight distinguished between uncertainty, where results cannot be measured or predicted, and risk, where probabilities can be computed (Runde, 1998). He clarified this further by classifying probability into three groups: a priori probability, which is derived from mathematical or logical reasoning; statistical probability, which is based on empirical observations where relative frequencies can be determined; and estimates, which are used when there is no shared basis and assigning probabilities is not feasible. While estimates convey true uncertainty in cases where classification or computation is impossible due to unique and incomparable circumstances, the first two types fall under risk because they deal with measurable consequences.

Even though knowledge is generally and inevitably ambiguous, Keynes offered a new theory of reasoned grounds for belief that included strategies to deal with the inconclusive character of arguments. Like Knight, Keynes distinguished uncertainty from the comprehension of risk by describing it as the lack of numerically definable probability. Understanding probability distributions, which can be determined either a priori or based on frequency distributions, is necessary for quantifiable risk; the greater the calculable volatility of mathematical expectation, the greater the risk. However, Keynes argued that the social and physical realms are organic, which restricts the application of quantified expectation (Dow, 2019).

Keynes conceptualized uncertainty as an inherent and ubiquitous condition influencing human behavior. He argued that individuals generally act because of rationality, but the

extent of action depends on the level of uncertainty, he suggested, does decision-making give way to inaction. A central element of Keynes's view is the weight of argument, the idea that the strength of a decision depends on how much and what kind of evidence support it. As Marsay (2016) explains, even while a theory may be supported by consistent evidence, this does not prove that is true; rather, a stronger evidential weight makes an action more appealing, even if that weight cannot be quantified.

The concept of uncertainty served as the foundation for Keynes's theory of money and interest. When it comes to long-term expectations—the term that applies to actual investment decisions—uncertainty is generally higher. Entrepreneurs rely on the customary opinions of experts and peers because the rationale and evidence supporting such expectations are inherently weak. They also believe that the present is a better guide than reason would truly support (Keynes, 2022). Liquidity preference and expected returns on capital, presuming that the amount of money does not change quickly, dictate the investment volume. Keynes blamed the "fetish of liquidity" for the stock market's short-term focus. As a result, the rate of interest is set in the money market rather than the market for loanable funds and is based on the level of confidence in expectations. The liquidity trap can be explained by most of the investors' confident view that interest rates can only rise (Keynes, 2022). Even when expectations are confidently held, they are invariably predicated on beliefs that can change over time and vary, as among investment groups. As a result, changes in the speculative demand for money might affect the interest rate and, consequently, actual spending intentions (Alada, 2015; Dow, 2019).

Keynesian uncertainty challenges the conventional economic approach by arguing that uncertainty is an intrinsic element of the economic system and critiques the mainstream's attempts to quantify uncertainty. Uncertainty isn't just a temporary state during crises but is a fundamental and ongoing feature of economic life. Therefore, it should be a central consideration in economic theory. It shapes the economic environment, and, in turn, the economic environment shapes uncertainty. This reflexive relationship is crucial. Changes in behavior, conventions, and institutions contribute to uncertainty. However, these same elements can also evolve to help society cope with and reduce uncertainty (Dow, 2013; Dow 2016).

The fluctuating character of the economy and nature is incompatible with measurable uncertainty. It is impossible to link economic occurrences to recurrent frequencies and set

distributions. Uncertainty results from the unavailability of information rather than from a lack of it. It is impossible to infer trustworthy future probabilities from historical data (Lawson, 1988).

Keynesian uncertainty is a form of reasoning and logical inference (Rotheim, 1988). He explains that some systems can be broken down into smaller parts and analyzed with probability methods, but social and economic systems are organic and cannot be reduced to their components. Economic events that are socially produced and historically specific are historical and open-ended rather than deterministic. Decisions are based on belief, trust, and convention.

Probability was initially understood as a logical instrument for making decisions in a rational way. But as time went on, it became clear that decisions are frequently made in real life with little information, making it impossible to calculate probabilities. In these circumstances, people rely on conventions, self-assurance, and inner impulses which referred to as *animal spirit*, rather than on measurable chances. This change demonstrate that economic life is non-ergodic, which means the future cannot be reduced to stable or repeatable patterns (Carvalho, 1988).

Palley (1993) contends that uncertainty allows fluctuations in investment and liquidity preferences, which makes aggregate demand unstable. Palley argues that expectations are socially formed and change over time, in contrast to rational expectations theory, which holds that all agents share a single true model. He also emphasizes that economic models do not merely describe the world but actively shape people's behavior, making uncertainty both an analytical issue and a matter of how knowledge interacts with expectations.

A more comprehensive paradigm, combining Post Keynesian and neoclassical perspectives on decision-making, in which financial organizations alternate between calculable risk and fundamental uncertainty depending on circumstances. This idea offers a more solid behavioral basis for comprehending the real workings of loan markets. She believes that loan behavior moves along a spectrum. In stable periods, it resembles probabilistic risk assessment, while during turbulence it is governed by norms, rules, and heuristics (Neal, 1996).

Conversely, challenging the ergodic/non-ergodic distinction as the primary basis for interpreting uncertainty and in favor of an epistemological emphasis on the boundaries of

human knowledge (O'Donnell, 2014). The critique is the ontological framing for being incoherent, noting that it obscures the role of learning, interpretation, and context in shaping decision-making. The argument reframes uncertainty as originating more from the limits of what can be known than from the reality by highlighting human capabilities and cognitive limits (O'Donnell, 2014; Rosser Jr., 2015).

Classical theory was built on the restrictive ergodic hypothesis, which assumed forecasts of the future could be drawn from past data (Davidson, 2015). Economic analysis can become more comprehensive and capture decision-making under uncertainty, such as investment driven by animal spirits by ignoring this assumption. The problem is not to declare all situations non-ergodic, but to ensure theoretical space for situations where certainty does not exist. Moreover, opposing views risk reinforcing laissez-faire positions by limiting the justification for active government intervention.

More recent contributions deepen these themes. The two ideas of probability and uncertainty are reexamined, with uncertainty being defined as situations in which probabilities essentially cannot be measures and probability being defined as framework for rational belief (Carabelli, 2023). In addition to offering a classification of uncertainty, Dequech (2023) urges discussion among many post-Keynesian perspectives rather than depending solely on one. The relation between these discussions and actual investment behavior is illustrated, revealing that institutional and societal factors influence real investment behavior whereas ergodic assumptions break down in the face of true uncertainty (Sen, 2020).

While the early literature focused on conceptual issues, the past two decades have seen an acceleration in attempts to operationalize uncertainty for empirical work. Media-based measures such as the Economic Policy Uncertainty (EPU) Index gauge the frequency of uncertainty-related terms connected to policy and the economy (Baker et al., 2013; 2016). With similar effort, World Uncertainty Index (WUI) has been developed using country reports published by Economic Intelligence Unit (EIU), the research and analysis branch of Economist Group, a British media company. The index provides long-run, cross country panel of uncertainty signals, including category-specific variants like trade policy uncertainty (Ahir et al., 2018; 2022). In parallel, Caldara and Iacoviello (2022) develop the Geopolitical Risk (GPR) index, which tracks new about adverse geopolitical events. These indices do not resolve the Knight-Keynes problem of non-quantifiability in

principle, but they offer consistent proxies that enable economists to study how uncertainty co-moves with investment, trade, and growth across countries and over time.

The concept of uncertainty climax in Keynes (2022) emphasized a deep, irreducible kind of uncertainty- not merely risk, where probabilities are known, but fundamental uncertainty where future outcomes are not quantifiable. This type of uncertainty is also called Knightian uncertainty. On the other hand, uncertainty is largely a phenomenon related to the future. Because the future is uncertain, investment decisions depend heavily on expectations which are often fragile and changeable. If we think at firm level, firms invest based on long-term expectations of profitability. When uncertainty rises, expectations become pessimistic, and investment fails. Keynes also argue that the role of animal spirit. To explain why people still act despite uncertainty, Keynes introduced the idea of animal spirit- non rational instincts, emotions, and confidence.

2.2 Drivers of Uncertainty

Due to the impact of capitalism's growing and intensifying crises, uncertainty has been the subject of an increasingly growing debate and research into its links with other economic variables and indicators since the last quarter of the 1800s. These links might be highly varied yet being often interrelated to one another because of the idea of uncertainty includes ambiguity or risk and has difficult to define (Baker et al., 2014; Davis, 2019). However, putting uncertainty at the core of this network of connections would not be incorrect. Economic crisis, financial instability, fiscal policy, volatility of macroeconomic variables including exchange rate and inflation, policy unpredictability, elections, geopolitical shocks, wars and regional conflicts, refugee crisis, pandemics, natural disasters and environmental changes, trade disputes, technological change, and institutional fragility are the elements of this structure that need to be defined. This review outlines the way in which economic theory and empirical study have addressed these origins and sources.

Macroeconomic and financial instability constitute key origins of uncertainty. Sudden fluctuations in aggregate variables such as Gross Domestic Product (GDP) growth, inflation, employment, and interest rates alter firms' and consumers' behavior. Research by Bloom (2014) demonstrates that spikes in macroeconomic uncertainty typically reduce investment and hiring. Downturns tend to amplify these effects, creating an asymmetric

pattern when recessions magnify the harm caused by uncertainty more than booms offset it. Similarly, financial volatility which means shifts in asset prices, credit availability, and liquidity, adds another layer of unpredictability. Indices such as the Volatility Index (VIX) are frequently employed to capture these dynamics (Bloom, 2009).

Policy unpredictability is another major source. Governments influence uncertainty through fiscal, monetary, and regulatory actions. Empirical studies indicate that high policy uncertainty increases the cost of capital, discourages investment, and complicates employment planning (Julio & Yook, 2012). These components may vary between regions and from country to country. In the US, newspapers tend to emphasize fiscal policy and entitlement programs, while studies of the Eurozone highlight fiscal, monetary, and regulatory, trade, and energy dimensions (Azqueta-Gavaldón et al., 2023). Policy uncertainty tends to intensify around elections, when partisan divides and shifting platforms increase ambiguity about future actions (Baker et al., 2020a).

Geopolitical shocks add another destabilizing element. The GPR index constructed by Caldara and Iacoviello (2022) captures how adverse trigger declines in trade, capital flight, and heightened risk aversion. Events such as BREXIT or the COVID-19 pandemic reveal how tightly coupled global system magnifies the impact of such shocks global uncertainty. Due to the rise of terrorist attacks, regional conflicts and wars after 1990, immigration has become one of the fundamental phenomena of today's world. Immigration has also been reframed as a source of uncertainty, with Donadelli et al. (2020) arguing that public anxieties and political debates around migration exert long-term macroeconomic effects, particularly in advanced economies.

Global supply shocks represent another pathway. Disruption in commodities and essential goods generate ripple effects across production and consumption. Studies show that oil price volatility, for instance, has country-specific effects on economic policy uncertainty. Wang et al. (2022) find differentiated responses across BRICS countries. While Chinese oil price heavily regulated by the state, shows delayed reactions, other economies experience immediate and pronounced uncertainty spillovers. In studies related to economic growth, regard less of the measure of uncertainty used, we find that fiscal deficits have a strong negative effect on per-capita income growth in cases of high uncertainty and no significant adverse effect in cases of low uncertainty (Goulas and Zervoyianni, 2013).

Policy uncertainty, particularly fiscal, monetary, and regulatory unpredictability, is a major concern for economic agents. Baker et al. (2016) developed the EPU Index, which quantifies policy-related uncertainty using media coverage, tax code expirations, and disagreement among forecasters. Policy uncertainty can reduce investment, increase the cost of capital, and affect firm-level hiring and production decisions (Julio & Yook, 2012). Regulatory uncertainty, especially in sectors like energy, health, and tech, influences long-term planning and innovation.

Financial uncertainty involves volatility in asset prices, credit availability, interest rates, and investor sentiment. Studies link financial crises to rapid spikes in uncertainty, particularly due to credit constraints and liquidity shortages (Bernanke, 1983). Stock market volatility, measured through indices like the VIX, is frequently used as a proxy for financial uncertainty (Bloom, 2009). Interactions between financial and macroeconomic uncertainty are especially prominent during systemic crises, as shown during the Great Recession of 2008-9 meltdown.

Uncertainty also arises from technological change and innovation, which affect industries unevenly and introduce unpredictability in productivity, competition, and labor markets. Schumpeterian theories emphasize creative destruction, where new technologies displace older firms, creating uncertainty in employment and market structures. R&D investment is highly sensitive to uncertainty about future returns, patent policies, and technological obsolescence (Baker et al. 2013). Weak or unstable institutions contribute to long-term uncertainty regarding contract enforcement, property rights, and policy continuity. Institutions shape the incentives and information available to economic agents, thus influencing uncertainty. Emerging and developing countries often experience higher levels of institutional uncertainty due to political instability, corruption, or lack of legal frameworks.

Exogenous crises provide stark illustrations of these drivers. The COVID-19 pandemic, as shown by Altig et al. (2020) and Baker et al. (2020b), has created an unprecedented surge in uncertainty, larger than the Great Recession of 2008-9 and similar in magnitude during the Great Depression. Pandemic-induced volatility reshaped expectations globally, combining health risks, economic contractions, and policy responses in a complex feedback loop.

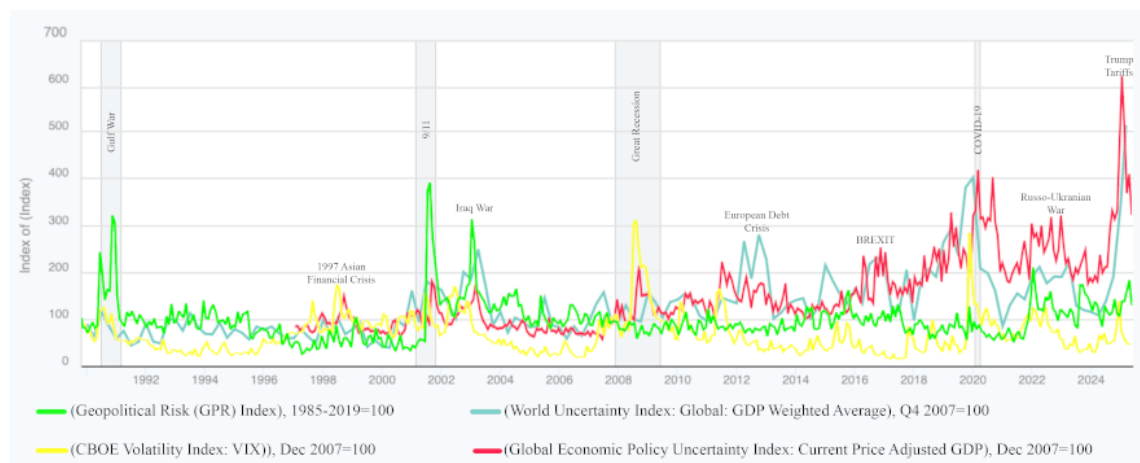
Taken together, these findings underscore that uncertainty is multi-dimensional and shaped by overlapping forces. Macroeconomic fluctuations, financial cycles, policy debates, geopolitical conflicts, technological change, and institutional design all contribute in distinct but interconnected ways. For policymakers and firms alike, the challenge lies not so much in eliminating uncertainty, as in recognizing its sources, anticipating its propagation channels, and designing strategies that enhance resilience in the face of shocks.

2.3 Measuring Uncertainty

Economic uncertainty stems from a wide array of sources—macroeconomic volatility, policy shifts, financial turbulence, global events, technological innovation, and institutional instability. Each of these sources interacts with others, creating a complex environment that shapes the behavior of firms, households, and governments. After the global economy becomes increasingly interconnected, understanding and measuring the effects of these sources of uncertainty has evolved substantially in the last thirty years.

Figure 2.1

Uncertain times



Sources: FRED³ and Caldara et al. (2022)⁴

³ <https://fred.stlouisfed.org/>

⁴ <https://www.matteoiacoviello.com/gpr.htm>

Figure 2.1 displays the evolution of the global uncertainty indices from 90s. As shown in the figure, each capture distinct yet interrelated dimensions of uncertainty, political, policy-related, and financial. Their synchronous spikes during major global events demonstrate how various forms of uncertainty increasingly overlap and amplify one another in an interconnected world economy. This convergence underscores that no single indicator fully encompasses the complexity of global uncertainty: while the VIX reacts to short-term financial turbulence, the WUI and EPU reflect more persistent institutional and informational ambiguity (Baker et al., 2016; Ahir et al., 2018), and the GPR measures exogenous geopolitical shocks (Caldara & Iacoviello, 2022). Together, these measures reveal a structural shift toward a regime of chronically elevated uncertainty, where shocks are transmitted rapidly across markets and borders, making the task of quantifying uncertainty both indispensable and inherently imperfect in global economic analysis.

First efforts to quantify uncertainty came from financial markets. Stock market volatility, particularly implied volatility from options prices, provided a timely and continuous signal of investor sentiment. This method was intuitively appealing because financial markets accumulate information rapidly and volatility in financial markets is consistent with shocks, crises, and recessions. Another early approach was based on disagreement in expectations. Surveys of professional forecasters were used to measure dispersion in forecasts of key macroeconomic variables such as GDP and inflation. High dispersion was interpreted as a sign of uncertainty (Barron & Stuerke, 1998).

A major methodological innovation came with the introduction of text-based indices. Baker et al. (2013, 2016) developed EPU, constructed from newspaper coverage of terms relating to the economy, policy, and uncertainty. This approach allowed researchers to systematically quantify how frequently uncertainty was discussed in public discourse, creating a new channel for capturing perceptions of unpredictability linked to politics, regulation, and institutions. The advantage of EPU measure lies in their timeliness, scalability, and interpretability. It can be constructed for all countries or regions, compared across time, and directly linked to political events. This makes EPU the most widely used uncertainty tool in policy and macroeconomic research.

While national measures proliferated, globalization required a cross-country perspective. Ahir et al. (2018, 2022) developed WUI using textual analysis EIU reports for over 140 countries. Covering the period since 1900s, the WUI provided the first globally

comparable uncertainty dataset. Unlike EPU, which is narrowly focused on policy, the WUI captured a broader mix of economic, political, and institutional sources of unpredictability.

Furthermore, there are policy-related and categorical uncertainty measures, too. Caldara and Iacoviello (2022) constructed a GPR index based on newspaper references to wars, conflicts, terrorism, and international tensions. Spanning over a century, the GPR index spiked during the two world wars, the Cuban Missile Crisis, the Gulf War, 9/11, 2014 Russo-Ukrainian conflict, and 2003 invasion of Iraq by US-led coalition and ongoing Middle Eastern conflicts.

2.3.1 Volatility Index (VIX)

The most prominent of early efforts to measure uncertainty in financial market was to define an index of volatility. The Chicago Board Options Exchange (CBOE) announced the VIX, which developed by Robert E. Whaley in 1993 (Whaley, 2009). The index derived from option prices once S&P 100 then S&P 500 Index, that captures US equity market-implied volatility over 30-day horizon. High index levels reflect investor anxiety about a likely stock market decline. The volatility of US dollar, the credit spread, the Federal Reserve Board (FED) rate deviation, and changes in oil prices do not appear to have a significant impact on the index (Fernandes et al., 2014). Consequently, VIX index as a proxy for economic uncertainty is viewed as a forward-looking measure that captures investor sentiment and reactions to unexpected shocks (Bloom, 2009).

2.3.2 Economic policy uncertainty (EPU)

The motivation created by the long-term effects of the great recession pushed us to create a new tool for econometric analysis to include policy instruments regarding future uncertainties. The first and big result of this motivation is to measure of EPU. To make this they developed a method. For this method, they determine 10 leading newspapers in the US and search the archives of each newspaper from 1985. They executively analyze articles containing terms related *economic, policy, and uncertainty*. And obtain an average value of 100 corresponding to the ratio of articles containing these terms in total number of articles (Baker et al., 2016; Davis, 2016).

The EPU, first measure for the US, was followed by the Global Economic Policy Uncertainty (GEPU) and country-based studies (Moore, 2017; Tobback, 2018; Davis et

al., 2019; Arbatli et al., 2022), which aim to reflect global uncertainty level. Moore (2017) constructs the first composite monthly index of economic uncertainty for Australia, extending back to 1986. Moore's index blends policy-related and broader economic uncertainty, making it more suitable for a small open economy where global shocks play a central role (Moore, 2017). Tobback et al. (2018), for instance, constructed a Belgian EPU using machine-learning methods to reduce misclassifications, showing superior predictive power compared to simple keyword approach. Specifically, the support vector machine derived index significantly improved forecast of sovereign bond yields, Credit Default Swap (CDS) spreads, and consumer confidence during periods of heightened risk. This demonstrates the potential of computational linguistics to refine uncertainty measures, tailoring them to specific institutional contexts.

2.3.3 World uncertainty index (WUI)

WUI is a novel measure of global uncertainty reflects the frequencies of the word *uncertainty* and its variant in EIU country reports and aggregates global signals, allowing analysis of spillover effects and contagion. WUI provides the first consistent, long-run, cross-country measure of uncertainty, thereby extending the scope of previous indices that were largely confined to developed countries. This index also is the first panel index of uncertainty. The index covers a large group of countries from different level of economic development and five continents, with a population greater than 2 million. Thus, index reflects not only advanced economies but also emerging economies and economies in transition (Ahir et al., 2018; 2022).

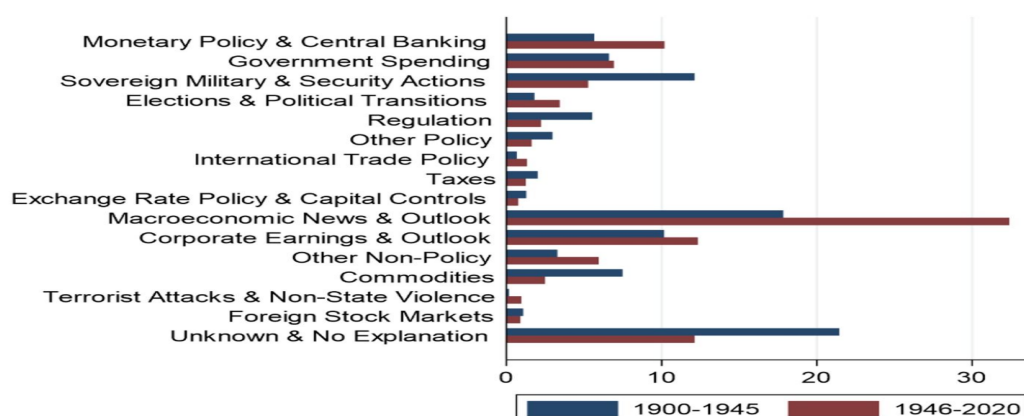
2.3.4 Policy-related uncertainty indices

Researchers have investigated the reasons and sources behind stock market jumps and tried to distinguish between government-controlled elements and macroeconomic news and outlook (Sammon et al., 2021). The figure presents the distribution of stock market spikes across various categories in US is shown in Figure 2.2. After post-World War II macroeconomic developments and monetary policy practices are by far the driving factor behind the jumps in global uncertainty. Although the VIX is an index reflecting financial markets, in this section we will examine indices has more political character. For example, Global Financial Uncertainty, which consider financial uncertainty shocks such as 1997 Asian crisis, European Sovereign Debt Crisis as peak (Caggiano & Castelnuovo, 2023), and aggregate macroeconomic and financial uncertainty measure (Carriero et al.,

2018). Or Mumtaz and Theodoridis (2017) defines uncertainty as the result of a combination of country-specific and common to all countries volatility in output, inflation, interest rates, and stock returns.

Figure 2.2

Distribution of jump reasons by era and category



Source: CEPR⁵

Similarly, in the study of measuring economic policy uncertainty (Baker et al., 2016), connected studies emerge the uncertainties of the sub-categories at specific headings with a similar effort and coordination. The one is Trade Policy Uncertainty (TPU) that arises from tariffs, sanctions, trade agreements, and protectionist measures. It is a subset of EPU but deserves separate attention because of the critical role of international trade plays in growth, supply chains, and investment. Global catastrophes such as BREXIT and ongoing US-China trade tension have demonstrated how sensitive trade uncertainty is to international crisis (Wu et al., 2025). Empirically, trade policy uncertainty has been linked to reduced international trade volumes, investment hesitation, and supply chain disruption. Handley and Limao (2017) showed that firms often delay market entry or expansion under uncertain tariff regimes. Recent US-China trade tension exemplifies how escalating tariff threats increase exchange rate volatility and discourage cross border FDI. Another policy related measurement is about monetary policy, monetary policy uncertainty reflects ambiguity about central bank actions regarding interest rates, inflation

⁵ <https://cepr.org/voxeu/columns/distinctive-character-policy-driven-stock-market-jumps>

target regime, or unconventional monetary policies (Caldara et al., 2020). It can emerge from unclear communication, political interference, or regime shifts. Bloom (2014) found that monetary policy surprises amplify financial market volatility, leading to risk-off behavior by investors. In emerging economies, credibility of central banks plays a critical role about unclear inflation targeting can lead to capital flight and exchange rate instability. Conversely, transparent forward guidance tends to reduce uncertainty and stabilize expectations.

The last index we mentioned that would examine is Climate Policy Uncertainty (CPU). Traditional categorical EPU indices focus on trade, monetary, or fiscal, but climate and environmental policies are increasingly important. Because firms and investors face carbon taxes, energy subsidies, environmental regulations, and international climate agreements. CPU can delay green investment, raise financing costs for carbon-intensive industries, and influence global capital allocation. Like EPU, researchers executively analyze articles containing terms related *climate, environmental policy, and uncertainty*.

2.3.5 Trade Policy Uncertainty

In addition to the work of Baker et al. (2016), Ahir et al. (2022) constructed a measure for trade policy uncertainty by counting the number of times uncertainty (or its variants) is mentioned, in proximity to a word related to trade, in the EIU country reports. Terms searched in the reports that may be related to trade: trade, tariff, protectionism, North American Free Trade Agreement (NAFTA), United Nations Conference on Trade and Development (UNCTAD), and World Trade Organization (WTO). The index is equally weighted average and scaled by total number of words and multiple by 100,000. On the other hand, the most widely used TPU indices developed by Caldara et al. (2020) that identifying and counting articles that mention trade-related terms such as tariffs, trade barrier, Uruguay round.

2.3.6 Geopolitical risk index (GPR)

Caldara and Iacoviello (2022) define geopolitical risk as the result of an escalation of terrorism, conflicts and political tensions that harms international relations, and introduce the GPR. To create GPR index using media coverage and the algorithm that calculates the percentage of articles discussing unfavorable geopolitical events in major US, UK, and Canadian newspapers, the GPR index, which reflects the disparate geographic imprint of significant geopolitical events, can be seen as a measure that is primarily

relevant from North American and British perspective, or as a measure that is relevant for large companies, investors, and policymakers.

2.3.7 Others

Following the work of Baker et al. (2013), interest in measuring uncertainty has grown, and uncertainty indices has become one of the dominant elements of econometric analysis. As a result of this interest, many different indices attempting to reflect uncertainty were published. In this section, we will discuss some of the more prominent indices.

One of the most interesting studies is called Twitter (recently X)-based uncertainty index. In 2021, Twitter launch archive of its tweets to academic researchers and a group of researcher search derivatives of ‘uncertainty’ keyword in English tweets and create an index. The method is like EPU and results also very similar. The intriguing aspect of this index is that, like household surveys, it is generated directly from household members’ view rather than specialists (Baker et al., 2021).

Another example from Dzielinski (2012) that introduced a novel uncertainty measure derived from Google Trends search volume indices. The approach is motivated by psychological findings that economic agents increase their efforts to search for information in response to uncertainty. By tracking queries such as *economy*, the index captures real-time investor attention and uncertainty. Unlike survey-based measures, search data reflect actions rather than statements, thereby reducing biases related to honestly or strategic misreporting. Compared to traditional financial measures such as the VIX, the search-based method showed strong correlations and predictive power for stock returns and volatility.

On the other hand, surveys provide subjective yet direct insight into perceived uncertainty and expectations and offer dispersion-based measures of forecast uncertainty. Lahiri and Sheng (2010) highlight forecast disagreement as a stand-in for in macroeconomic expectation uncertainty. Business sentiment surveys, such as those from the OECD or European Commission, include questions on future expectations, with response variance used to gauge uncertainty. These measures are useful for short-term assessments but can be sensitive to behavioral biases.

CHAPTER TWO

3 LITERATURE REVIEW

In the contemporary global economy, uncertainty has become a distinguishing feature of microeconomic and macroeconomic dynamics. External shocks spread across borders more quickly and intensely as economies become increasingly integrated. Unlike risk, which can be calculated and managed global uncertainty results from the unpredictability of political, financial, geopolitical, and technological events that influence economic expectations and decisions. It has wide-ranging and enduring consequences that affect long-term trends in growth, trade, and investment in addition to short-term stability.

There are several ways in which uncertainty impacts economic activity. Uncertainty about the future causes firms and investors to frequently postpone or cut back their commitments, which weakens capital formation, slows innovation, and lowers opportunity for employment. Effective policy formulation and execution are especially challenging for governments in unstable times, which can further damage monetary and fiscal environments. Economic development slows because of individuals and firms cutting down on spending, trade flows become more erratic, and FDI is restricted. Concurrently, currency rates and investment inflows become more unpredictable, which makes financial markets more volatile and makes downturns more severe.

The global dimension of uncertainty intensifies these challenges. Global instability can result from a disturbance that starts in one nation and spreads swiftly through trade relations, investment choices, and financial markets, such as economic crisis, geopolitical conflict, or epidemic. Developed, developing and transition economies are all sensitive to the shocks brought on by a highly linked global economy, even though the scope and severity of the consequences vary. This is why it's critical to look at how global uncertainty affects major economic indicators and variables. The sections that follow synthesize this literature by focusing on the role and impact of uncertainty. First, microeconomic indicators such as consumption, savings and housing; second, macroeconomic variables including economic growth, financial markets, international trade and FDI. Finally, the chapter also pays attention to how these dynamics differ across

country groups, recognizing that institutional and structural features condition the impact of uncertainty.

3.1 The Role of Global Uncertainties on Microeconomic Indicators

At the microeconomic level, uncertainty alters household savings and consumption and firms' investment behavior in ways that ripple through the broader economy. Several empirical studies (see Choudhry, 2003, 2018; Caldara & Iacoviello, 2022) document how shocks to volatility, policy, or geopolitics influence consumption, housing, and firm-level and sector-based decisions. Also, numerous research (see Kang & Ratti, 2013; Hailemariam et al., 2019; Zhang & Yan, 2020; Maquieira et al., 2023) has investigated how uncertainty affects subterranean resources and associated markets.

An essential microeconomic foundation for understanding firm behavior under uncertainty is provided in the study of entry and exit decisions with irreversible investment costs (Dixit, 1989). The analysis demonstrates that sunk costs lead firms to act more cautiously, as they place value on the option of waiting before making a commitment. By emphasizing the option value of delay, the study explains why firms often postpone irreversible decisions in uncertain environments. Because capital goods are expensive and challenging to resell, many investment decisions are irreversible. Consequently, as uncertainty increases, business often postpone allocating resources. Even after adjusting for other variables like stock returns or interest rates, investment decreases as uncertainty rises using forecaster disagreement as a measure of uncertainty (Ferderer, 1993).

A study on a comprehensive number of Greek firms shows that uncertainty negatively affects economic activity and investment, with the impact intensifying during crisis period (Panagiotidis & Printzis, 2020). The effect varies considerably across sectors and firm sizes, as small firms are more vulnerable, while larger firms display stronger protective mechanisms against uncertainty. Similar result as for consumers, there is a great deal of subjective uncertainty regarding the future direction of the social security system and how it will affect household behavior in Japan, according to survey-based statistics (Masayuki, 2017). Due to precautionary motives, household savings rise when social security and tax system are uncertain; this effect is more pronounced for low-

income households. Contrastingly, firms can withstand a certain amount of uncertainty, and as EPU rises, investment declines less in US market (Chen et al., 2019).

On a sectoral level, the correlation between oil prices and global uncertainties has changed over time (Hailemariam et al., 2019). Before the Great Recession of 2008-9, the relationship was negative, but following the crisis, oil prices put positive pressure on the global uncertainty. More generally, commodity prices, shaped by demand and supply shocks, fall steadily with declining economic activity (Bakas & Triantafyllou, 2020). Pandemic-induced uncertainty reduces commodity price volatility, which remains significantly lower for about a year, as uncertainty shifts from market fundamentals to the broader shock itself.

Although the relationship varies across different EPU indices and frequency ranges, US categorical EPU and crude oil returns are generally adversely correlated, with higher mutual effects during major crises (Zhang & Yan, 2020). Interestingly, economic policy uncertainty is greatly increased by oil-market demand shocks; however, shocks to the world's oil supply have little effect on the uncertainties surrounding economic policy (Kang & Ratti, 2013). Similarly, both GEPU and domestic EPU negatively affect stock returns, reflecting lower investment and higher capital cost among copper companies (Maquieira et al., 2023). Stock returns of copper firms show greater sensitivity to copper price movements when EPU is high, highlighting the impact of uncertainty on strategic metal markets.

Studies have also examined the differential effects of EPU and other global uncertainty measures on investment. Suh and Yang (2021) indicate that while EPU reduces investment, alternative uncertainty indices are linked to a positive investment response. Exogenous increases in uncertainty influence the economic decision in firm level in New Zealand (Kumar et al., 2023). When macroeconomic uncertainty rises, firms adjust by lowering prices, cutting employment, and reducing investment relative to their initial plans for the following six months. Although sales decline in higher uncertainty, firms increase advertising expenditures, reflecting the greater value of information within their industry. In contrast, firms facing elevated uncertainty are less inclined to adopt new technologies or expand facilities. The impact on wages is negligible, and the likelihood of developing new products remains unchanged. More, EPU provoke firm-level uncertainty (Kang et al., 2014).

Household savings especially precautionary, The Tian'anmen Square Movement in 1989 caused a significant political shock in China (Aaberge et al., 2017). The month when the political uncertainty shock ended saw a rise in the saving rate after accounting for seasonality. Households with higher incomes and more social advantages had greater growth in savings. It's interesting to note that a significant decrease in semi-durable consumption, such as apparel, and the frequency of significant durable adjustments are the only reasons for the savings gain. In the study involving labor market dynamics, when household savings rise in response to a rise in income uncertainty, household savings rise considerably (Giavazzi & McMahon, 2012). Either a household can grow its savings by working more or by consuming less; in other words, it can modify its labor supply by working part-time and boosting precautionary savings.

On the other hand, households with greater volatility in consumption are more responsive to uncertainty shocks, as these shocks heighten perceived risks and induce adjustments in spending behavior (Nam et al., 2021). By employing a linear ARDL model, the short-run effects of policy uncertainty on consumption can be identified for each G7 country (Bahmani-Oskooee & Nayeri, 2020). The results are asymmetric, country-specific and significant in the short-run for roughly half of the cases, whereas for far fewer countries in the long-run. Corporate cash reserves and tendency to hold cash, widely regarded as one of the most critical elements of financial policy, are significantly affected by policy uncertainty (Phan et al., 2019). The underlying mechanism of this positive association is explained primarily by firms' precautionary motives, complemented to a lesser extent by tendency to delay investment decision.

Using Johansen cointegration and error correction techniques, Choudhry (2003) conducts an empirical investigation of how stock market volatility affects US consumer spending across four real consumption categories: total expenditure, durable goods, non-durable goods, and services, from 1978 to 2000. The findings show that consumption and its drivers have a long-term equilibrium relationship. Volatility has notable but distinct effects on durable items, non-durables, and overall spending, whereas services have negligible influence. Error correction tests also show a unidirectional causal relationship between consumer spending and stock market volatility, but not the other way around. This suggests that volatility is a source of macroeconomic instability through channels of consumption. Thus, the work supports theories of precautionary behavior and the impacts

of income uncertainty by highlighting the complex role that stock market uncertainty plays in influencing consumption patterns.

There is a consistent correlation between listed corporations' assessments of geopolitical risks and the aggregate GPR index. Industries that are positively exposed to geopolitical risks suffer a decline in investment that is greater than the total impact of the dynamic effect of industry- and firm- specific geopolitical risk on firm-level investment (Caldara & Iacoviello, 2022).

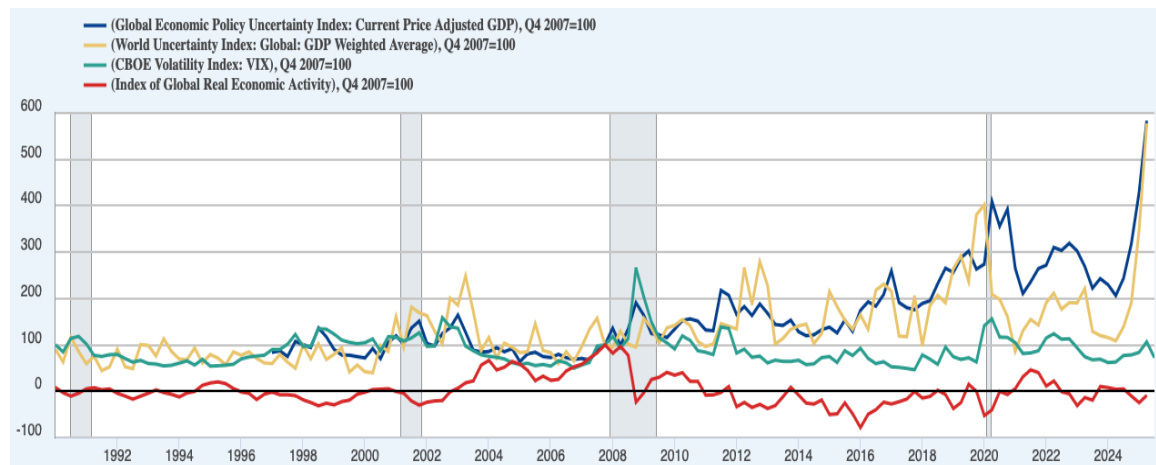
Economic uncertainty results from negativity during financial crisis periods, which reduces projections of future economic activity. Following the crisis, the Brexit campaign may have an impact on the UK property market by decreasing foreign investment and raising doubts about the future of EU citizens living in the UK. The property market in the UK was severely impacted by the global financial crisis that lasted from 2007 to 2010. Choudhry (2020) investigates the effects of EPU on house prices across ten regions of England and Wales and finds evidence of a stable long-run relationship between house prices, income, interest rates, and EPU in nine of the ten regions. Results show that EPU exerts a significant negative effect on house prices both in short and long run, with particularly strong evidence in southern regions like London and the Southwest. The findings highlight that policy uncertainty not only influences investment and credit conditions but also directly constrains housing demand, underscoring the vulnerability of regional housing markets to macroeconomic and political shocks.

3.2 The Role of Global Uncertainties on Macroeconomic Variables

In this section, at macroeconomic level, we will focus first how uncertainty transmits through exchange rates, inflation, output, employment dynamics, and interest rates, and shapes overall economic stability at macroeconomic level (see Caggiano et al., 2014; Krol, 2014; Choi & Loungani, 2015; Choi, 2017; Schaal, 2017; Caldara & Iacoviello, 2022). Then, as a separate title, we will provide an in-depth review of the literature on economic growth under uncertainty. This order will be followed by financial markets, international trade and FDI.

Figure 3.1

Economic activity and notable uncertainty indices



Source: Federal Reserve Bank of Dallas⁶

To further investigate how the relationship between uncertainty and economic activity globally, Figure 3.1 shows that jumps in uncertainty indices, particularly in times of crisis, coincide with jumps in global economic output. Furthermore, each jump appears to increase the size and impact of future jumps. As an example of times of crisis, some studies have triangulated the oil crisis of the 1970s and examined the impact of oil price fluctuations and the uncertainty created by these fluctuations on output. So, oil price uncertainty significantly negatively impacts global real economic activity (Jo, 2014). A study with similar objectives was conducted by Choi (2017) comparing 12 OECD small open economies with the US. The negative impact of uncertainty shocks on output in the US decreased with time but increased again under the zero lower bound. In contrast, the negative impact of uncertainty shocks on output has grown in small open economies, with different countries responding differently to inflation and exchange rates based on whether they are safe-haven or commodities exporting economies.

One of the most negative effects of the Great Recession of 2008-9 was unemployment, especially in the US. The unemployment rate, which was 5 % in Jan 2008, rose to 9.5 % in Jun 2009.⁷ It is demonstrated that if one ignores the fact that uncertainty shocks usually occur during recessions, their effect on unemployment is significantly understated. It is

⁶ <https://www.dallasfed.org/research/igrea>

⁷ <https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm>

also discovered that during economic downturns, inflation exhibits a stronger reaction. It's interesting to note that these shocks have a greater impact on the unemployment rate in the US than monetary policy shocks (Caggiano et al., 2014). On the contrary, Choi and Loungani (2015) shows the distinct character between unemployment and aggregate uncertainty.

Financial markets themselves are highly sensitive to global uncertainty. Increases in uncertainty typically raise stock market volatility, widen interest rate spreads, and intensify exchange-rate fluctuations. A weaker economy should have higher levels of political uncertainty; stocks should be more volatile and correlated when political uncertainty is higher; political uncertainty should command a premium for risk; and a weaker economy should have stronger effects of political uncertainty on volatility, correlation, and risk premia (Pástor & Veronesi, 2013). For countries that rely heavily on imports or exports, unstable exchange rates can be especially damaging, as they introduce additional unpredictability into pricing, revenues, and costs. The wealth effect also matters when asset prices decline due to uncertainty, households feel poorer and reduce consumption, which in turn lowers aggregate demand. Since EPU indicators tend to be mobile across countries, stock market participants are limited in their ability to alter government-related uncertainty both domestically and internationally (Ko & Lee, 2015).

Beckmann and Czudaj (2017) analyzed the US newspaper-based measures of uncertainty, economic, monetary, and fiscal policy uncertainty, against major currencies, the euro, Japanese yen, British pound sterling and Canadian dollar. In long-term, market participants' expectations seem to be shaped by the US policy uncertainty. The findings indicate that while medium- and long-term exchange rate projections show bias, short-term estimates are associated with current rates. Similarly, against uncertainties of different origin and types, gold prices are positively associated with exchange rate depreciation, serve as an effective hedge against inflation, and exhibit higher returns during periods of economic recessions (Chiang, 2022).

While domestic policy uncertainty predominantly affects developing markets, Krol (2014) offers empirical evidence that both domestic and the US-led EPU considerably enhance exchange rate volatility, especially for industrial economies during downturns. Though its impact is less pronounced than that of policy-related uncertainty, general economic uncertainty also increases volatility. These results demonstrate how policy-

related uncertainty is transferred into financial markets, implying that uncertain policy environments increase exchange rate volatility and consequently, may reduce investment and trade flows.

By using close elections as natural experiments, Redl (2020) offers cross-country data on the independent effect of macroeconomic uncertainty shocks. He creates financial and macroeconomic uncertainty indexes for eleven developed nations and demonstrates how uncertainty spikes surrounding important elections have a major negative impact on employment, investment, and GDP. Macro uncertainty shocks account for up to 20% of production variation at medium horizons, explaining a significant portion of cyclical swings in contrast to financial shocks, which are frequently less significant. The study's primary contribution is to broaden the scope of uncertainty analysis outside of the US and show that macroeconomic uncertainty plays a significant role in business cycle dynamics even in the absence of financial crises (Redl, 2020).

Spikes in GPR index causes long-term drops in investment, employment, and stock prices, according to VAR models used for the years 1985 to 2019. This fall in activity is caused by arising from geopolitical events. Furthermore, higher values of the GPR index are linked to forecasting lower GDP growth, and major risks to GDP growth, based on cross-country data and country-specific indices spanning more than 100 years (Caldara & Iacoviello, 2022).

Openness and exchange rate volatility are measured by Wu et al. (2025) that uses the ratio of total imports and exports to GDP, the ratio of financial account assets to GDP, and the volatility of the real effective exchange rate. TPU shocks have a greater effect on countries with low exchange rate volatility. This finding suggests that, even though prompt exchange rate adjustments may make them more volatile, they frequently raise import prices or make export goods more competitive in terms of price, which helps to partially offset the detrimental macroeconomic effects of trade uncertainty.

To a certain degree, openness can mitigate the adverse effect of TPU on the macroeconomy. In nations with strong economic openness, TPU has little effect, but in nations with low openness, it still shows up as a negative supply shock. The complex relationship between financial openness and trade uncertainty shocks is demonstrated by the fact that trade uncertainty is a negative supply-side shock that primarily affects nations

with low financial openness and can also lead to inflation in nations with high financial openness (Wu et al., 2025).

3.2.1 The role of global uncertainties on economic growth

The preceding part, we tried to show how global uncertainty and macroeconomic variables are related. However, we thought that economic growth needed its own section. This is since economic growth has been a central theme from the dawn of economic theory and is a notion that shapes and directs other economic variables. While the relationship between uncertainty and economic growth has been widely studied, with most findings (see Lensink et al. 1999; Baker & Bloom, 2013; Born & Pfeifer, 2014; Bhagat et al., 2016; Mandeya & Ho, 2021; Diakonova et al., 2023) pointing to a negative association, uncertainty increases the cost of decision-making, discourages long-term commitments, and weakens overall efficiency.

Early contributions by Lensink et al. (1999) demonstrated that uncertainty has a strong adverse influence on growth, particularly when linked to fiscal deficit, export conditions, and inflation. While monetary policy uncertainty based on inflation also shows some adverse effects, but it is less consistently significant compared to fiscal policy uncertainty. Uncertainty lowering overall efficiency along with predictable trade conditions. A later study by Lensink (2001) reinforced these findings, showing that policy uncertainty reduces per capita growth across countries. However, its impact is conditional on financial development. Economies with deeper and sophisticated financial systems can partially offset the growth-reducing effects of uncertainty. Regression results confirm that uncertainty related to both inflation and government spending significantly hampers growth, but the interaction with credit to the private sector mitigates these effects. Thus, growth performance improves when financial markets are better developed under the uncertainty. An interesting study in the literature examines the effects of the US, one of the main contributors of policy-related uncertainty, on Swedish economic activity. Regardless of how big or minor the US policy uncertainty shocks are, they have a considerable impact on Sweden's GDP growth (Stockhammar & Österholm, 2014).

In economies that have faced repeated political and economic crises, alongside high inflation, devaluations, and volatile growth, analyzing how uncertainty influences economic performance under both low and high levels of risk helps clarify the nature of this relationship across different macroeconomic settings (Aromí et al., 2022). The study

by Mandeya and Ho (2021) examines the effect of inflation and inflation uncertainty on South Africa's economic growth over 1961-2019 using an ARDL framework. The findings reveal that inflation exerts a consistently negative impact on growth in both the short and long run, while inflation uncertainty has only a short run adverse effect, aligning with the adaptive expectations view. Importantly, the adoption of inflation targeting in 2000 reduced the relevance of inflation uncertainty, leaving inflation as the primary growth-dampening factor. The results highlight that while inflation targeting successfully anchored expectations, sustained growth requires complementary policies beyond price stability.

In the post-COVID era, alongside the Russo-Ukrainian war, climate change-related uncertainty also influences the economic activity in the US, with all WUI indices demonstrating forecasting power for GDP growth (Liu & Gao, 2022). Diakonova et al. (2023) looked at how Russia's economic activity was affected by shocks connected to the conflict and policy uncertainty. GDP, the main measure of economic growth, is the idea of economic activity in their study. Using the Structural Vector Autoregression SVAR model, the study focuses on the August 2008 Russo-Georgian conflict, the 2014 Russo-Ukrainian war, and the second Chechen war. It finds that negative shocks to the chosen indicators result in economic slowdown, with a sustained decline in GDP growth and a brief but significant increase in country risk. From another perspective in the literature, following the path from terrorism to tourism and subsequently economic growth highlights a persistent long-run negative relationship between terrorism and tourism, with important implications for EPU (Ghosh, 2019).

3.2.2 The role of global uncertainties on financial markets

As a result of the global trend toward liberalization of capital movements, financial markets have become largely integrated. This is compounded by technological tools like blockchain and fintech, along with their financial impact. In this context, uncertainty plays a role, affecting asset prices, investor sentiment, and shaping credit conditions. Empirical findings (see Neal, 1996; Asongu et al., 2017; Karaman & Yıldırım-Karaman, 2019; Nguyen et al., 2020; Ahmed & Sarkodie, 2021; Chiang, 2022; Pellegrino et al., 2023) indicates that uncertainty shocks, both domestic and international, have a substantial impact on how banking systems, commodity markets, and safe-haven assets operate.

Frictions within the banking sector substantially magnify the adverse impact of uncertainty shocks on economic activity, while also prolonging their persistence beyond what would occur in the absence of such financial rigidities (Bonciani & van Roye, 2016). On the other hand, credit frictions can significantly amplify the response of real activity to uncertainty shocks, in some cases nearly doubling the impact (Caggiano et al., 2021). The adverse effects of uncertainty on the US labor market are strongly mediated through these financial frictions. Moreover, the interaction of financial uncertainty and credit supply shocks made a particularly pronounced contribution during the Great Recession of 2008-9.

Yıldırım-Karaman (2017) suggests that independent central banks help reduce the adverse effects of uncertainty shocks, and there is also some indication that higher levels of central bank transparency may provide a similar stabilizing influence. In less developed financial systems, uncertainty significantly reduces output, while in more advanced systems the effect is insignificant (Karaman & Yıldırım-Karaman, 2019). Higher financial development also lessens the contradiction of investment and consumption during periods of uncertainty.

In study among African countries, Asongu et al. (2017) find that while uncertainty in foreign capital flows does not significantly influence money supply, deposits, or overall financial size, it enhances banking efficiency and both banking and financial system activity, particularly when uncertainty is above average levels. These results suggest that instability in FDI inflows can stimulate domestic credit allocation and reduce surplus liquidity into a catalyst for stronger financial intermediation. The findings challenge the conventional view that financial development requires stability, showing instead that moderate uncertainty may strengthen financial market functions in developing economies.

According to Ahmed and Sarkodie (2021), the consequences of COVID-19 outcomes and EPU on commodities markets vary by regime and are more pronounced in situations of high volatility. Natural gas benefits from lockdown-driven domestic energy demand, but oil shows asymmetric reactions, declining with increased cases in stable regimes but increasing in chaotic ones. While silver has less potential for hedging, precious metals- particularly gold- prove to be efficient safe heavens in high volatility environments. In high volatility states, industrial and agricultural commodities like copper, steel, corn and

soybeans show positive returns, primarily due to supply chain disruptions and demand links for biofuels.

Nguyen et al. (2020) show that economic policy uncertainty exerts heterogeneous effects on bank credit growth across 22 economies. Their result indicates that higher levels of EPU, especially domestic, significantly reduce credit growth, while increases in the percentage change of both domestic and global EPU are associated with temporary expansions in lending, reflecting heightened risk-taking. The study finds supply-side factors, such as liquidity and profitability, amplify the negative effects of uncertainty, whereas large and well-capitalized banks are more resilient. Importantly, the negative effects are more pronounced in emerging economies, suggesting greater vulnerability of their banking systems to policy shocks.

3.2.3 The effect of global uncertainties on international trade

Uncertainty, particularly regarding trade policy, macroeconomic conditions, and geopolitical events has emerged as a powerful factor shaping international trade. It affects firms' decision to enter foreign market, invest in export capacity, and maintain global supply chains. The academic literature increasingly recognizes that trade volumes are sensitive to both domestic and global uncertainty shocks.

The channels through which global uncertainty influences economic outcomes are well established. Trade is one of the most direct mechanisms. When firms are uncertain about demand conditions or about the future of trade policy, they may reduce exports or imports. International contracts often require long-term commitments, and when the future is unclear, firms may prefer to delay them. The result is a slowdown in global trade volumes and disruptions to supply chains. Another important channel is investment. Firms faced with high levels of uncertainty are reluctant to undertake large and irreversible projects. This is true not only at the domestic level but also for multinational corporations considering FDI. Portfolio investors, likewise, often withdraw funds from markets perceived as risky and move capital into low-risk precious metals like gold, or government bonds. This behavior can produce *sudden stops* in capital inflows to developing economies, leading to currency depreciation, higher borrowing costs, and sometimes financial crises.

Trade disputes shape trade and welfare outcomes through TPU even before policies are enacted, as shown by the UK's 2016 BREXIT referendum (Graziano et al., 2024).

BREXIT-related uncertainty raised EU import prices and reduced welfare, with stronger effects in sectors more exposed to potential most-favoured-nation tariff increase.

Uncertainty reduces trade, with the effect robust across methods but varying by region and development level (Nana et al., 2025). Developing countries and emerging economies are especially vulnerable, and regional trade into Old World is considerably constrained. Multilateral commitments at the WTO help reduce trade policy uncertainty and encourage greater product entry by exporters. Evidence from Australia shows that firms delay entry when anticipating policy reversals, whereas tariff bindings enhance predictability and responsiveness (Handley, 2014). These results emphasize the credibility and importance of WTO commitments in securing stable market access.

The study of Abaidoo (2019) examines the relationship between EPU in major economic blocs and international trade, with the aim of assessing how global trade reflect the policies of dominant players in the world economy. ARDL results show that EPU from both the US and China affects global trade flows, with the US exerting a stronger constraining impact than China. Similar effort with sample of economies that carry out overwhelming majority of world trade, Tam (2018) shows that the US EPU significantly influences global trade flows, explaining not only its own trade shocks but also those of other economies, thereby reaffirming the US' central role in the world trading system.

Uncertainty unique to exporters makes a nation more isolated from the rest of the world, which results in less trade with its trading partners (Matzner et al., 2023). The EPU of the exporting and importing nations has a major influence on the amount of commerce and the likelihood of trading (Borojo et al., 2022). Nonetheless, the detrimental impact of exporters' EPU on extensive and intense margins is more noticeable than that of importer nations' EPU. As sunk export cost increase, the impact of uncertainty on trade and its margins becomes stronger, supporting the real options channel as the underlying mechanism (Greenland et al., 2019). This pattern also mitigates endogeneity concerns, since it cannot be easily explained by low demand expectations alone. Foreign suppliers are becoming more numerous and larger as trade costs decline (Gervais, 2018). The number of foreign suppliers rises as uncertainty rises, but their ideal size falls.

Exchange rate volatility has a strong impact on trade flows (Chowdhury, 1993), and this effect can be in either direction, however, depending on the position that traders take toward risk (Bahmani-Oskooee & Bolhassani, 2012). Exchange rate uncertainty causes

market participants to reduce their activities, change prices, or change demand and supply sources when they are risk averse in G7 countries (Chowdhury, 1993). Just as, Dell’Ariccia (1999) tests the connection between trade and exchange rate uncertainty using data from Western European countries. Several variables were included in the analysis as stand-ins for uncertainty, and the results were all consistent. Bilateral volatility was shown to have a little but noteworthy detrimental impact on trade. Taking simultaneity bias into account, time fixed effects and instrumental factors produced findings that supported the premise that exchange rate uncertainty had a detrimental influence on trade.

By demonstrating that, under some circumstances, global uncertainty can actually boost international trade, Baley et al. (2020) contradict the widely held belief that uncertainty always discourages trade. Their model shows that uncertainty increases the terms of trade's mean and variance, with the net effect relying on how substitutable the items are. Higher predicted trade returns offset the negative risk effect when items are less interchangeable, which increases exports. Through risk-sharing, the system works: in unstable internal conditions, governments export more to assure foreign consumption, making trade a useful kind of insurance. These results demonstrate how global uncertainty might encourage cross-border trade by promoting worldwide risk-sharing rather than acting as a barrier.

There has been an extensive literature on exchange rate uncertainty on trade flows after the failure of Bretton Woods and fixed exchange rate regime. Baum and Caglayan (2010) reveals an analysis about exchange rate uncertainty and bilateral trade flows which is not clear. When some models imply positive relationship, some has negative. But their study also shows that exchange rate uncertainty has an economically meaningful impact on the volatility of trade flows between developed and developing countries, 75 out of 81 samples. Handley and Limão’s (2015) study demonstrate that trade policy uncertainty acts as an implicit barrier to trade by discouraging firms from making costly, irreversible export and investment decisions. Using a dynamic model and Portuguese firm-level data, they show that firm entry into export markets substantially increased participation. Even when tariff levels are low, the unpredictability of future trade policy can deter internationalization.

3.2.4 The effect of global uncertainties on foreign direct investment (FDI)

The relationship between global uncertainty and international capital flows has been a recurring theme in recent literature, with a strong emphasis on FDI. Uncertainty, whether arising from economic policy shifts, geopolitical shocks, or systemic crisis, acts as a hidden cost for investors by raising risk premia, amplifying volatility, and delaying irreversible investment decisions (see Gulen & Ion, 2016; Schmidt & Zwick, 2015; Smith, 2021; Gao et al., 2024).

One of the main determinants of FDIs in literature is that institutional quality mediates the effects of policy uncertainty on capital flows (Julio & Yook, 2016). Strong institutions reduce investment delays during changes in government and increase a nation's appeal to foreign investors. Election-related FDI cycles are more noticeable in countries with weaker institutions but minor or nonexistent in those with strong institutions. A supporting result by examining the effects of interest rates both short and long run on emerging economies along with financial globalization, Byrne and Fiess (2016) notes the importance of financial openness and institutions rather than controlling capital movements.

Higher EPU dramatically lowers FDI inflows; this effect is especially noticeable in economies that are less developed financially (Choi et al., 2021). Uncertainty both the host and home countries serves as a barrier, and firms do not relocate their investments overseas when faced with increased domestic uncertainty, highlighting the widespread detrimental effects on FDI. For inward FDI, uncertainty is important, but the outcomes are not necessarily what was anticipated (Jardet et al., 2023). Differentiating between country groups more especially, advanced and emerging economies, and underdeveloped countries is also important. Moreover, rising internal uncertainty stemming from greater cultural distance between home and host countries leads firms to favor non-FDI over FDI entry modes (Erramilli & D'Souza, 1995). Interestingly, the findings also suggest that in high-risk environments, firms may sometimes opt for FDI rather than avoiding it, challenging conventional expectations.

During the Euro area sovereign debt crisis, Schmidt and Zwick (2015) documented extreme episodes of capital surges, stops, and retrenchments associated with rising uncertainty over fiscal sustainability and the stability of the monetary union. These factors discouraged foreign investors, reinforced home bias, and worsened financial instability

among member states. Turning to the Chinese context, Gao et al. (2024) provide micro-level evidence which confirms the sensitivity of FDI to uncertainty. Using a data from 264 cities between 2005 and 2014, rising EPU significantly reduces inward FDI, especially in regions with stronger financial development, higher industrial production, and greater marketization.

There is a causal relation with the EPU and the flow of FDI (Hsieh et al., 2019). Both the host nations' EPU indices and the EPU index have an impact on the outflow of FDI from the home nations. Specifically, the amount of overseas investment made by domestic multinational enterprises shows a spike when the degree of policy uncertainty in the US rises. FDI inflows decline in countries with elevated economic policy uncertainty, WUI used (Nguyen & Lee, 2021). While stronger financial market development tends to attract greater FDI, domestic uncertainty continues to act as a deterrent, offsetting some of the benefits of financial depth. Domestic EPU reduces FDI inflows, whereas GEPU exerts a positive effect (Canh et al., 2019). When both rise simultaneously, only global uncertainty maintains a significant positive influence, regardless of domestic conditions.

Moreover, the impact became more pronounced after the Great Recession of 2008-9, suggesting that foreign investors became more cautious in response to systemic shocks. Their open economy model shows that EPU negatively affects FDI both through reduced demand in production markets and increased financing costs (Gao et al., 2024). Expanding the scope to global capital markets, Agoraki et al. (2024) examine the effects of multiple dimensions of uncertainty, EPU, GPR, WUI. While GPR consistently depressed equity and bond fund flows, EPU primarily reduces equity flows, and WUI triggers a flight-to-safety toward active bond funds. Importantly, global uncertainties exert a stronger influence than country-specific factors, reinforcing the systemic nature of modern capital market responses. Furthermore, emerging economies appear particularly vulnerable, as adverse effects of geopolitical shocks on equity flows are more pronounced compared to advanced economies.

Even mature financial systems in advanced economies are not immune to global uncertainty shocks. Smith (2021) analyzing the French economy and found that both global and domestic uncertainty reduces FDI inflows and financial development, with the COVID-19 pandemic amplifying these effects. Liquidity constraints and solvency concerns played a key role in curtailing foreign investment. On the other hand, Meinen

and Roehle (2017) compared different uncertainty measures across the euro area, finding that macroeconomic uncertainty indices better explain investment behavior than EPU or stock market volatility. Interestingly, Suh and Yang (2021) note that while EPU tends to reduce investment, other non-EPU measures sometimes show a positive association with firm-level activity, underscoring the complexity of measurement. The distinction arises from the construction of the measures. While the EPU index is based on the frequency of uncertainty-related terminology in newspapers, alternative measures capture variability derived from statistical data. This methodological difference largely explains the divergence in their impact on investment.

3.3 The Effect of Global Uncertainties on Various Country Groups⁸

Uncertainty has heterogeneous effects across countries because of differences in development levels. Developed countries often experience recessions or slower growth when uncertainty increases, but they usually possess stronger institutions and policy tools to manage the situation. Central banks in these countries can lower interest rates, provide liquidity, or adopt unconventional measures such as quantitative easing. Fiscal authorities may implement large stimulus packages. Developing countries, by contrast, often face harsher effects. They are more dependent on external capital, and when uncertainty rises, investors frequently withdraw funds, leaving these countries with depreciating currencies and rising interest rates. Many developing economies also have less room for fiscal or monetary stimulus, which limits their ability to respond effectively. Transition economies, which are still building market institutions and financial systems, may be even more vulnerable. For them, uncertainty often translates into sharp exchange-rate swings, loss of investor confidence, and disruptions to economic reforms.

Over the past decade, research (see Carrière-Swallow & Céspedes, 2013; Kumar et al., 2021) has shown that uncertainty effects developed and developing countries in different ways, reflecting variations in structural characteristics, institutional settings, and channels of transmission. In advanced economies, such as the US, the Eurozone, and Japan uncertainty shocks are often interpreted as demand-side disturbance and short-lived but powerful. It quickly spreads through financial markets and global trade networks,

⁸ The source used for country classification is: <https://tinyurl.com/maep52np>

producing sharp declines in investment, output, and exports. For example, BREXIT-related trade policy uncertainty reduced UK export participation, particularly in industries with high sunk costs (Graziano et al., 2018). Evidence from the US shows that firms often delay hiring and investment when uncertainty rises, producing output contractions through precautionary saving and real-option effects (Kumar et al., 2021). In addition, financial markets in advanced economies display heightened sensitivity to policy and market volatility, as uncertainty depresses stock returns in Spain both in the short and long run (Sánchez-Gabarré, 2020). Because of their deeper financial integration, these economies tend to experience contractionary outcomes when global uncertainty shocks spread through capital markets and investor expectations (Kang et al., 2020).

By contrast, developing and emerging economies face more complex and higher baseline levels of uncertainty and more persistent effects. Uncertainty shocks in these economies often interact with supply-side vulnerabilities and lead to larger contractions in output, investment, and trade, and the recessionary effect is more pronounced in emerging economies than in advanced economies (Miescu, 2023). Global economic policy uncertainty is also strongly linked to stock market volatility across emerging economies, volatility spillovers are relatively stronger in South Africa, Mexico, and South Korea, while they are weaker in Brazil and Turkey (Yu et al., 2021). Research on BRICS countries further suggest that global policy uncertainty weakens the positive relationship between the financial sector and economic growth, with South Africa being especially vulnerable (Asafo-Adjei et al., 2021). This indicates that emerging markets are more exposed to external shocks and experience amplified instability in financial channels and capital flows (Apaitan et al., 2022).

Transition economies face an additional dimension of uncertainty linked to institutional fragility and political instability. Sušjan and Redek (2008) developed an index of transition-specific uncertainty and found a consistently negative association between high uncertainty and growth across Central and Eastern Europe. Institutional change, weak legal frameworks, and political volatility amplified uncertainty and slowed growth during the transition period. At the same time, Bahmani-Oskooee et al. (2013) showed that while monetary and economic uncertainty in transition economies can destabilize money demand, in most cases the effects are temporary, and monetary targeting can still function

effectively. Nonetheless, long-term growth performance remains constrained by the persistence of institutional uncertainty.

Zhang et al. (2018) analyze the recent China-US trade conflict effect global economy with China's great contribution to global economic production, conflict start in 2018 and impose %25 tariffs with initiation by the US, then China respond similar tariffs on the US products. Conflicts that is more likely to be driven by political incentives between these two key economic powers can cause greater global uncertainty with no benefits to either party. Their paper focus on impacts of EPU of China and US on several major international markets. China's EPU increased before Great Recession of 2008-9 but decline significantly during post-crisis period. The US EPU index dominated all aspect affecting four global markets. With Granger causality method, other three market affecting both China and the US EPU movements.

When comparing across country groups, three patterns stand out. First, uncertainty is higher in developing countries but more synchronized across developed ones. Second, uncertainty mainly operates through financial channels and trade disruptions in developed countries, while in developing countries it is magnified by fragile financial systems, currency risks, and institutional weakness. Third, long-term consequences are more severe in developing countries, as uncertainty not only reduced trade and investment but also undermines structural development by discouraging export diversification and FDI inflows.

CHAPTER THREE

4 EMPIRICAL ANALYSIS: PANEL CAUSALITY BETWEEN GLOBAL UNCERTAINTIES ON INTERNATIONAL TRADE AND INVESTMENT FLOWS

This chapter presents a rigorous empirical investigation into the causal dynamics between global uncertainty indicators and key macroeconomic variables governing international trade and investment. Employing a Panel Granger Causality framework, the analysis tests the predictive power of lagged values of uncertainty indices on contemporary movements in trade openness and FDI flows across a broad panel of countries. The findings provide critical insights into the directional influence of uncertainty on global economic integration.

4.1 Data and Sample Selection

4.1.1 Data

The empirical analysis is conducted using a balanced panel dataset constructed from multiple sources. The primary data source is the World Bank's World Development Indicators (WDI), supplemented by specialized indices measuring global uncertainty. The variables utilized in this study are as follows:

- **Trade Openness (Open):** Measured as the sum of exports and imports of goods and services as a percentage of a country's GDP. This variable, sourced from the WDI, serves as a proxy for a country's integration into the global trading system (Dollar & Kraay, 2004). A higher value indicates a greater reliance on international trade.
- **Foreign Direct Investment (FDI):** Two measures are employed:
 - **Net FDI Inflows (FDINI_current):** The net inflow of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor, expressed in current US dollars.

- **Net FDI Inflows (% of GDP) (FDINI/GDP):** The net inflows normalized by GDP. This measure controls for economic size and is the primary variable for causality testing to ensure stationary (see Section 3.1.4).
- **Economic Policy Uncertainty Index (EPU):** Developed by Baker et al. (2016), this index measures policy-related economic uncertainty based on newspaper coverage frequency. It captures the frequency of articles containing terms related to the economy, uncertainty, and policy.
- **World Uncertainty Index (WUI):** This index, developed by Ahir et al. (2018), quantifies uncertainty based on the frequency of the word "uncertainty" (or its variants) in the EIU country reports. It provides a country-specific measure of perceived economic and political uncertainty.

Table 4.1 gives the summary of the variable definitions.

Table 4.1

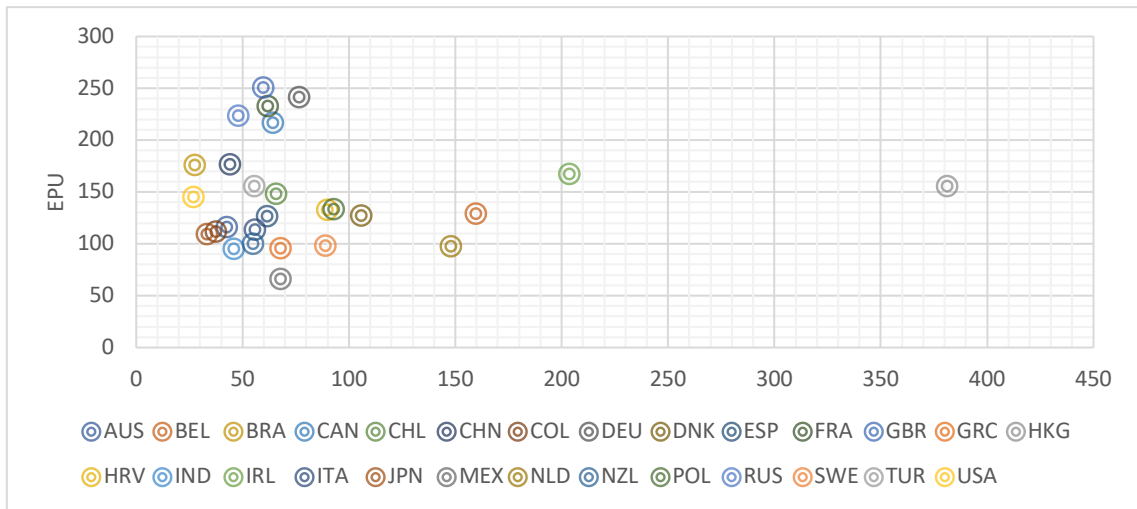
Variable Definitions

Variable name	Symbol	Data Source
Trade openness calculated as (Exports + Imports)/GDP. (%)	Open	World Bank WDI
Foreign Direct Investment, net inflows as a percentage of GDP.	FDINI/GDP	World Bank WDI
Foreign Direct Investment, net inflows.	FDINI_current	World Bank WDI
Economic Policy Uncertainty Index. A higher index indicates higher policy uncertainty.	EPU	Baker et al. (2016)
World Uncertainty Index. A higher index indicates higher global uncertainty.	WUI	Ahir et al. (2018)

The link between the variables of our analysis, trade openness, net FDI inflows, and net FDI inflows as a percentage of GDP and EPU is depicted in Figure 4.1, 4.2 and 4.3. Trade and investment variables lie on the X-axis, while Y-axis showing values of the EPU index, annually. The average function was used to convert the EPU index published at daily and monthly frequencies to annual frequency.

Figure 4.1

A scatter plot of EPU and Trade Openness

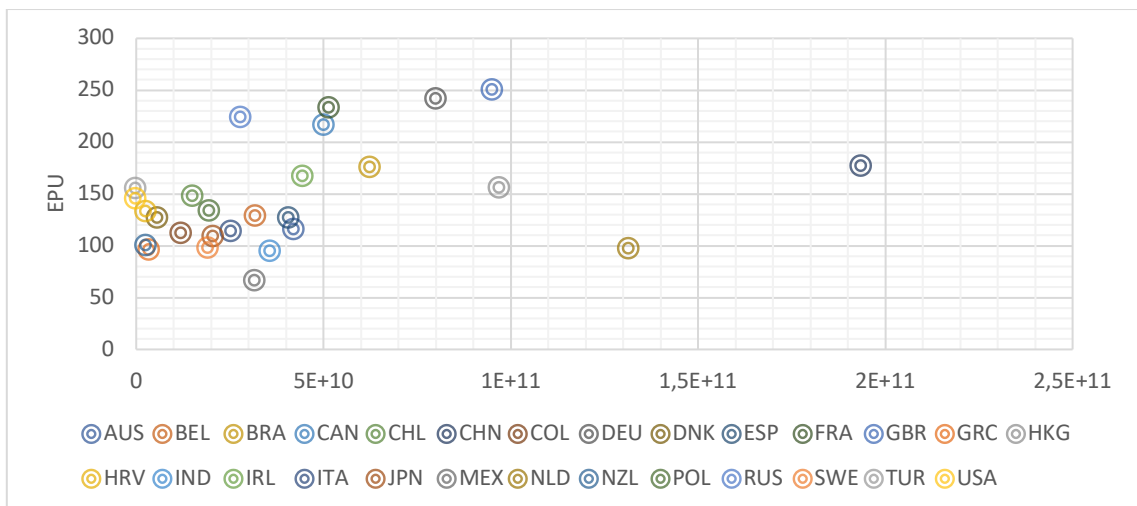


Source: Author.

Thus, each dot represents an observation of EPU for a given country at average of years in analysis' time periods. Additionally, since each different color represent a different country.

Figure 4.2

A scatter plot of EPU and net FDI



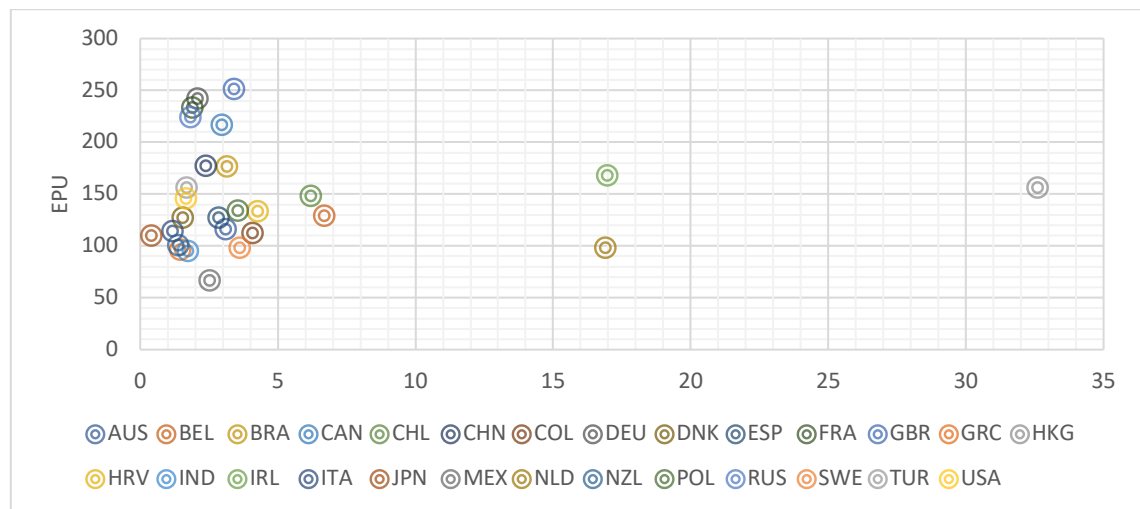
Source: Author.

Similarly in Figure 4.4, 4.5 and 4.6, the link between the variables of our analysis, trade openness, net FDI inflows, and net FDI inflows as a percentage of GDP and WUI is

depicted this time. Developed countries such as Japan and US consistently show higher absolute values of uncertainty over time, reflecting structural drivers, compared to peers but also systematic tracking of global cycles. More distinctive spikes are seen in developing countries particularly Brazil, China, India, Mexico, and Türkiye, indicating that uncertainty is fueled by domestic political shocks.

Figure 4.3

A scatter plot of EPU and net FDI normalized by GDP

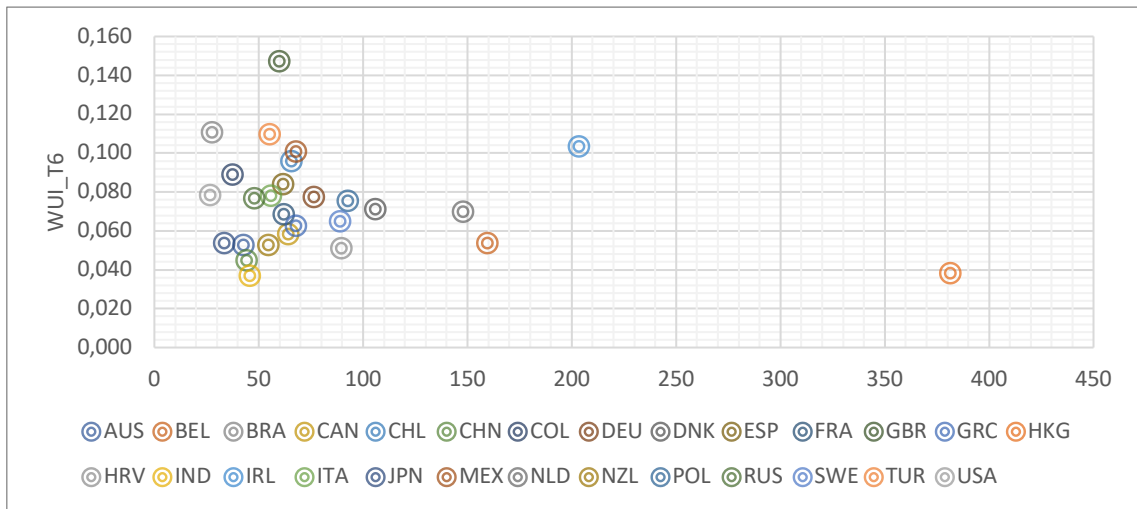


Source: Author.

This illustrates how susceptible institutions are to shocks. European countries, France, Germany, Italy, Spain, and UK show moderate EPU, except for situations like Brexit. On the contrary, relatively isolated countries, for example, Nordic countries and New Zealand has with very few spikes and indicates relatively stable policy environment with lower recorded EPU intensity.

Figure 4.4

A scatter plot of WUI and Trade Openness

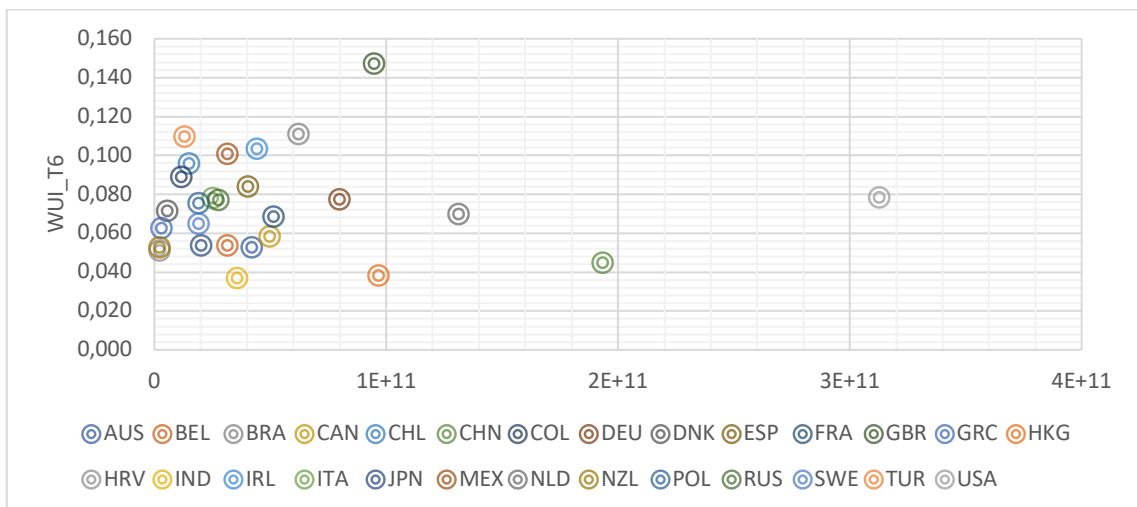


Source: Author.

Again, the average function was used to convert the quarterly WUI index to annual frequency. Thus, each dot represents an observation of WUI for a given country at average of years in analysis' time periods. Additionally, since each different color represent a different country and we used 27 countries in our analysis, there are 27 different colored dots in charts.

Figure 4.5

A scatter plot of WUI and net FDI

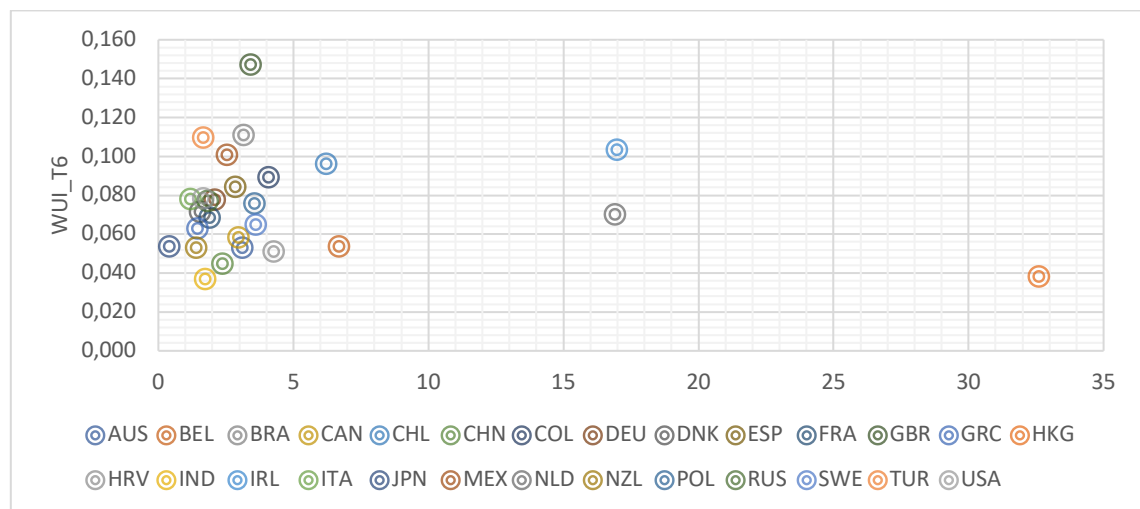


Source: Author.

The results are similar to EPU in terms of trade openness. WUI is higher in developed countries with more globally integrated media coverage and political visibility. Opposed to, developing countries show lower baseline levels but distinctive spikes during crisis times. On the other hand, small open economies like Hong Kong, sits far right of the graph not due to unusually high uncertainty, but because of exceptional high openness and scale effects of GDP.

Figure 4.6

A scatter plot of WUI and net FDI normalized by GDP



Source: Author.

The interesting thing is no clear linear relationship with net inflows. Which means high WUI does not always reduce FDI inflows immediately. Because of their scale and resilience, large economies continue to draw in capital flows in spite of uncertainty. Small open economies like Ireland, or financial hubs like Hong Kong show very high FDI to GDP ratios when larger economies absorb uncertainty shocks more easily because net inflows are small relative to GDP.

4.1.2 Selection of sample

The initial sample encompasses 27 countries, representing a diverse mix of advanced, emerging, and transition economies from various geographical regions, including Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, France, Germany, Greece, Hong Kong SAR (China), India, Ireland, Italy, Japan, Mexico, the Netherlands, New Zealand, Poland, Russian Federation, Spain, Sweden, Türkiye, the

United Kingdom, and the United States. This section aims to provide a comprehensive global perspective on the interplay between uncertainty and economic flows.

4.1.3 Time period

The study utilizes annual data spanning a 20-year period from 2005 to 2024. This timeframe is strategically chosen as it encompasses multiple signification periods of global uncertainty, including the aftermath of the Great Recession of 2008-9, the European Sovereign Debt Crisis (2010-2012), various geopolitical tensions, the COVID-19 pandemic (2020-2021), and subsequent recovery and inflationary periods. This allows for the analysis of relationships across different economic cycles.

4.1.4 Preliminary analysis

Table 4.2 respectively give descriptive statistics and correlation analysis of the variables used in the study.

Table 4.2

Descriptive statistics and correlation analysis

Panel A: Variable descriptive statistics						
Statistic	Open	FDI_current	FDINI/GDP	FDINI_current	WUI	EPU
N	538	539	540	540	540	526
Mean	84.52	1.10e+09	4.93	5.45e+10	0.07	146.56
Std Dev	72.02	5.90e+10	10.11	9.18e+10	0.05	88.26
Min	22.11	-3.45e+11	-30.78	-3.09e+09	0.00e+00	27.00
25%	46.85	-1.55e+10	1.37	9.38e+09	0.04	92.81
Median	62.40	-2.66e+09	2.49	2.87e+10	0.06	124.84
75%	88.83	1.75e+10	4.23	6.24e+10	0.10	174.01
Max	442.62	2.18e+11	85.98	7.34e+11	0.36	739.67
Panel B: Correlation matrix						
	Open	FDI_current	FDINI/GDP	FDINI_current	WUI	EPU
Open	1.000	-0.018	0.598	-0.000	-0.074	0.018
FDI_current	-0.018	1.000	-0.089	-0.215	-0.113	-0.004
FDINI/GDP	0.598	-0.089	1.000	0.495	-0.113	-0.069
FDINI_current	-0.000	-0.215	0.495	1.000	-0.034	0.055
WUI	-0.074	-0.113	-0.113	-0.034	1.000	0.362
EPU	0.018	-0.004	-0.069	0.055	0.362	1.000

Source: Author's calculations.

The descriptive statistics reveal notable characteristics of the key variables. Trade openness (Open) exhibits a mean value of 72.7% of GDP, yet the substantial standard deviation of approximately 60 indicates considerable cross-country heterogeneity, encompassing both highly open and relatively closed economies. Similarly, the FDI variables are characterized by pronounced volatility, as evidenced by standard deviations that are large relative to their means. This pattern suggests the presence of significant outliers, likely attributable to extreme inflows in global financial hubs and substantial outflows from major capital-exporting nations.

The uncertainty indices also display distinct distributions. The WUI demonstrates a considerably wider range (51 to 502) compared to the EPU (68 to 203), consistent with its design to capture a broader set of global shocks and crises. Furthermore, while the median EPU value (118) closely aligns with its mean, indicating a roughly symmetric distribution, the median WUI is lower than its mean, implying a right-skewed distribution. This skewness suggests that while most observations cluster at lower levels of global uncertainty, the series is punctuated by infrequent but extreme events that significantly elevate the mean.

The three measures of FDI exhibit strong positive intercorrelations, as anticipated. Consistent with established economic theory, which posits that liberalized trade regimes attract greater foreign capital, trade openness shows a modest positive association with the inflow-based FDI measures (FDINI/GDP and FDINI_current). Furthermore, a significant positive correlation is observed between the WUI and the EPU ($r = 0.656$), suggesting these indices, while distinct, often co-move and may capture complementary facets of a broader uncertainty environment. In contrast, the correlations between these uncertainty indices and the economic flow variables (Open, FDI) are negligible and statistically insignificant. However, this absence of a linear relationship does not preclude a more complex dynamic; the underlying interaction may be characterized by non-linearities or temporal lags that are not captured by a simple correlation coefficient.

4.2 Methodology and Empirical Findings

4.2.1 Empirical methodology: Panel causality

The methodological approach of this study employs the panel causality test developed by Dumitrescu and Hurlin (2012) to investigate potential causal linkages among FDI, trade openness, and economic growth. Prior to implementing this procedure, the analysis begins by testing for cross-sectional dependence across the countries within the panel. This diagnostic step is conducted using three established tests: the Lagrange Multiplier test by Breusch and Pagan (1980), the Cross-sectional Dependence (CD) test advanced by Pesaran (2004), and the Bias-Adjusted LM test introduced by Pesaran et al. (2008).

Upon confirmation of significant cross-sectional dependence, the analysis proceeds to examine the stationarity properties of the variables. For this purpose, a second-generation panel unit root test, the Cross-Sectionally Augmented IPS (CIPS) test by Pesaran (2007), is utilized, as it remains robust under conditions of cross-sectional correlation.

Finally, the Dumitrescu-Hurlin (D-H) heterogeneity-robust causality test is applied. This method represents an advancement over traditional homogenous Granger causality tests by allowing all coefficients to be heterogeneous across cross-sectional units. A key advantage of the D-H test is its applicability in panels characterized by cross-sectional dependence, heterogeneity, and whether the time dimension (T) is smaller or larger than the number of cross-sections (N). It is also suitable for unbalanced panels. The test is grounded in the estimation of the following heterogeneous model:

The test examines the null hypothesis (H_0) of Homogeneous Non-Causality (HNC), that there is no relationship from variable X to variable Y for any cross-sectional unit. The alternative hypothesis (H_1) is that a causal relationship exists for *at least one* unit in the panel.

The procedure involves estimating individual Granger causality regression for each country i :

$$y_{it} = \alpha_i + \sum_{k=1}^L \gamma_i^k y_{it-k} + \sum_{k=1}^L \beta_i^k x_{it-k} + \varepsilon_{it} \quad , i=1, 2, \dots, N; t=1, 2, \dots, T$$

Where α_i , $\gamma_i^{(k)}$ and $\beta_i^{(k)}$ represents respectively constant term, lag parameter and coefficient slope. The null and alternative hypothesis are below:

$$H_0 : \beta_i = 0, \quad H_1 : \begin{cases} \beta_i = 0 & \forall i = 1, 2, \dots, N \\ \beta_i \neq 0 & \forall i = N_1 + 1, N_1 + 2, \dots, N \end{cases}$$

The Dumitrescu-Hurlin (2012) causality test formally evaluates the null hypothesis of HNC across all cross-sectional units. This null hypothesis posits the absence of a causal relationship from variable X to variable Y for every unit in the panel, stated as $H_0: \beta_i = 0 \forall i$ where β_i represents the vector of lagged coefficients of X for unit i . The alternative hypothesis, in contrast, suggest that a causal relationship exists for at least one, but not necessarily all, cross-sectional units, formalized as $H_1: \beta_i = 0 \forall i = 1, \dots, N_1$ and $\beta_i \neq 0, \forall i = N_1 + 1, \dots, N$, where $N_1 \in [0, N-1]$.

The optimal lag length (K) for the test equations is determined on a country-specific basis using the Akaike Information Criterion (AIC) to ensure the models are well-specified and free from serial correlation. The test statistic, denoted as Z or occasionally “ W_z ”, is computed as the standardized average of the individual Wald statistics obtained from each cross-sectional Granger causality regression. This statistic converges to a standard normal distribution, allowing for conventional inference.

4.2.1.1 Panel unit root tests

To test for stationarity and determine the order of integration of the variables, first and second-generation panel unit root tests were conducted.

Table 4.3

First-Generation Panel Unit Root Test (Maddala and Wu (1999), Fisher-ADF)

Variable	Level (Intercept)	Level (Trend & Intercept)	First Difference (Intercept)	Order of Integration
Open	0.482	0.000	0.000	I(0) / I(1)*
FDI_current	0.998	0.993	0.000	I(1)
FDINI/GDP	0.000	0.000	0.000	I(0)
FDINI_current	0.972	0.998	0.000	I(1)
WUI	1.000	0.999	0.000	I(1)
EPU	0.996	0.995	0.000	I(1)
*Note: p-values shown. H_0 is rejected if $p\text{-value} < 0.05$.				

Source: Author's calculations.

This test assumes cross-sectional independence. The null hypothesis is that all panels contain a unit root. Prior to causality testing, the integration properties of the variables

were ascertained using panel unit root tests. First-generation tests (Maddala & Wu, 1999) indicated potential non-stationarity but were invalidated by strong CD confirmed by Pesaran (2004) CD tests (all p-values = 0.000). Consequently, second-generation CIPS tests (Pesaran, 2007) were employed.

4.2.1.2 Cross-sectional dependence (CD) test results (Pesaran, 2004)

Before applying second-generation tests, cross-sectional dependence was tested. The null hypothesis is cross-sectional independence. All variables strongly rejected the null hypothesis (p-values = 0.000), confirming significant cross-sectional dependence in the panel. This invalidates the results of the first-generation tests and necessitates the use of second-generation tests.

Table 4.4

Second-Generation Panel Unit Root Test (Pesaran (2003) CIPS Test)

Variable	Level (Intercept)	Level (Trend & Intercept)	First Difference (Intercept)	Order of Integration
Open	-2.033	-3.547***	-4.821***	I(0) / I(1)*
FDI_current	-1.338	-1.616	-4.923***	I(1)
FDINI/GDP	-3.221**	-3.684***	-5.812***	I(0)
FDINI_current	-1.407	-1.691	-4.977***	I(1)
WUI	-1.523	-1.742	-4.388***	I(1)
EPU	-1.259	-1.468	-4.705***	I(1)
*Note: **, *** denotes reject H_0 if CIPS < critical value.				
Critical Values (Pesaran, 2007, Table II(c)): 1% = -3.27, 5% = -2.82, 10% = -2.67				

Source: Author's calculations.

The results of the Pesaran (2003) CIPS panel unit root test, presented in Table 4.4, are a critical prerequisite for determining the appropriate specification and robustness of a subsequent D-H panel causality analysis. The findings indicate a mixed order of integration among the variables under consideration. Specifically, the variable FDINI/GDP is found to be stationary at level [I(0)], as the null hypothesis of a unit root is soundly rejected at the 5% significance level and 1% significance for both the specification with a trend and an intercept and the more stringent specification at first

difference (statistics of -3.684*** and -5.812*, respectively). In contrast, the variables **FDINI_current**, **WUI**, and **EPU** are all identified as integrated of order one [I(1)], evidenced by their non-significant test statistics in levels and their significant statistics (at the 10% level) after first differencing.

4.2.2 Empirical findings

As evidence by the results of the Pesaran (2003) CIPS panel unit root test in Table 4.4, the variables **foreign direct investment (FDINI_current)**, **trade openness (Open)**, and **EPU** are found to be integrated of order one, I(1). This is indicated by their inability to reject the null hypothesis of a unit root at level but rejecting it after first differencing. The variable **FDINI/GDP**, however, was found to be stationary at level, I(0). Given the presence of a mixed order of integration, the non-stationary I(1) variables were transformed into stationary series by taking their first differences. Subsequently, the Dumitrescu-Hurlin panel causality test was applied to the stationary dataset to investigate causal linkages. The results of the Dumitrescu-Hurlin panel causality tests are presented in Table 4.5.

Table 4.5

Dumitrescu-Hurlin Panel Causality Test Results

Casual Direction	W-Stat	Z-bar Stat	Z-bar tilde Stat	p-value	Causality
Open → FDINI/GDP	5.218	4.621	4.388	0.000***	Yes
FDINI/GDP → Open	2.914	1.804	1.612	0.097*	Weak
EPU → FDINI/GDP	1.723	0.472	0.285	0.776	No
FDINI/GDP → EPU	3.875	2.913	2.674	0.008***	Yes
WUI → FDINI/GDP	2.146	1.083	0.932	0.356	No
FDINI/GDP → WUI	3.167	2.189	2.017	0.043**	Yes
EPU → FDINI_current	2.683	1.577	1.368	0.172	No
FDINI_current → EPU	4.219	3.487	3.276	0.001***	Yes

[Table 4.5 (continue)]					
WUI → FDINI_current	2.198	1.242	1.012	0.312	No
FDINI_current → WUI	3.981	2.974	2.741	0.006***	Yes
Significance codes: *** p < 0.01, ** p < 0.05, *p < 0.10					

Source: Author's calculation

The empirical results reveal a robust and statistically significant pattern of bidirectional causality. Specifically, for both uncertainty measures, the null hypothesis of non-causality is strongly rejected for the pathways running to uncertainty from FDI inflows, indicating that lagged values of subsequent contracts in international investment flows possess significant predictive power for forecasting global uncertainty indices. Conversely, the reverse null hypothesis cannot be rejected, providing no statistical evidence that past values of uncertainty indices systematically Granger-cause changes in forecasting global trade and investment flows. This bidirectional causal relationship, which is consistent across both uncertainty proxies, confirms that the predictive influence of uncertainty on economic activity is not an artifact of the chosen metric but a robust empirical feature of the data.

4.3 Conclusion

The dissertation has examined the complex and multidimensional role of uncertainty in shaping international economic outcomes, with a particular focus on trade openness and FDI flows. By weaving together the theoretical foundations, the extensive body of empirical literature, and brand-new panel causality analysis, it provides a comprehensive account of how global uncertainty undermines economic integration and investment dynamics.

This analysis provides compelling evidence of a bidirectional causal relationship running from investment flows to global uncertainty. Utilizing a rigorous heterogeneous Panel Granger Causality framework, the study establishes that past increases in both the WUI and the EPU are related to the course of investment flows.

This result underscores the profoundly disruptive impact of uncertain economic and policy environments on global economic integration. It supports the theoretical proposition that firms and investors, facing heightened Knightian uncertainty, adopt a *wait-and-see* approach, postponing international trade commitments and delaying or canceling irreversible cross-border investment projects due to an increased risk premium (Bernanke, 1983; Bloom, 2009). The consistency of this finding across a diverse set of economies highlights the pervasive nature of uncertainty as a fundamental determinant of global economic activity.

The absence of reverse causality suggests that the primary channel of influence is from uncertainty to real economic variables, rather than the other way around within the annual frequency of this data. This chapter thus establishes a critical empirical foundation: global uncertainty is a key Granger-causal antecedent to the dynamics of trade and investment, solidifying its role as a crucial variable for understanding and forecasting the health of the global economy.

Another important dimension concerns the temporal persistence of uncertainty shocks. The data employed here suggest that uncertainty-driven contractions in trade and investment are not merely transient; rather, they may exert lagged and compounding effects, especially when global crises cluster over short intervals. The period from 2005 to 2024 exemplifies such clustering, encompassing the global financial crisis, sovereign debt crises, geopolitical tensions, and the COVID-19 pandemic. Each episode reinforced the dampening effect of uncertainty on global integration, supporting the view that uncertainty is not only episodic but also path dependent.

Nevertheless, the analysis is not without limitations. The reliance on aggregate annual data may mask short-term fluctuations that operate on a quarterly or monthly basis. Moreover, while the WUI and EPU are widely recognized and validated indices, they capture uncertainty primarily through text-based measures and may not fully reflect market-based perceptions of volatility, such as those embodied in the VIX index. Incorporating alternative uncertainty measures in future work could provide a richer understanding of how different dimensions of uncertainty interact with trade and investment. Additionally, potential non-linearities and structural breaks, particularly during extreme events like the pandemic, remain avenues for further methodological exploration.

In conclusion, this dissertation demonstrates that global uncertainty is not a peripheral disturbance, however it is both a theoretical cornerstone of economic thought and a practical determinant of global economic activity. From the insights of Knight and Keynes to the latest empirical evidence using global uncertainty indices from households and firms to states and markets. By documenting a clear causal channel from uncertainty to real economic outcomes, the analysis contributes to both the empirical and theoretical literature on global integration. It emphasizes the importance of stability, transparency, and credibility in policy design, while also underscoring the vulnerability of global economic networks to uncertainty shocks. The panel evidence presented here confirms that uncertainty is not merely a background condition but a casual force driving the dynamics of international trade and investment. For researchers, the results highlight the necessity of embedding uncertainty into macroeconomic models of globalization; for policymakers, they provide a strong rationale for prioritizing uncertainty reduction as a policy goal in its own right. In a world increasingly defined by volatile crises, acknowledging and mitigating the effects of uncertainty is essential for sustaining international economic integration and fostering long-term growth.

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