

Economic Growth and Uncertainty

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ABSTRACT

I examine the role of “uncertainty” and its relation to GDP Growth. According to the economic theory and other empirical studies, uncertainty has an economically negative association with Gross Domestic Product (GDP Growth). In order to capture uncertainty, I utilize the Economic Policy Uncertainty Index (E.P.U Index). In this paper, I run 2 regression models. Firstly, I run a Two-Stage Least Squares model using instrumental variables in order to detect if the relationship is statistically significant. The next step includes a Vector Autoregressive Model (VAR Model) for the estimation of response that a shock to uncertainty has on economic activity. The results confirm this negative relation for all the examined regions (continents) and countries. However, some of these countries have a statistically significant relationship and the response on Growth after a shock in EPU Index is relatively high, while other countries or regions have no significant impact.

Keywords: Uncertainty, Economic Policy Uncertainty Index, GDP Growth, Vector Autoregressive Model, Two-Stage Least Squares Model

Εξετάζω τον ρόλο της αβεβαιότητας και της συσχέτισης της με το ρυθμό αύξησης του ΑΕΠ (Ακαθάριστο Εγχώριο Προϊόν). Σύμφωνα με την οικονομική θεωρία και άλλες εμπειρικές μελέτες που έχουν διεξαχθεί η αβεβαιότητα έχει μια οικονομικά αρνητική συσχέτιση με την με την οικονομική ανάπτυξη. Για να προσδιορίσω την αβεβαιότητα χρησιμοποιώ τον Δείκτη Economic Policy Uncertainty (E.P.U. Index). Στην εργασία χρησιμοποίησα 2 μοντέλα παλινδρόμησης. Σε πρώτη φάση χρησιμοποίησα ένα Two-Stage Least Squares Model έτσι ώστε να εκτιμηθεί το αν η συσχέτιση μεταξύ των μεταβλητών είναι στατιστικά σημαντική. Το δεύτερο μέρος περιλαμβάνει ένα Διανυσματικό Αυτοπαλίνδρομο Μοντέλο (VAR Model) για την εκτίμηση της απόκρισης που έχει το Α.Ε.Π μετά από ένα shock στον Δείκτη της αβεβαιότητας. Τα αποτελέσματα και των 2 παλινδρομήσεων επιβεβαίωσαν την αρνητική σχέση για όλες τις εξεταζόμενες περιοχές (ηπείρους) και χώρες. Ωστόσο, ορισμένες από αυτές τις χώρες είχαν μια στατιστικά σημαντική σχέση και η επίδραση της αβεβαιότητας ήταν στατιστικά σημαντική, ενώ σε άλλες χώρες ή περιοχές η αβεβαιότητα δεν είχε σημαντική επίδραση

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INTRODUCTION

The deepest stimulus for writing this study was the Economic Policy Uncertainty Index (EPU INDEX). Firstly, was described generally the importance of uncertainty, analyzing why the uncertainty matters and its effects on the economic activity. The chapter 2 includes the specific Index, analyzing the way that is constructed not only the individual indices but also the Global EPU Index and the categorical EPU Indices for US and Japan . Furthermore, was presented the overtime evolution of the Index for US, European Union, Japan and globally, as well as the effect that have the several economic and political events on the index. Additionally, was compared this Index with the Volatility Index(VIX) and the fiscal and monetary policy uncertainty Index of US and Japan.

The third part of the work includes the empirical panel analysis. The analysis made using independent variable the GDP Growth and explanatory variables EPU Index the investment ratio, government consumption, trade openness and adjusted terms of trade. The purpose of the analysis was the estimation of the EPU Index effect on economic Growth of the next time period (quarter). The included countries were determined by the availability of EPU Index. More specifically, in this chapter was described the several tests that made (for unit-root, heteroscedasticity, multicollinearity, reverse causality) and the specific variables that used with the correspondent coefficients and p-values that generated by the regression. In the fourth chapter was examined the importance of uncertainty on economic Growth individually for each country, running time-series regressions with the same variables.

Subsequently, in fifth chapter was made an attempt of estimation of Impulse Response of GDP Growth after a shock in Uncertainty and are presented the in tables and Figures the Result of the Vector Autoregressive Model .Lastly the last part of the work is dedicated to Greek Economic Policy Uncertainty Index and its sub-indices that published recently. Specifically sixth chapter refers to the overtime evolution of the Index, in its correlation with other Global and European EPU Indices as well as in the way of construction of sub-indices. For these Indices was run regressions and A VAR Model as in the case of other countries so as to be tested the relation of each index to economic activity and also to be estimated the Impulse Response of uncertainty to a shock of those Indexes

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CHAPTER 1: UNCERTAINTY

1.1 INTRODUCTION

Uncertainty is a broad concept with many dimensions. Specifically, uncertainty can be approached at a macro level (like growth rate), micro level (growth rate of firms) and noneconomic events like war and climatic change. All the forms of uncertainty tend to increase during recession periods and fall in booms while examining around the globe is observed that macro-uncertainty is almost 30% higher in developing countries. Additionally, beyond the exogenous shocks that caused by a recession (crises and wars) and affect adversely the uncertainty, this can endogenously be higher in recession periods, as the shrinking on economic Growth usually induces greater micro and macro uncertainty.

1.2 DEFINITION

The modern definition of uncertainty was created by Frank Knight, a famous Chicago economist. Firstly Knight defined the related concept of “risk” which he argued describes a known probability distribution over a set of events. The Knight defined “uncertainty” as the people’s inability to forecast the likelihood of events happening. For example, the number of coins ever produced by mankind is uncertain. To calculate this would require coins ever produced by mankind is uncertain. To calculate this would require estimating the distribution of coins minted across the hundreds of countries that exist today and throughout history, a task where most people would have no idea exist today and throughout history, a task where most people would have no idea even how to begin

1.3 THE KEY FACTS ABOUT UNCERTAINTY

Given this broad definition of uncertainty, it would be no surprise that there is no perfect measure but instead a large variety of proxies. Many times as measures of uncertainty have used the volatility of the stock market and the GDP because when a data series becomes more volatile it is harder to forecast. The key facts about uncertainty are the following:

Fact 1: Macro-uncertainty rises during recession periods

The most macroeconomic indicators have a countercyclical behavior. Specifically, the volatility of stock markets, bond markets, exchange rates, and GDP Growth all rise sharply during recessions. A typical example is the VIX (Volatility Index) of 30-day implied volatility on the S&P 500 stock market index. The VIX is traded on Chicago Board Options Exchange (C.B.O.E) and is constructed based on the values of put and call options, representing the market’s expectations volatility over the next 30 days. The VIX is clearly countercyclical, rising by 58 percent on average in recessions. In Figure 1 is presented the overtime evolution of VIX and as we can see it spikes around the global financial crisis of 2008-2009

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This surge in stock market volatility can be explained mainly by the leverage effect, as during recessions usually take on more debt, increasing their stock returns volatility. However, another factor that increases the prices of options (provide insurance against large price movements) is the high-risk aversion. Additionally, other financial prices like exchange rates and bond yields also experience a spike in volatility in recession. Moreover, the Economic Policy Uncertainty Index which is another proxy for uncertainty (for this index will make the analytical description in the next chapter) has clearly countercyclical behavior in the United States with its level 51% higher during recessions

Additionally, in the Figure 2 is presented the results of a panel analysis of about 50 forecasters, examining data from Philadelphia Federal Reserve. The results showed that an additional proxy for uncertainty is a disagreement of professional forecasters and periods when banks, industries and hold more diverse opinions are more possible to reflect higher uncertainty. Specifically in the period of global financial crisis the forecast disagreement spike (red line) and at the same time the forecast uncertainty gets its higher value (black line). Finally, the mean GDP forecast is dampened, taking its lowest value

Fact2: Micro-uncertainty also increase in recessions

As in the case of macro-data and at the level of micro-data on individual industries, firms and plants uncertainty appears to rise during recessions. Another panel analysis that made for 16.000 plants showed that the dispersion of sales growth rates during the Great Recession of 2008-2009 was 152% higher than in the period before the recession (2005-2006). In particular, the figure 3 plots in the horizontal axis the sales growth rate and the vertical axis the density of sales. As we can see, the red solid line that represents the recession period is more scattered than the black dashed line, which means that sales have higher volatility in recessions

Furthermore, because of the fact that unemployment rises during recessions, this will have as a result the increase in volatility in personal and household incomes as well. Though, not only the income on non-employers but also perhaps less expected that the wages for even those who are employed become more volatile during recessions. This is coming true, especially for low-income workers. Generally, the increasing volatility of macro, industry firms, and plants translated into the higher volatility of average wages for employers

Fact 3: Developing countries appear higher uncertainty

Low incomes countries in regions like Africa and South America tend to have more volatile GDP Growth rates, stock markets, and exchange rates. Specifically in panel analysis of 60 countries using available growth and financial data was examined those with low incomes. The results of the analysis showed that developing countries had 50 percent higher volatility of

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growth rates, 12% higher stock price volatility and 35% higher bond-market volatility, so overall developing countries experience about one-third higher macro-uncertainty

1.4 THE CHANNELS THROUGH WHICH UNCERTAINTY AFFECT ECONOMIC ACTIVITY

Examining the relationship of uncertainty with other macroeconomic variables the logical conclusion that we can infer is that Economic-Policy Uncertainty is negatively correlated with other macroeconomic variables and this impact is confirmed both taking the contemporaneous and lagged values of the variables

There are several channels through which high levels of uncertainty affect GDP Growth and general economic activity

- The first channel is the real options effects and concerns the investment part. Firms can look at their investment choices as a series of options. The premise is that when firms are uncertain about the future, it is expensive to invest and disinvest or to hire and fire. This situation encourages the firm to wait. This delay can develop the site and if not, then it can continue avoiding costly mistakes. Though, real options effects are not permanent because the actions that can be reverse do not have as a result the loss of an option
- The second is an analogous channel, the consumption. When uncertainty is arises, the households relatively easily delay spending particularly in durable consumer products like machines, furniture, equipment and cars limiting demand and encouraging people to spend less. For example, if people think about do an important consumption spending, but they could either do this year or wait until the next year, it is more valuable to wait when income uncertainty is in high levels.
- Another other channel is through which uncertainty can affect economic activity is the risk premium. This happens because the investor wants to be compensated for higher risk premium and because greater uncertainty tends to raise risk premia. Furthermore, uncertainty raises the cost of debt financing and banks charges higher interest rates because of the fact that uncertainty increases the probability of default. Generally, this role of uncertainty can reduce micro and macro growth
- Lastly, because many managers are not diversified in their wealth holdings, the increase of uncertainty encourage them to take a more cautious toward risk-taking and investments

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1.5 EMPIRICAL STUDIES RELATED TO THE EFFECTS OF UNCERTAINTY ON MACROECONOMIC VARIABLES

A significant dynamic relationship exists between our economic policy uncertainty index and real macroeconomic variables. These relationships estimated using Variance Decomposition Models for the United States for the time period from the January 1985 to December 2014. The results showed that an increase in economic policy uncertainty as measured by our index foreshadows a decline in economic growth and investment and employment in the following months or quarters

1.5.1 United States VAR estimated impulse responses

The figure 4 indicates the VAR estimated impulse responses functions for GDP and Gross Fixed Investment(black line) to an EPU innovation equal to the increase in the EPU Index from its 2005-2006 to its 2011-2012 average value with 90 percent confidence bands(red lines). What we can see, is that uncertainty affects negatively on both variables and especially the first quarter after the shock the impact is greater on investment than GDP. Additionally, the results of the forecast error Variance Decomposition showed that among the other factors that affect the behavior of GDP and Investment is economic uncertainty, having the greater importance and explaining better the long-run evolution of the variables. In the other factors are included by order the log(S&P 500 Index), federal reserve, log gross domestic product

1.7 ECONOMIC CONSEQUENCES IN EUROPEAN AREA

Concerning the European area the uncertainty can adversely affect the economic growth. As we can see from the results of the generalized impulse responses functions, the shocks are temporary. So an increase in uncertainty does not affect GDP for many time periods after the shock but contribute to shrinking GDP for the next 3 periods after the shock. Though, the biggest impact occurs the second quarter after the shock, where a one-standard-deviation increase on uncertainty damper GDP Growth around 0.3%. Figure 5 the blue line denotes the median response of GDP Growth and the yellow lines denote the 95% one-standard deviation confidence.

Additionally, was assessed the quantitative importance of uncertainty on the macroeconomic fluctuations. For this reason, was made an analysis of the forecast error variance decomposition for real GDP Growth for forty quarters. As we can see in the Figure 6 Uncertainty is second only to the lagged contribution of past real GDP Growth with a percentage of 20%, which means it estimated to contribute significantly to real GDP growth fluctuations in the euro area. Moreover, other factors such as world demand, saving rates, real exchanges, real investments, real exports and other it does not seem to have a significant effect on economic growth fluctuations

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CHAPTER 2: ECONOMIC POLICY UNCERTAINTY INDEX (EPU INDEX)

2.1 INTRODUCTION

Economic Policy Uncertainty Index was developed by Baker Bloom and Davis in order to investigate the role and the importance of Economic - Policy Uncertainty, based on news articles from the respective countries. Initially, this index was constructed for the United States of America. Gradually, this index was created for other eleven countries, including all G10 economies and until nowadays this index exists in 22 countries

2.2 MEASUREMENT OF EPU INDEX

The construction of EPU Index based on the frequency of articles that pertaining the terms “economic” “economy”, “uncertain” uncertainty” and other “policy” terms such as “congress” “deficit” “Federal Reserve” “White House” and relies on 10 leading newspapers of the country. A specific article in order to meet our criteria must contain terms in all three categories. The newspapers included in the index for the USA are USA Today, the Miami Herald, the Chicago Tribune, the Washington Post, the Los Angeles Times, the Boston Globe, the San Francisco Chronicle, the Dallas Morning News, the New York Times, and the Wall Street Journal

The main difficulty with the calculation of EPU Index is that the overall number of articles varies across time and newspapers, so was scaled the raw counts of articles by the total number of articles in the same newspaper and time. Subsequently, each monthly newspaper level-series was standardized to unit-standard deviation from 1985-2009, and then average across 10 papers by month. Finally, we normalize the 10-paper newspapers series to a mean of 100

More specifically, for the analytical calculation of Index let X denote the scaled EPU frequency counts for $i=1\dots 10$ for month t and T_1 and T_2 denote the time intervals used in standardization and normalization calculations

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For the precise calculation of EPU we follow the next steps:

- For each paper we calculate the time series variance, σ^2_{it} for time interval T_1
- Standardize X_{it} by dividing through by the standard deviation σ_{it} for all t . This operation yields for each paper a series Y_{it} standard deviation in the Interval T_1
- Compute the mean over newspapers of Y_{it} in each month to obtain a series Z_{it}
- Compute M , the mean value of Z_{it} in the interval T_2
- Multiply Z_{it} by $(100/M)$ to obtain the normalized EPU time-series Index

2.3 GLOBAL EPU INDEX

Except for individual EPU Indices Steven J. Davis constructed a Global EPU Index. This Index is based on 16 countries that account for two-thirds of global output and is calculated as the GDP weighted-average of global National EPU Indices. As we can see in Figure 7, the average value of the Global EPU Index is much higher the last year, because of the increased instability and the global crisis that prevail in a global level. Specifically, the average price of Index the time period from July of 2011 to August 2016, is 60 percent higher than in the previous fourteen and one-half years and 22 percent higher than the two-year period of 2008-2009. The recent years the Index is at an all-time-high reaching the value of 282

The index has its highest value in June 2016 around the Brexit referendum and the serious concern over the dissolution of the European Union. An Index also fluctuates around consistently high levels from mid-2011 to early 2013, a period that characterized by major political and economic events such as the Bank crises and recurring sovereign debt, a generational leadership transition in China and intense partisan battles over fiscal and healthcare policies by Obama's Government. Moreover, the index spikes in reaction to Asian financial crisis, the 9/11 terrorist attacks, the US invasion of Iraq, the Global Financial Crisis of 2008-2009, the European immigration crisis and the concerns about Chinese economy in late 2015

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2.4 USA ECONOMIC POLICY UNCERTAINTY INDEX

Observing the Figure 8 that depicts the overtime movement of the Index for the US, the conclusion is that it generates high values at time-periods around major political and economic events. For instance, among other events and developments the Index it clear spikes around the Gulf Wars, close presidential elections, the terrorist attack of 9/11, the stimulus debate, the Tarp Legislation and the Lehman Brothers bankruptcy at late 2008 and the Battle over the “Fiscal Cliff”.

On the other hand, after several notable political events did not observe high values of Index. A typical example, is the partial federation government shutdowns close to which Economic Policy Uncertainty Index indicates no large spikes. This happens because of the fact that, of the total 8.000 articles that found in News Bank archives about these shutdowns, less than 25% mention “economy”, only less than 2% mention “uncertainty” and only 1% mention both

2.5 CATEGORICAL EPU INDICES FOR USA AND JAPAN AND THE TERMS THAT CORRESPOND TO EACH OF THE CATEGORY

In addition to National EPU Index, there are also specific-categories EPU indices. For the creation of policy-categories indices, a necessary condition is the application of additional criteria to those articles that contain the terms “economy”, “uncertainty”, “policy”. For instance, the monetary policy category includes the presence of one or more category relevant terms such as “The Fed”, “central bank”, “interest rate”, “inflation” and so on. The Fiscal policy includes anything covered by Taxes & Government Spending. All categorical EPU Indices and the terms that correspond to each of them are listed below

- **Taxes:** taxes, tax, taxation, taxed

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- **Government Spending & Other:** government spending, the federal budget, budget battle, balanced budget, defense spending, military spending, entitlement spending, fiscal stimulus, budget deficit, federal debt, national debt, Gramm-Rudman, the debt ceiling, fiscal footing, government deficits, balance the budget

Fiscal Policy: Anything covered by Taxes or Government Spending & Other • **Monetary Policy:** federal reserve, the fed, money supply, open market operations, quantitative easing, monetary policy, fed funds rate, overnight lending rate, the fed, Bernanke, Volker, Greenspan, central bank, interest rates, fed chairman, fed chair, lender of last resort, discount window, European Central Bank, ECB, Bank of England, Bank of Japan, BOJ, Bank of China, Bundesbank, Bank of France, Bank of Italy

- **Healthcare:** health care, Medicaid, Medicare, health insurance, malpractice tort reform, malpractice reform, prescription drugs, drug policy, food and drug administration, FDA, medical malpractice, prescription drug act, medical insurance reform, medical liability, part d, affordable care act, Obamacare

- **National Security:** national security, war, military conflict, terrorism, terror, 9/11, defense spending, military spending, police action, armed forces, base closure, military procurement, saber rattling, naval blockade, military embargo, a no-fly zone, military invasion

- **Financial Regulation:** banking (or bank) supervision, glass-Steagall, tarp, thrift supervision, dodd-frank, financial reform, commodity futures trading commission, cftc, house financial services committee, base, capital requirement, Volcker rule, bank stress test, securities and exchange commission, sec, deposit insurance, DFIC, FSLIC, OTS, occ, firrea

- **Regulation:** Anything covered by Financial Regulation and truth in lending, union rights, card check, collective bargaining law, national labor relations board, nlr, minimum wage, living wage, right to work, closed shop, wages and hours, workers compensation, advance notice requirement, affirmative action, at-will employment, overtime requirements, trade adjustment assistance, davis-bacon, equal employment opportunity, eeo, osha, antitrust, competition policy, merger policy, monopoly, patent, copyright, federal trade commission, ftc, unfair business practice, cartel, competition law, price fixing, class action, healthcare lawsuit, tort reform, tort policy, punitive damages, medical malpractice, energy policy, energy tax, carbon tax, cap and trade, cap and tax, drilling restrictions, offshore drilling, pollution controls, environmental restrictions, clean air act, clean water act, environmental protection agency, epa, immigration policy

- **Sovereign Debt and Currency Crises:** sovereign debt, currency crisis, currency crash, currency devaluation, currency revaluation, currency manipulation, euro crisis, Eurozone

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2.6 SOURCES OF ECONOMIC UNCERTAINTY IN USA

For the answer of the question about which aspects of policy are the most important sources of uncertainty was searched articles that meet the criteria of economic policy uncertainty. In short from the analysis the conclusion is that the historically high levels of uncertainty in 2010 and 2011 mainly reflect concerns about monetary policy and taxes and secondarily a broad range of other policy-related concerns. Specifically, the conclusions that inferred are the following:

- In the period from 1985 to 2011 monetary has the greater contribution, as it accounts for one-third of policy-related economic uncertainty. Moreover, concerns related to government spending, taxes and fiscal policies jointly account for 30%
- The peaks of economic policy uncertainty in 2010 and 2011 are mainly due to concerns about taxes and monetary policy. Judging by a frequency count of articles, policy uncertainty in these two areas is more than four times higher in the last two years than on average from 1985 to 2011
- Several other categories (healthcare, entitlement programmers, financial regulations and sovereign debt and currency crises) have also elevated levels of policy uncertainty in 2010 and 2011.

2.7 COMPARISON BETWEEN POLICY UNCERTAINTY AND OVERALL ECONOMIC UNCERTAINTY

Except for the EPU Index, they have created two new-based indexes that are relied on data from Google News. The Policy uncertainty (given by the blue line) and the overall economic uncertainty (given by red dashed line). Specifically, the red line count the number of articles that mention the term “economy” and “uncertainty” but may or not may not the term “policy”. So if an article mention both the terms “economy”, “uncertainty” and the term “policy” it showed up in both indexes. If talks about the economy and uncertainty but not refer to the term “policy”, it showed up in the index given by the red line. Respectively, if an article talks about policy, but not refer to the terms “economy” “uncertainty” it showed up in the index given the blue line

From the overtime comparison of the two lines, we can infer that there is a gap between them, which is due to the fact that many articles that talks about economic uncertainty and do not mention the term “policy”. Though, as we can see in Figure 9 this gap is greater for the time

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period from 1985 until 2000 because the certain events (like recession fears and 1987 Stock Market Crash) generated a lot of talk about economic uncertainty but not much talk about policy

However, policy-related concerns have become a more important source of economic uncertainty. Specifically, the years after the 9/11 terrorist attack and especially from 2008 onwards is observed a convergence of the two lines. So, in recent years, when an important political-economic event occurs is more likely the new articles to discuss both economic uncertainty and policy. Therefore, for the period after 2000, the news based Index of economic policy is more highly correlated with the new-base index of policy uncertainty

2.8 COMPARISON OF EPU INDEX AND VIX (Volatility Index)

There is another way for evaluation Economic Policy Uncertainty Index. This is by comparing it with other measures of uncertainty such as VIX (volatility index), an Index of 30-day option-implied volatility in the S&P 500 stock index. Though, between the two indices, there are important conceptual differences. EPU Index involves no explicit horizon while on the other hand VIX reflects implied volatility over a 30-day look-ahead period. Additionally, while VIX pertains uncertainty about the equity terms, the EPU Index measure policy uncertainty, and not just for equity terms. Lastly, the VIX is mentioned only to publicly traded firms, which account for one-third of total employment

In Figure 10 , the blue line corresponds EPU Index and the red line the VIX Index. As we can see the two indices are highly correlated with each other with a coefficient to be 53%. Though, there are also show distinct variations between the two indexes, as VIX Index is clearly connected with financial and stock market events. Therefore, VIX show stronger responses to the Asian Financial Crisis and the Lehman Brothers collapse. On the other hand, the EPU Index is connected with events that involve policy concerns and at the same time affect stock price volatility. For this reason, EPU Index reacts more strongly in the wake of political events like Gulf regions, the political battles over taxes and government spending, the election of a new president and the 9/11 terrorist attacks

In order to be detected the role of difference between the EPU Index and VIX was constructed a newspaper-based index of equity market uncertainty. More specifically, this Index is similar with EPU, and is maintained the terms “economy” and “uncertainty”, but it replaced the term “policy” with the terms “stock price”, “equity price” and market price”. As it is reasonable the correlation coefficient of this new-based index with the VIX is 73%, considerably higher than the EPU-VIX correlation

2.9 JAPANESE ECONOMIC POLICY UNCERTAINTY

The Japanese EPU Index does not display any strong movements and has a moderately anticyclical behavior as it seems in Figure 11. From 1987 until 1997 there are not large

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variations but on the outbreak of the Asian financial crisis, the index reached on peak getting the highest value. Though, gradually the value of the Index was stabilized and peaks again 2008 around the Lehman Brothers collapse and 2001 after Prime Minister Kan resigns. Moreover, from 2013 the Index exhibits a period of gradual decline, coinciding with the launch of Abenomics and an improvement in confidence indicators.

However, since 2015 the index has risen again reflecting mainly the intense concerns about developments in China, a new negative interest rate policy, and the Brexit referendum

2.10 SOURCES OF ECONOMIC POLICY UNCERTAINTY IN JAPAN

Additionally, in Japan it is interesting to check the main sources of economic policy uncertainty and their variation over time. The greater sources of uncertainty reflects the fiscal policy, with on average 57% on articles contain one or more of the fiscal policy and follow the monetary policy with 28 percent contain monetary policy terms. Low contribution to uncertainty has trade policy with 8 percent and only 3% contain exchange rate terms. Figure 12

The leading role of fiscal policy on the overall uncertainty fell to relatively low levels in 2006-2007 period, before rising the high levels after the global financial crisis. The high percentage of monetary policy is fixed overtime because the main problem of Japanish economy is the deflation. So gradually authorities have made much effort, adopting different monetary policies with frequent changes on interest rates, which are negative for some period. This has as a result the elevation of monetary policy uncertainty.

2.11 COMPARISONS OF FISCAL AND MONETARY POLICY BETWEEN JAPAN AND USA

In the Figures 13 and 14 are presented the comparison of Japan's fiscal and monetary policy with the US counterparts. For the time period from late 1980s and the early 1990s the fiscal policy uncertainty was higher and more volatile in US, while during the Asian Financial Crisis was observed the reverse pattern. However, the years after 2000 fiscal policy uncertainty has remained relatively fixed in US, except for a spike around the November 2016 election. On the other hand, Japan has experienced rising levels of fiscal policy uncertainty, mainly due to uncertainty surrounding consumption tax hikes.

With regard to the monetary policy, this increased for both countries around the stock market of 1987, the Asian Financial Crisis and in early 2000s. They fell for both countries around the late 2000s and rose again in 2008-2009 during the global financial crisis. Comparing the two countries, we see that Japanese monetary policy index has been highly elevated since introduction of negative interest rates in January 2016. In contrast, the U.S index remained at low

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levels except for a temporary shock response to British referendum in 2016. Lastly, the correlation coefficient is 30% for both monetary and fiscal policy uncertainty

2.12 EUROPEAN ECONOMIC POLICY UNCERTAINTY

In euro area the Economic Policy Uncertainty has been calculated as the weighted-average of country-specific data for economic policy uncertainty in Germany, Spain, France, Italy and Netherlands. In contrast to America, in euro area the Economic-Policy Uncertainty Index tends to rise steeply around major political-economic events and occasions like Gulf War, 9/11/01 terrorist attacks. Though the Index tend to increase sharply and get maximum values during the recession periods As shown in the Figure 15 the index spikes mainly at the time period around the sketched grey frames that correspond the recessions periods and crises of 1993, 2008-2009 and 2012.

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CHAPTER 3: EMPIRICAL ANALYSIS

3.1 INTRODUCTION

The main purpose of the analysis is the estimation of how Economic-Policy Uncertainty affects the GDP Growth of the next time-period. For the examination of this relation is considered useful the construction of a model, in which the dependent variable will be the economic growth and Economic Policy Uncertainty Index is one of the explanatory variables. So, the next step is the survey on bibliography for the detection of the other regressors of the model.

The dependent variable (Y) of the model will be GDP Growth, and some of the most important factors that affect economic growth and would be considered as determinants are Investment ratio, Government Consumption, Economic Policy Uncertainty Index, Trade Openness and the adjusted Terms of Trade. Therefore, these indicators will be used as independent variables in the regression. So the basic form of the model is

$$Y_t = \alpha_0 + \alpha_1 X_{1t} + \alpha_2 X_{2t} + \alpha_3 X_{3t} + \alpha_4 X_{4t} + \alpha_5 X_{5t} + e_t$$

Let: Y= GDP Growth

X₁= Economic Policy Uncertainty

X₂= Investment Ratio

X₃= Government Consumption

X₄= Trade Openness

X₅= Adjusted Terms of Trade

As analyzed above, was made a panel data analysis and used quarterly data from 2Q 1996 to 2Q 2017. For some countries data was gathered for different period of time, which means is an unbalanced panel. The sample consists of 19 countries that were determined by the availability of data for Economic Policy Uncertainty Index. For the analysis was used the General Method of Moments Model using an instrumental variable technique and the regression describe the relation between Economic Growth and prior values of the explanatory variables

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3.2 THE VARIABLES OF THE MODEL

GDP Growth

Gross Domestic Product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. For this variable data was gathered from Eikon Database for GDP value at constant prices and calculated the quarterly GDP Growth. As we can see in Figure 16 China has the highest Growth for this Index that approaches the 0.4% and follows India with rate 0.09%. For the rest of the countries the growth is below 0.05%.

Economic Policy Uncertainty Index

The data for the Economic Policy Uncertainty Index was gathered from its official site. The Index is published every month for each country, so the data converted into quarterly (the last observation of the quarter) in order to be in the same time level with the GDP Growth and the other variables of the model. Analytical information for the nature and the construction of this Index was described in the first chapter. As we can see in Figure 17 United Kingdom has the highest value of the Index exceeding 160, while following Australia, Brazil, and Canada with a value close to 130 and the other countries fluctuated close to 100

For this variable, in the instrument list, we add lag value only for the previous time-period because we want to estimate the effect of uncertainty on the GDP growth of the next quarter. The results clearly show a robust and negative effect of uncertainty on economic growth and the coefficient is negative with a highly significant P-value 0.00531(0.00971). This means that an increase 1% on the EPU INDEX will have as a result the shrinking of GDP of the next quarter in the amount of 0.5% and vice versa the decrease on EPU by 1% from quarter to quarter will affect in economic growth of the next period by 0.53%

Investment Ratio

The Investment ratio is represented by Gross fixed capital formation, abbreviated as GFCF, consists of resident producers' investments, deducting disposals, in fixed assets during a given period. It also includes certain additions to the value of non-produced assets realized by producers or institutional units. Fixed assets are tangible or intangible assets produced as outputs from production processes that are used repeatedly, or continuously, for more than one year. For the construction of this index data was gathered from EIKON database for the Gross Fixed Capital Formation (GFCF) Indicator and for the GDP values at constant prices and calculate an investment ratio for each of the countries that we conclude in the analysis.

As we can see in Figure 18 China has the greatest ratio in this Index approaching 40%, and follows Korea and India with percentages above 32%, while the rest of the countries fluctuated

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from 20% to 30%. Lastly, the lowest values with rates below 20% appear to have Brazil, Germany, Italy, Russia and the United Kingdom

With regard to the relation between investment ratio and economic growth, a positive coefficient on the contemporaneous form is more likely to reflect the positive relation between growth opportunities and investment rather than the positive effect of an exogenously higher investment ratio on the growth rate. For verification of probability of existence causal relation between GDP growth and investment ratio, performed a Granger Causality test and finding that there is reverse causality between the variables (is a form of endogeneity). The results of the test are presented in Table 1 for all the variables

So, because $p\text{-value} < 0.10$ reject the Null hypothesis (table 3) in both two cases, which means that there is reverse causality between the two variables. Therefore in order to correct the problem of reverse causality (is a form of endogeneity), we add lags and the instrument list includes the investment ratio over the previous 4 quarters but not the contemporaneous value.

Government Consumption

This indicator is the ratio of government spending to GDP Value and data was gathered from Eikon Database for quarterly periods. Government spending measured by day-to-day expenditures on education, health, and defense. In Figure 19 is presented the depiction of the ratios by country with Sweden and Netherlands to have the greatest values with rates close to 25% and follows France with percentage of 23%. The lowest value of the Index has Germany and Singapore with rates close to 10%. The majority of countries have rates between 10% and 20%

As in the case of investment ratio, also government spending was tested for reverse causality running a Granger causality test and because $p\text{-value} < 0.10$ (Table 3) we reject again Null Hypothesis so we do have reverse causality

So in the instrument list, we add lags values for the three previous quarters but not for the contemporaneous government consumption ratio. The estimated coefficient is negative and statistically significant -0.041880 (0.0207) which means that 1% increase in the government consumption would decrease the GDP on impact by -0.041880 (4.1%). If we had included as an instrument the contemporaneous value then the coefficient is almost twice as high and statistically significant -0.07825 (0.0039)

In any case, there is a negative relation between the two variables that shows that a greater volume of the public sector and of non-productive government, has as a result, the reduction of growth rate. So a big government is bad for Growth

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Trade Openness

Trade openness is an economic indicator calculated as the ratio of a country's total trade, a sum of exports plus imports to the real GDP. The interpretation of the Openness Index is: the higher the index the larger the influence of trade on domestic activities, and the stronger that country's economy. For this variable was gathering data for exports, imports and GDP value from EIKON database at standardized constant prices and was calculated the trade openness.

As we can see in Figure 20 Singapore has the most open economy with the value of the Index approach 4% and follows Ireland and Nederland's with rates above 1%. Moreover, the percentages for the rest countries are below 1%. Furthermore as in previous variables, trade openness also was examined for reverse causality and the results showed that there is no problem because we accept Null Hypothesis(p-value 0.67) that Trade Openness does not Granger cause GDP Growth as we can see in table 3

Adjusted Terms of Trade

The terms of trade represent the prices of the exports of a country relative to the prices of its imports; the ratio is calculated by dividing the price of the exports by the imports, with the result then being multiplied by 100. For the analysis, the specific variable that used was the growth rate in terms of trade multiplied by the percentage of exports plus imports to GDP value for each quarterly period. The Adjusted Terms of Trade by country is presented in Figure 21

Additionally, we make also Granger causality test and was founded that terms of trade do not Granger cause GDP Growth because of p-value>0.10(table 3). In contrast, GDP Growth Granger cause terms of trade (p-value<0.10). Therefore there is no problem of reverse causality

The change in the adjusted terms of trade depend primarily on world conditions and is regarded as exogenous with the contemporaneous economic growth and ,is therefore, appear in the instrument list, adding lag values for the three previous periods included the contemporaneous.

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3.3 UNIT-ROOT TESTS

Firstly, all the variables of the model were tested for the existence of unit-root. Unit-root is important because it is interesting to know if shocks have permanent or transitory effects. The main criterion on which we mainly based to make a decision is the Im, Pesaran and Swin W-Stat. The results of the panel data unit-root test showed that all the variables are stationary except for trade openness in which p-value was $0.61 > 0.10$. So, in order to convert this series, we add first difference and make it stationary. The results of unit-roots are presented in the Table 4

3.4 MULTICOLLINEARITY, HETERODESCEDASTICITY, AND NORMALITY AT RESIDUALS

After unit-roots, the next step was the test for existence multicollinearity between the explanatory variables. Multicollinearity occurs when the dependent variables are highly correlated with each other (correlation coefficients either very close to 1 or -1). This test was carried out using the correlation matrix and the results are presented in the table below. As we can see all the values that correspond to the correlation are quite low and only the correlation between investment ratio and government consumption approaches -0.50. So the conclusion is that we do not have a problem with the correlation of the variables. The correlation matrix is in table 5

Subsequently was carried out a test for Heteroscedasticity. The specific test we run was the White test. To execute it, we run the same model setting as a dependable variable the square of residuals and on the other side of regression the squares of explanatory variables. The Null Hypothesis is that there is no heteroscedasticity and because probability (p-value) of F statistic was $0.0825 < 0.10$ Reject Null Hypothesis but marginally so we assume do not have problem

Except for White Test, made a Histogram-Normality a test to check for the residual's Normality. In this, the Null Hypothesis (H_0) is that the residuals are normally distributed and because $P\text{-Value} < 0.1$ we reject Null Hypothesis so there is no normality at residuals. The results of this test are presented in table 6

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3.5 FIXED OR RANDOM EFFECTS

The next step includes the following three important tests that are presented in table 6:

- **Poolability test:** The Null Hypothesis of poolability test assumes homogeneous slope coefficients. This test is conducted to find out if we should examine data in panel form or to examine each cross-section individually. The test showed a significant p-value (0.037) so was decided that is much preferable to make a panel analysis.
- **The Hausman Test** explores the null hypothesis that the coefficient estimated by the efficient random effects estimator is the same as the ones estimated by consistent fixed effects estimator. In this case, it is safe to use random effects (insignificant p-value=0.85). If we get significant p-values we should use fixed effects.
- **Sargan test** with which we attempt to answer if the instruments that were chosen and described later in the analysis of the variables are suitable. The Null Hypothesis (H_0) of this test is that the instruments are valid. The p-value was 0.2562 so we accept H_0

3.6 CONCLUSIONS OF EMPIRICAL PANEL ANALYSIS

The empirical analysis results in the conclusion that all the coefficients of explanatory variables have statistical significant p-value and affect economic Growth. Specifically, the coefficient of variable X_1 (EPU INDEX) is 0.00531 with p-value 0.00971. This means that an increase 1% on the EPU INDEX will have as a result the shrinking of GDP of the next quarter in the amount of 0.5% and vice versa the decrease on EPU by 1% from quarter to quarter will affect in economic growth of the next period by 0.53% Moreover, the coefficient of variable X_2 is positive with p-value statistical significant (0.031717) 0.02118, which means that 1% increase in the investment ratio, it corresponds to an economic growth by 0.031717(3,17)

Furthermore, the estimated coefficient of variable X_3 (Government Consumption) is negative and statistically significant -0.041880 (0.0207) which means that 1% increase in the government consumption would decrease the GDP on impact by -0.041880(4.1%). If we had included as an instrument the contemporaneous value then the coefficient is almost twice as high and statistically significant -0.07825(0.0039). Concerning the variable X_4 (Trade openness), the results showed a positive coefficient with a statistically significant p-value 0.03732(0.0378). This means that a 1% increase in the trade openness, can have as a result the growth 3.7%. Lastly, the Variable X_5 (Adjusted terms of trade) has a negative and a statistically significant p-value 0.03111(0.0353). This means that a 1% percentage change in terms of trade, can have as a result the shrinking in the amount of 3.1%.

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Null Hypothesis: There is no significant statistical relationship between the explanatory and dependent variable

So we have the following cases:

- If $p\text{-value} > 0.10$ accept the Null hypothesis
- If $P\text{-value} < 0.10$ Reject Null for significance level 10%
- If $P\text{-value} < 0.05$ Reject Null for significance level 5%
- If $P\text{-value} < 0.01$ Reject Null for significance level 1%

So in the table 7 are presented the variables, coefficients, p-values, the result (accept or no of Null) and the effect of each variable on growth, as describes above

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CHAPTER 4: THE RELATION OF UNCERTAINTY TO GROWTH BY COUNTRY OR REGION

4.1 INTRODUCTION

The next chapter includes the examination of the impact of uncertainty not in cross-country empirical analysis but examining this effect in each country or region separately. So for each of the variables of the model was created a time-series and we run a Two-Stage Least Squares Model using again the instrumental variable technique

4.2 GLOBAL

Firstly, was examined the effect of Economic Policy Uncertainty on GDP Growth in a global level. The Global Economic Policy Uncertainty Index (GEPU) was available at the official site of the Index. The GEPU is a weighted-average of national EPU Indices (Australia, Brazil, Canada, Chile, China, France, Germany, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, United Kingdom, and the United States).

For the calculation of Global GDP Growth was used a weighted coefficient for each country based on the nominal GDP values. Subsequently, this coefficient was multiplied with the GDP Growth of each country and making the sum of all countries we end up in a time-series of Global GDP Growth. In the same way as GDP Growth we worked for the other variables of the model ending up in a time-series for each of them (Global Investment Ratio, Global Government Consumption, Global trade openness, Global adjusted Terms of trade)

The next step was the running of a 2-stage least squares model using the instrumental variable technique. As in the case of panel analysis, we make a test for unit-root. Because of the fact that here we have a time-series the criterion in which we based was the Augmented Dickey-Fuller that has a Null Hypothesis that there is unit-root. The results of the test presented in table 8. As in the case of panel analysis, for this time series was run tests for multicollinearity, heteroscedasticity, and normality at residuals and the results were similar as in the case of panel analysis. Moreover was made again Sargan test in order to check the validity of instruments variables. For Economic Policy Uncertainty we add lag value for the previous time period as in the case of panel analysis.

The results of the regression showed that in global level Uncertainty has as statistical significant negative Relation to Growth with coefficient -0.0001293 and p-value equal to $0.0775 < 0.10$ as it seems it table. This means that if change by 1, it will cause a reverse change of Growth by 0.001293% . So, in case of Index rises by 10 units the Growth will be reduced by 0.01293% and vice versa.

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4.3 EUROPE

Subsequently, was used the European Index of Economic Policy Uncertainty that is constructed based on the 5 of the largest countries of European area (France, Germany, Spain, Italy, United Kingdom). At the same time, for these countries, was calculated the weighted-average (based on GDP values) of growth rate and of other variables of the model as in the case of global variables

The results indicated that in European area there is also a negative statistical significant association of uncertainty with GDP Growth of the next time period (quarter) with coefficient and p-value equal to $0.818 < 0.10$

Analyzing each of these countries individually the results showed that in Spain the Economic Uncertainty plays an important role and the coefficient is negative and statistical significant, which is reasonable because Spanish economy faces problems and is very flexible especially the last years. Additionally, in Italy and France uncertainty is also statistically significant related to Growth but not so strongly as Spain On the contrary in United Kingdom and mainly in Germany is maintained the negative coefficient, but Uncertainty does not seem to be statistically significant related to economic activity. This may be explained by the fact that are more stable economies and the Uncertainty that can be disseminated from major global events(as uncertainty is linked around the globe) does not cause a substantial change to Growth

Lastly was examined the case of other European countries in which the Index is available. Specifically, negative and statistically significant is the effect in Russia, Netherlands, and Ireland, while in Sweden uncertainty does not show to play important role in economic Growth. Analytically the coefficients and the p-values for each country presented in the table 9

4.4 ASIA PLUS AUSTRALIA

The next step was the examination of the Asian continent's countries plus Australia. For these countries was used a time-series, which constructed by the weighted average(based on GDP Values) of all variables as in the case of Europe Area, while for Economic Policy Uncertainty was used the average of these countries. The results showed again a negative coefficient as in the European Area. However, in Asia this Relation is not statistical significant as p-value is equal to 0.1931 this time.

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After this, was tested each country individually and was founded that uncertainty has negative and highly statistical significant impact on China's economy, and is a relatively significant relation in India. On the contrary in Korea and Singapore the effect is also negative, but marginally not statistically significant. Moreover, as we see in table 10 in Japan and Australia this impact it does not seem so important, appearing high p-values.

4.5 AMERICAN CONTINENT

With regard to the impact of uncertainty on economic activity in the American continent is observed that there is also a Statistical significant Relation. In the USA p-value is highly strong statistical significant affecting negatively the economic growth and other macroeconomic variables as we described in the theoretical part of the work using the empirical studies with the Variance Decomposition. Analogous the results and for Canada and Brazil with a negative and statistical significant coefficient. On the contrary in Brazil there is also negative association but is minimal and Uncertainty it does not seem to be a key factor for economic activity. The results are presented in table 11

4.6 CATEGORICAL EPU INDICES FOR USA AND JAPAN

Because of the availability of categorical EPU Indices, that mentioned in the theoretical part, was made an attempt of estimation of the impact of these USA's EPU Indices on economic Growth. The logical result we reached is that the P-values is insignificant for categorical EPU Indices for Health, entitlement programmes, National Securities, Regulation, Sovereign Debt, because these indices they don't have a direct relationship with economic activity. Additionally, the coefficients of trade, fiscal policy (spending or taxes) and taxes are negative but p-value is again statistically insignificant

On the other hand, the coefficient of monetary policy EPU Index is also negative but the p-value is highly statistically significant. This happens because monetary policy is an important tool for the maintenance of price stability, preferably in low levels, in order to achieve sustainable Growth. For this reason, an increase in the uncertainty about monetary policy has a negative impact on economic growth. In addition, monetary policy is being exercised through the channel of financial regulations and so has an impact on financial conditions, which include not only the costs, but also the availability of credit banks' willingness to assume specific risks. Therefore, financial regulations EPU Index have negative and highly statistical significant relation with economic Growth.

The results are presented in the table 12

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CHAPTER 5: IMPULSE RESPONSE OF GDP GROWTH TO A SHOCK IN UNCERTAINTY

5.1 INTRODUCTION

In the fifth part of the work was made an attempt of estimation of the impulse response of GDP Growth after a shock in Economic Policy Uncertainty Index. For this purpose, we run a Vector Autoregressive Model (VAR).

5.2 VECTOR AUTOREGRESSIVE MODEL (VAR)

Vector Autoregressive Model (VAR) is a regression model of an equalizing system in which there are only endogenous variables. All endogenous variables are interpreted by lag values of the same and the other variables of the model. A Vector Autoregressive Model of auto p has the following form:

$$y_t = a + A_1 * y_{t-1} + A_2 * y_{t-2} + \dots + A_p * y_{t-p} + u_t$$

where $t = \text{Integer Number}$, $y_t = (y_{1t}, \dots, y_{kt})$ where is an $(K * 1)$ vector with K time-series, $A_i, i = 1, \dots, p$ είναι $(K * K)$ fixed rate matrices, $a = (a_1 \dots a_k)$ is an $(K * 1)$ vector of stable terms and lastly $u_t = (u_{1t}, \dots, u_{kt})$ is a white noise vector

5.3 INDIRECT RESPONSE

Firstly, we start with the order of the variables that we use in the VAR Model making with this way some assumptions. The macro-variables GDP Growth and Investment ratio will be first placed in the model and the last will be placed the EPU INDEX. In that order, posing the GDP and before EPU INDEX we assume that macro-variables do not react directly to a shock in EPU Index but a quarter later. The results are presented in table 13

In global level the results showed that in case we do not assume direct effect the shrinking of GDP Growth after a shock in EPU Index will be 0.05% for the second quarter, something that remains in the third quarter, while in the next quarter the effect is not statistically significant (Figure 22). So the cumulative reduction of global economic activity will be 0.1% for the months 3-9 after the shock. With reference to the European Union and given the zero effect in the first quarter a shock to EPU Index will have as a result a decrease on GDP Growth by 0.05% in the

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second quarter, 0.07% the third and 0.06% the fourth. Therefore the cumulative effect is -0.18%. (Figure 23)

In Asia, the shock on uncertainty will result in a decrease of economic activity by 0.14% in the second quarter while the effect is not statistically significant in the next quarters. (Figure 24). In United States a shock on EPU Index will cause a cumulative shrinking on GDP Growth by 0.017 for the quarters 2-4 (0.05 in the second quarter, 0.07 in third quarter and 0.06 in the fourth quarter) and from then on the effect is not statistically significant.

5.4 IMMEDIATE RESPONSE

Subsequently, we try to place the EPU Index before the macro-variable assuming in this way that there is an immediate effect on economic activity after a shock of EPU Index (Results in table 14). In this case, the global GDP is shrinking by 0.2% for the first quarter after the shock, while the effect of the shock is statistically insignificant for the next quarters (Figure 25). In European Union, the impulse response of GDP Growth to a shock of EPU INDEX will be 0.06% in the first quarter, 0.09% for the second and 0.09% for the third so the cumulative effect will be 0.24% in 3 quarters (nine months) as it seems in (Figure 26). In Asia, the direct effect is 0.17% on the first quarter of the shock, while the effect on other quarters is statistically insignificant. Lastly, the greatest effect on the first quarter after the shock is appearing in the USA, reaching the 0.25% but in the next quarters, the effect is statistically insignificant. (Figure 27)

5.5 COUNTRIES WITH THE GREATEST RESPONSES TO A SHOCK TO UNCERTAINTY

A significant observation of the results analysis is that the higher reaction after a shock to uncertainty seems to happen in Irish economy, which appears to have a shrinking of GDP Growth by 0.82% in the second quarter, while in the next quarters the effect is statistically insignificant (Figure 28). On the contrary, in the case of direct effect the reduction of activity reach 0.39% in the first quarter and 0.79% in the second (Figure 29). Furthermore, in Brazil the shock also has a significant impact on GDP reducing it by 0.29% in indirect effect, while with the assumption of immediate effect the shrinking of GDP reach 0.36% which is maintained and the second quarter. Moreover Nederland also appears to have significant direct reduction on GDP by 0.35%, while in indirect effect the reduction of economic activity is 0.14% in the second quarter

5.6 THE CHARACTERISTIC CASE OF SPAIN

Additionally, in all regions and countries that examined as we can see at the tables 13 and 14 the response of growth after the shock on uncertainty extend to the fourth quarter in the case of

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indirect effect while examining the immediate response the effect is limited to the third quarter the much. The only case in which the effect goes beyond these limits is Spain, with the reaction to be maintained for longer period of time (6th quarter when we assume indirect effect and 5th in case of immediate response) as it seems in the Figures 30 and 31

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CHAPTER 6: THE GREEK ECONOMIC POLICY UNCERTAINTY INDEX

6.1 INTRODUCTION

The Greek Economic Policy Uncertainty Index is constructed by Gikas Hardouvelis, George Karalas, Dimitrios Karanastasis, and Panagiotis Samartzis and run from January 1998 to the present in monthly level. The way of measurement is similar with the respect of America that described in chapter 2 and counts the number of articles that contain terms in the sets of “economy” “policy” and “Uncertainty”. The newspapers in which the articles must be published are “Kathimerini”, “Vima”, “Nea”, “Naftemporiki”. Moreover has been published some sub-indices that described later in the text.

6.2 THE EVOLUTION OF GREEK ECONOMIC POLICY UNCERTAINTY INDEX

In the first part of the sample (from 1998 to 2001) before Greece join the Monetary and Economic Union (EMU) the Index was in relatively high levels. Subsequently, though, during the period 2003-2007 the Index dropped reflecting the positive economic climate. Since the outbreak of the global economic crisis from 2009 the Index rose and maintained in high levels during the consecutive phases of Greek Crisis. Furthermore, the Index on average was by approximately 35% higher the period of 08/2007-12/2017 than it was the period 01/2012-7/2007.

From the observation of Figure 31 that displays the monthly evolution of the Index, we can infer that Index is getting high prices not only during events that related directly with our country but around major international events as well, especially prior to the Greek crisis, when the major peaks are driven mainly from international economic-policy developments. More analytically the index records important international events such as Russian Crisis, George Bush win in the Presidential election of 2000, 09/11 terrorist attack and Iraq War getting high values. The price of the Index around these mainly global events exceeded 150 and near Iraq War reached 180. Then followed a period where Index is maintained in low levels, reflecting the stability prevailing at local and international level.

After this period of stability, there was the outbreak of Global Financial Crisis that hit the index again above 150. From then on Index captures mainly significant local events such as the Greek bailout of 2010, the Plans for Referendum by Papandreou and the public discussion about it in 2011, the Greek double election in 2012, the election of 2015 and the actual referendum of 2015 with the price of the Index to exceed again 150. As we can see from the Figure 33 the Index records its highest level overtime in December 2014 after the failure to elect New President of Hellenic Republic and the snap election Notice reaching the price of 230 and remain

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in levels around 200 during elections of January 2015-Syriza win and Tsipras referendum. Then comes a sudden fall to return to levels close to 150 the period of Brexit and with the approval of 2017 budget by the parliament. Lastly, the latest high Index value has recorded the January of 2017 when the second review of the third bailout program is delayed and the Index approximate the price of 180

6.3 CORRELATION OF GREEK EPU INDEX WITH OTHER GLOBAL EPU INDICES

As it seems column 1 of table 15 the correlation of Greek EPU Index with other European and global EPU indices is quite high. This means that uncertainty is highly linked around the globe and it also influenced not only by local but by global events as well. Moreover, it means that the occurrence of a major event at a global level and the uncertainty that it causes can be disseminated and affect other countries worldwide. Analysing the correlation for periods of time that major political and economic events occurred is observed that during the time of global financial crisis the correlation are even higher, exceeding 90% when it is related to the Global.

On the other hand, during the first phase of Greek Crisis (October 2009 –November 2014) the correlations with other EPU indices shrunk in size (column 5 of table) with the sole exception of Spain where the correlation increased from 35.1% to 53.5%. (Spain was also in crisis period). Moreover, in the second phase of the Greek crisis (December 2014- December 2017) the correlation essentially collapsed especially those with indices outside Europe as it seems in column 5.

The explanations for these results are that Greek Crisis has his own idiosyncratic characteristics and the uncertainty continued to elevate with increased tend because of a prolonged recession, while other European and Global countries exhibit declined uncertainty. The last conclusion that we can infer from the drop in correlation is that Greek Crisis is no longer a serious source of concern for other Europeans, as in the periods 2010 and 2011 where the diffusion of uncertainty transformed Greek Crisis into EMU Crisis

6.4 INDICES OF POLITICAL AND ECONOMICAL UNCERTAINTY AND OTHER SUB-INDICES

In addition to creating EPU Index, was created also some additional indices. Two of them are broader than EPU Index and reflect wider categories of uncertainty(Economic Uncertainty index(EU) and Political Uncertainty Index((POLU), while the rest five are sub-indexes of EPU Index and refer to different economic and policy aspects.

6.4.1 Indices of Political and Economic Uncertainty Index

Economic Uncertainty Index(EU): In order to construct the index of Economic Uncertainty was used articles that refer the terms “economy”and “uncertainty” (that is the two first group of

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words of table 17) but not articles that contain the term “policy” and the relative 3st group of words . This is not means that EU Index is a sub-index of EPU Index but the oposite, EU reflect a wider category of Uncertainty. So the set of articles that satisfy the criteria for inclusion in EPU is a part of the set of articles for inclusion in EU. This happens because was captured broader aspects of Economic Uncertainty despite the fact the fact that there was minimization of policy dimension.

Political Uncertainty Index: For the construction of Political Uncertainty is mandatory an article to include at least one word related to uncertainty (that is from group of word 1 of table). Moreover it is not essential to contain word relatives to “Policy” and “Economy” (that is from group of word 2 and 3 of table) For this Index the words that an article must include capture more precisely the notion of “political Uncertainty”. These words are presented in the table 18

6.4.2 Sub- Indices of EPU

For the construction of sub-indices was used an additional criterion relative to those that must satisfied for EPU Index. Specifically the articles must contain a fourth group of terms that differs for each specific category that we focus on. The sub-indices of EPU are separated in five categories:

- Greek Monetary Policy Uncertainty Index(EPUM)
- Greek Currency Uncertainty Index(EPUC)
- Greek Banking Uncertainty Index(EPUB)
- Greek Pension Uncertainty Index(EPUP)
- Greek Fiscal Policy Uncertainty Index(EPUF) which is separated to the sub-indices of Greek Debt Uncertainty Index(EPUD) and Greek Tax Uncertainty Index(EPUT)

The groups of terms that each sub-category Index must contain are listed in table 18:

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6.5 EMPIRICAL STUDIES FOR GREECE -UNCERTAINTY AND GDP GROWTH

6.5.1 General

As in the case of other countries was made an attempt not only to estimate the Relation between EPU index and other sub-indices to GDP Growth but to calculate the Response of economic activity in the shocks of these Indices as well. So we firstly run a two-stage least squares model (using instrumental variables) using the same variables as in the previous regressions and then we run a VAR Model

6.5.2 Results of the Regression

The results of the regression showed that Greek EPU Index has also a negative and statistically significant relation to GDP Growth with coefficient -0.000210 and p-value equal to $0.056 < 0.10$. This means that an increase in EPU by 1 unit, the GDP Growth will be decreased by 0.0210% and vice versa, so if Index rises by 10 the GDP Growth will be reduced by 0.210% . Additionally, for Economic Uncertainty (EU) the magnitude and the level of significance of their coefficients are close to EPU Index something logical as these Indices are highly correlated.

In accordance with the other sub-indices, the coefficients of Currency Uncertainty (EPUC) and are Banking Uncertainty (EPUB) are also statistical and Greek Debt Uncertainty Index (EPUD) significant and seems to dominate indicating their important role as a dimension of general EPU Index. This is something logical because Currency Uncertainty reflects the fears about Grexit, Banking Uncertainty the financial distress and Debt Uncertainty the fears about the sovereign debt and its settlement. The results of the Regressions with the coefficients and their respective p-values are presented in the table 19

6.5.3 Results of VAR Analysis

Furthermore, as we refer was run a quarterly VAR of three Variables (GDP Growth, Investment Ratio and EPU Index) as in the case of other countries. From the analysis, we find that the Impulse Responses are similar in the case of immediate and indirect effect. Furthermore, there is a coincidence of the VAR Results with those of the regressions that presented above. Specifically, GDP Growth appears to have the greatest impulse response to a shock on EPU, EU, EPUC, EPUB, EPUD something that agrees with the regression that examined the relation. Moreover, economic activity does not react so strongly to a shock in EPUM, EPUP, and EPUT and these results are in agreement with those of the regression in which these sub-indices had no statistically significant relationship with Growth. The only sub-Index in which it seems to there is imbalance is EPUF the increase of which cause a relatively strong reduction on Growth, while in the previous regression showed p-value > 0.10 and it was not statistically insignificant. The results of the VAR analysis are presented in table 20 and in Figure 33 is presented the response after a shock to uncertainty

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CONCLUSION

Uncertainty is an important factor that affects the economic activity and is negatively correlated with macroeconomic variables.(Growth, Investment Industrial production, Unemployment. For these reasons efforts have been made to quantify it and two of the major indices that used are Volatility Index (VIX) and the Economic Policy Uncertainty Index that is available for almost 20 countries. Moreover the fact that Economic Policy Uncertainty Indices are highly correlated to each other indicates that Uncertainty is linked around the globe. So major global events that occur in a country can spread across Uncertainty to other countries and affect the economic activity of them. This is not always the norm as we saw in table 14 the two phases of the Greek crisis had little effect on other global uncertainty indices (in this time the correlation was low).

Additionally, as we refer the EPU Index and Growth are negatively related. This conclusion it follows from the regressions that run in global level by examining data in panel form. Similar results (that is a negative correlation) have emerged and in the case we construct a global time-series. With respect to the Individual countries and regions Uncertainty has a greater impact on European and American continent and less on Asian plus Australia(With exception of China and India). In the majority of the European countries, Uncertainty has a significant impact on Growth except for the United Kingdom, Germany, and Sweden in which economies are more stable. Specifically, the greatest impulse Response appears in Ireland, while characteristic is the case of Spain in which the reaction remains for longer period of time compared to all other countries. In Italy and the Netherlands the shocks have a relatively high response, appearing at the same time strong relation. In France and Russia, though, despite the strong relation the reactions to a shocks in uncertainty are low. In American countries Unites States, Canada and Brazil have significant p-values and in Brazil also happens one of the greatest impulse responses.

Lastly in Greece uncertainty also plays an important role and has a negative impact on economic activity, as follows from the regression and the Var analysis that made. Moreover, from the categorical EPU Indices, the greatest impact had Currency Uncertainty as reflects the fears about Grexit, the Banking Uncertainty reflects the financial distress and Debt Uncertainty the fears about the sovereign debt and its settlement.

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TABLES

Table1: The Variables and the sources of data

Variables	Description
Y(GDP Growth)	Gross Domestic Product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. For this variable, data was gathered from Eikon Database for GDP value at constant prices and GDP growth of quarter t is the annualized growth of GDP from quarter t-1 to quarter t.
X ₁ (Economic Policy Uncertainty Index)	The data for the Economic Policy Uncertainty Index was gathered from its official site. (http://www.policyuncertainty.com/europe_monthly.html .) The Index is published every month. In our quarterly sample was used the last month of the quarter
X ₂ (Investment Ratio)	For the construction of this index data was collected from EIKON database for the Gross Fixed Capital Formation (GFCF) Indicator and for the GDP values at constant prices and calculate the investment ratio for each of the country that we include in the analysis
X ₃ (Government Consumption)	Government spending measured by day-to-day expenditures on education, health and defense. This indicator is the ratio of government spending to GDP Value at nominal values and data was extracted again from Eikon Database for quarterly periods.
X ₄ (Trade openness)	Trade openness is an economic indicator calculated as the ratio of a country's total trade, sum of exports plus imports to the real GDP. For this variable was gathered data for exports, imports and GDP value from EIKON database at standardized constant prices(quarterly time-series)) and was calculated the trade openness
X ₅ (terms of trade)	The terms of trade represents the prices of the exports of a country relative to the prices of its imports; the ratio is calculated by dividing the price of the exports by the imports, with the result then being multiplied by 100.

Note: The sample consists of 18 countries that determined by the availability of data for Economic Policy uncertainty Index until February 2017. The only country to be excluded was Chile because we did not have adequate data for all the other variables.

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Table 2: The countries and the periods for which data extracted

Country/Region	EPU index	Other Variables
Global	March 1998-June 2017	1 st quarter 1998-2 st quarter 2017
Europe	June 2001-June 2017	2 st quarter 2001-2 st quarter 2017
Asia	June 2003-June 2017	2 st quarter 2003-2 st quarter 2017
America	December 1996-June 2017	4 st quarter 1996-2 st quarter 2017
Australia	March 1998-June 2017	1 st quarter 1998-2 st quarter 2017
Brazil	September 1996-June 2017	3 st quarter 1996- 2 st quarter 2017
Canada	September 1996- June 2017	3 st quarter 1996- 2 st quarter 2017
Chile	September 1996- June 2017	3 st quarter 1999- 2 st quarter 2017
France	September 1999- June 2017	3 st quarter 1999-2 st quarter 2017
Germany	September 1996- June 2017	3 st quarter 1999- 2 st quarter 2017
India	December 2004- June 2017	4 st quarter 2004-2 st quarter 2017
Ireland	June 1998- June 2017	2 st quarter 1998-2 st quarter 2017
Italy	June 1997- June 2017	2 st quarter 1997-2 st quarter 2017
Japan	September 1996- June 2017	3 st quarter 1996-2 st quarter 2017
South Korea	September 1996- June 2017	3 st quarter 1996- 2 st quarter 2017
Mexico	September 1996- June 2017	3 st quarter 1996-2 st quarter 2017
Netherlands	September 2003- June 2017	3 st quarter 2003- 2 st quarter 2017
Russia	September 2003- June 2017	3 st quarter 2003- 2 st quarter 2017
Sigapore	June 2003- June 2017	2 st quarter 2003- 2 st quarter 2017
Spain	June 2001- June 2017	2 st quarter 2001- 2 st quarter 2017
Sweden	September 1996- June 2017	3 st quarter 1996- 2 st quarter 2017
UK	September 1998 - June 2017	3 st quarter 1998- 2 st quarter 2017
USA	December 1996 - June 2017	4 st quarter 1997- 2 st quarter 2017

Notes: 1) As mentioned in Table 1 in the description the EPU Index is published every month in our sample we use the last observation of the quarter

2) The column “All variables” includes among others the GDP Growth at time t . So for this variable we extract data for a quarter earlier in order to calculate the annualized GDP from quarter $t-1$ to quarter t

3) Global EPU Index is a weighted-average of all national EPU Indices (Australia, Brazil, Canada, Chile, China, France, Germany, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, United Kingdom and the United States). Data for this Index was extracted directly from its official site

(http://www.policyuncertainty.com/europe_monthly.html). For the calculation of Global GDP Growth was used a weighted coefficient for each country based on the nominal GDP values. This coefficient was multiplied with the GDP Growth of each country and making the sum of all countries we end up in a time-series of Global GDP Growth. In the same way as GDP Growth we worked for the other variables of the regression

5) Similarly the European Index of Economic Policy Uncertainty was extracted directly from its official site and is constructed based on the 5 of the largest countries of European area (France, Germany, Spain, Italy, United Kingdom), while for the other variables of these countries the weighted-average (based on GDP values) of growth rate and of other variables of the model as in the case of global variables

6) For the Asian and American continent the same applies for all the variables, with the only difference that the EPU Index for these regions was not directly extracted from its official site but constructed as the weighted average EPU Indices of the countries corresponding to each country

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Table 3: Results of Granger causality tests for existence reverse causality between the variables of the model(panel data)

<u>Pairwise Granger Causality Tests using 2 lags</u>				
<i>Null Hypothesis</i>	<i>F statistic</i>	<i>P-value</i>	<i>Result</i>	<i>Conclusion</i>
GDP Growth does not Granger Cause Investment Ratio	19.8071	3.E-09<0.10	Reject Null	<u>There is problem</u> of reverse causality between the variables GDP Growth and Investment Ratio
Investment Ratio does not Granger Cause GDP Growth	50.0262	1.E-21<0.10	Reject Null	
GDP Growth does not Granger Cause Government Consumption	13.8768	1.E-06<0.10	Reject Null	<u>There is problem</u> of reverse causality between the variables GDP Growth and Government Consumption
Government consumption does not Granger Cause GDP Growth	52.0978	2.E-22<0.10	Reject Null	
GDP Growth does not Granger cause Trade Openness	11.3307	1.E-05<0.10	Reject Null	<u>There is no problem</u> of reverse causality between GDP Growth and Trade Openness because we accept Null Hypothesis that Trade Openness does not Granger cause GDP Growth
Trade Openness does not Granger Cause GDP Growth	0.38965	0.6774>0.10	Accept Null	
GDP Growth does not Granger Cause Terms of Trade	2.58732	0.00756<0.1 0	Reject Null	<u>There is no problem</u> of reverse causality between GDP Growth and Adjusted Terms of Trade because we accept Null Hypothesis that Terms of Trade does not Granger cause GDP Growth
Terms of trade does not Granger Cause GDP Growth	1.04325	0.3536>0.10	Accept Null	

Note: 1) Variable definitions in Table 1. Countries and sample periods in table 2

2) The variables “Investment Ratio” and “Government Consumption” appears to have reverse causality with GDP Growth. In order correct this problem which is a form of endogeneity we add lag values in the 2-stage Least Squares Model. Specifically for the variable “Investment Ratio” we add lag and the instrument list includes the investment ratio over the four previous quarters but not the contemporaneous value. The same applies for “Government Consumption” adding lag values for the three previous quarters but not for the contemporaneous Government Ratio

3) The change in the adjusted terms of trade depend primarily on world conditions and is regarded as exogenous with the contemporaneous economic growth and is therefore appear in the instrument list, adding lag values for the three previous periods included the contemporaneous value

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Table 4: Results of Unit-root Tests for the variables that used in the panel

Im, Pesaran and Swin W-Stat Criterion for Unit-root(panel data)			
Variables	Null Hypothesis	p-value	Result
GDP Growth	Unit-root(assume individual unit-root process)	0.0000<0.10	Reject Null-no unit-root
EPU Index	Unit-root(assume individual unit-root process)	0.0000<0.10	Reject Null-no unit-root
Government Consumption	Unit-root(assume individual unit-root process)	0.0072<0.10	Reject Null-no unit-root
Investment ratio	Unit-root(assume individual unit-root process)	0.0411<0.10	Reject Null-no unit-root
Adjusted term of trade	Unit-root(assume individual unit-root process)	0.0000<0.10	Reject Null-no unit-root
Trade openness	Unit-root(assume individual unit-root process)	0.6136>0.10	Accept Null-unit-root
First difference of Trade Openness	Unit-root(assume individual unit-root process)	0.0000<0.10	Reject Null-no unit-root

Note: Variables definitions in table 1. Countries and sample periods in table 2

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Table 5: Correlation Matrix for testing multicollinearity between the variables

CORRELATION MATRIX					
	TRADE OPENNESS	EPU INDEX	GOVERNMENT CONSUMPTION	INVESTMENT RATIO	TERMS OF TRADE
TRADE OPENNESS	1.00	-0.055	-0.014	-0.005	-0.008
EPU INDEX	-0.055	1.00	0.069	-0.096	-0.032
GOVERNMENT CONSUMPTION	-0.014	0.069	1.00	-0.494	0.019
INVESTMENT RATIO	-0.005432	-0.0067	-0.494	1.00	-0.034
TERMS OF TRADE	-0.008190	0.01307	0.019226	0.006717	1.0000

Note: Variables definitions in table 1. Countries and sample periods in table 2

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Table 6: Tests for Heteroscedasticity, Normality at Residuals and tests relative to the panel regression

Test	Null Hypothesis	P-value	Result
White Test	No heteroscedasticity	0.0825 > 0.10	Reject Null- Heteroscedasticity but marginally
Normality Test for Residuals	Residuals are Normally distributed	0.0008 < 0.10	Reject Null-Normality
Poolability test	The groups have a common intercept. (So we must examine each country individually)	0.0001 < 0.1	Reject Null-panel analysis
Hausman test	The GLS estimators are consistent-Random Effects	0.85 > 0.1	Accept Null –Random effects
Sargan test	The instrumental variables valid are valid	0.2562 > 0.10	Accept Null-valid instruments

Notes: 1) Note: Variables definitions in table 1. Countries and sample periods in table 2

2) Tests for heteroscedasticity and Normality at Residuals. Moreover tests examine if we must run panel data analysis, Random or fixed effects and if the instruments (placing lag values of the variables) are valid

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Table 7: The independent variables of the panel regression with their coefficients and their statistical significance (based on p-values)

Variable	Coefficients	p-value	Result	Relation of uncertainty to GDP Growth
X₁(Economic Policy Uncertainty Index)	-0.00531	0.00971<0.10	Reject null for significance level 1%	Negative and <u>highly strong</u> statistical significant Relation
X₂(Investment Ratio)	0.031717	0.01<0.02118<0.1	Reject Null for significance level 5%	Positive and strong statistical significant Relation
X₃(Government Consumption)	-0.041880	0.01<0.0207<0.1	Reject Null for significance 5%	Negative and strong statistical significant Relation
X₄(Trade openness)	0.0302	0.01<0.03732<0.1	Reject Null for significance 5%	Positive and strong statistical significant Relation
X₅(terms of trade)	-0.0353	0.01<0.0353<0.1	Reject Null for significance 5%	Negative and strong statistical significant Relation

Notes:1)The results of panel regression in which we use the 2-stage least squares model using the instrumental variable technique with the lags that refers to the notes of table 3

2) If p-value>0.10 accept Null hypothesis: there is no statistical significance relation

If P-value< 0.10 Reject Null for significance level 10%

If P-value<0.05 Reject Null for significance level 5%

If P-value< 0.01 Reject Null for significance level 1%

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Table 8: Unit-root tests for Global time-series

Augmented Dickey-Fuller test for Unit-roots(GLOBAL time-series)			
Variable	Null Hypothesis	P-value	Result
GDP Growth	Unit-root	0.0005<0.10	Reject Null-No unit-root
Global EPU Index	Unit-root	0.0940 >0.10	Reject Null-No unit-root
Investment Ratio	Unit-root	0.8164>0.10	Accept Null-Unit-root
First difference of Investment Ratio	Unit-root	0.0000<0.10	Reject Null-No unit-root
Government Consumption	Unit-root	0.1801>0.10	Accept Null-Unit-root
First difference of Government consumption		0.0000<0.10	Reject Null-No unit-root
Trade Openness	Unit-root	0.3006>0.10	Accept Null-Unit-root
First difference of trade openness	Unit-root	0.095 <0.10	Reject Null-No unit-root
Terms of trade	Unit-root	0.0015<0.10	Reject Null-No unit-root

Note: 1) Variables definitions of table 1 and sample period in table 2 that refers only to Global time-series

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Table 9: The Relation of Uncertainty to GDP Growth (using time-series regressions and the 2-Stage Least Squares Model) for all the countries (GLOBAL), for European continent and for each European country separately

Region /Country	Coefficient	P-Value	Results	Relation of Uncertainty to Growth of the next quater
Global	-0.0000293	0.0755<0.10	Reject Null for significance level 10%	Negative and Statistical significant Relation
Europe	-0.0000163	0.0818<0.10	Reject Null for significance level 10%	Negative and Statistical significant Relation
Germany	-0.0000112	0.4351>0.10	Accept Null	Negative but minimal Relation
France	-0.0000323	0.0306<0.05	Reject Null for Significance level 1%	Negative but strong Statistical significant Relation
Italy	-0.0000542	0.0632<0.10	Reject Null for significance level 10%	Negative and Statistical significant Relation
United Kingdom	-0.0000569	0.032>0.10	Accept Null	Negative but not Statistical significant Relation
Spain	-0.000289	0.058<0.10	Reject Null for significance level 5%	Negative and highly strong Statistical significant Relation
Nederland	- 0.000242	0.0052<0.01	Reject Null for significance level 1%	Negative and highly strong statistical significant
Ireland	-0.000294	0.0012<0.01	Reject Null for significance level 1%	Negative and highly statistical significant Relation
Russia	-0.000054	0.0523<0.01	Reject Null for significance level 1%	Negative and highly statistical significant Relation
Sweden	-0.002332	0.1572>0.10	Accept Null	Negative but not statistical significant Relation

Note: Variables definitions of table 1 and sample periods in table 2 (For Global Time-series, European region and each European country individually)

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Table 10: The Relation of Uncertainty to Growth (using time-series regressions and the 2-Stage Least Squares Model) for Asian continent plus Australia and for each country separately.

Region/Country	Coefficient	P-Value	Results	Relation of Uncertainty to Growth of the next quarter
Asia + Australia	-0.0000432	0.1931 > 0.10	Accept Null	Negative but not statistical significant Relation
China	-0.000314	0.0015 < 0.01	Reject Null for significance level 1%	Negative and highly strong statistical significant Relation
Korea	-0.0000172	0.1543 > 0.10	Accept Null	Negative but not statistical significant Relation
India	-0.0000192	0.0907 > 0.10	Reject Null for significance level 10%	Negative and strong statistical significant Relation
Singapore	-0.0000913	0.1378 > 0.10	Accept Null	Negative but marginally not statistical significant Relation
Japan	-0.0004325	0.4676 > 0.10	Accept Null	Negative but not statistical significant Relation
Australia	-0.0000134	0.2542 > 0.10	Accept Null	Negative but not statistical significant Relation

Notes: Variables definitions in table 1 and sample periods in table 2 (For Asian continent plus Australia and each Asian country individually)

Notes: If p-value > 0.10 accept Null hypothesis: there is no statistical significance relation

If P-value < 0.10 Reject Null for significance level 10%

If P-value < 0.05 Reject Null for significance level 5%

If P-value < 0.01 Reject Null for significance level 1%

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Table 11: The Relation of Uncertainty to Growth (using time-series regressions and the 2-Stage Least Squares Model) for American continent

Region/Country	Coefficient	P-value	Result	Relation of Uncertainty to Growth
America	-0.0004321	0.0845<0.1	Reject Null for significance level 10%	Negative and statistical significant Relation
Unites States	-0.0006423	0.015<0.01	Reject Null for significance level 1%	Negative and highly strong statistical significant Relation
Canada	-0.0001243	0.0321<0.05	Reject Null for significance level 5%	Negative and strong statistical significant Relation
Brazil	-0.0000424	0.0912<0.1	Reject Null for significance level 5%	Negative and statistical significant Relation
Mexico	-0.0000123	0.6913>0.1	Accept Null	Negative but minimal Relation

Note : Variables definitions in table 1 and sample periods in table 2(For American region and each country individually

Notes: If p-value>0.10 accept Null hypothesis: there is no statistical significance relation

If P-value< 0.10 Reject Null for significance level 10%

If P-value<0.05 Reject Null for significance level 5%

If P-value< 0.01 Reject Null for significance level 1%

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Table 12: Results of the regressions for the Relation of each categorical EPU Index to GDP Growth (USA)

Categorical EPU Indices for US	Coefficient	p-value	Result	Relation of Uncertainty to Growth of the next quarter
Monetary Policy	-0.007321	0.0067<0.01	Reject Null for significance level 1%	Negative and highly strong statistical significant Relation
Fiscal Policy	-0.00132	0.375>0.10	Accept Null	Negative but not statistical significant Relation
Taxes	-0.00353	0.255>0.10	Accept Null	Negative but not statistical significant Relation
Government Consumption	-0.00253	0.6763>0.10	Accept Null	Negative but minimal Relation
Health Care	+0.000229	0.8331>0.10	Accept Null	Positive and minimal Relation
National Security	-0.000459	0.6666>0.10	Accept Null	Negative but minimal Relation
Entitlement Programmes	+0.000321	0.6667>0.10	Accept Null	Positive but minimal Relation
Regulation	+0.000921	0.8514>0.10	Accept Null	Positive but minimal Relation
Financial Regulation	-0.00321	0.0288<0.05	Reject Null for significance level 5%	Negative and highly statistical significant Relation
Trade Policy	-0.000421	0.3673>0.10	Accept Null	Negative but not statistical significant Relation
Sovereign Debt, currency crises	+1.36E0.5	0.6013>0.10	Accept Null	Positive and minimal Relation

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Table 13: The results of Vector Autoregressive Model that examine the Impulse Response of GDP Growth after a shock on uncertainty for each region or country separately

<i>Impulse Response of GDP Growth after a shock in EPU Index</i>					
Results of VAR Model by region or country placing GDP Growth and Investment Ratio before EPU Index assuming in this way indirect response					
Region/Country	2 st quarter	3 st quarter	4 st quarter	5 st quarter	6 st quarter
GLOBAL	-0.05%	-0.05%			
European Union	-0.05%	-0.07%	-0.06%		
Asia	-0.014%				
Australia					
Brazil	-0.29%				
Canada	-0.07%				
China	-0.075%	-0.075%			
France	-0.057%	-0.059%			
Germany	-0.17%				
India	-0.082%	-0.1%			
Ireland	-0.82%				
Italy	-0.157%	-0.156%			
Japan	+0.01%	-0.14%			
Mexico	-0.17%				
The Netherlands	-0.14%				
RUSSIA	-0.1%	-0.095%			
Sigapore	-0.17%				
Spain	-0.04%	-0.059%	-0.060%	-0.061%	-0.060%
USA	-0.05%	-0.08%	-0.07%		
United Kingdom	-0.02%	-0.03%			

Note: 1) For the above Regressions was used the variables GDP Growth, Investment Ratio and EPU Index for the time-periods that described in table 2

2) We assume no direct effect placing macro-variables GDP Growth and Investment Ratio before EPU Index in the regression.

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Table 14: The results of Vector Autoregressive Model that examine the Impulse Response of GDP Growth after a shock in uncertainty for each region or country separately

<i>Impulse Response of GDP Growth after a shock in EPU Index</i>					
Results of VAR Model by region or country in which we place GDP Growth and Investment Ratio after EPU Index assuming in this way					
immediate response					
Region/Country	1st quarter	2st quarter	3st quarter	4st quarter	5 quarter
GLOBAL	-0.18%	-	-		
European Union	-0.06%	-0.09%	-0.09%		
Asia	-0.017%				
Australia	-0.05%				
Brazil	-0.36%	-0.36%			
Canada	-0.05%	-0.13%			
China	-0.05%	-0.08%			
France	-0.062%	-0.062%			
Germany	-0.025%	-0.14%			
Ireland	-0.39%	-0.87%			
Italy	-0.14%	-0.176%	-0.174%		
India	-0.11%	-0.13%			
Japan	-0.15%				
Mexico	-0.095%				
Netherlands	-0.35%				
RUSSIA	-0.01	-0.11%	-0.1%		
Singapore	-0.14%	-0.21%			
Spain	-0.04%	-0.075%	-	-0.091%	-0.092%
			0.090%		
USA	-0.25%				
United kingdom	-0.012%	-0.032%			

Note:1) 1)For the above Regressions was used the variables GDP Growth Investment Ratio and EPU Index for the time-periods that described in table 2

2)We assume immediate effect placing Investment Ratio and GDP Growth after EPU Index in the regression

Economic Growth and Uncertainty

Table 15 : Correlation among Greek and other Global EPU Indices

<u>Correlation among Greek and other Global EPU Indices</u>				
Country/Region	01/1998- 12/2017 (All the sample)	08/2007- 12/2017 (Global financial Crisis)	10/2009- 11/2014(1 st phase of Greek Crisis)	12/2014- 12/2017(2 st phase of Greek Crisis)
USA	46.6%	78.8%	32.4%	7.8%
European Union	59%	74.3%	50.3%	0.5%
Global	57.9%	90.5%	42.9%	0.5%
Germany	53.2%	58%	35%	18.6%
France	53.2%	62.2%	44.2%	6.8%
Italy	45.2%	56.6%	27.1%	19.7%
Spain	46.5%	45.1%	53.5%	-3.4%
United Kingdom	43.2%	66.7%	40.9%	-18.2%

Economic Growth and Uncertainty

Table16: Group of Words for the construction of Greek EPU INDEX

Group	English translation	Greek term
1	"uncertainty" or "uncertain"	"αβεβαιότητα" or "ανησυχία" or "ανασφάλεια"
1	"fear"	"φόβος"
2	"economy" or "economic"	"οικονομία" or "οικονομικό"
3	"reforms"	"μεταρρυθμίσεις"
3	"structural changes"	"διαρθρωτικές αλλαγές"
3	"legislation" or "legislative"	"νομοθεσία" or "νομοθετικό"
3	"Bank of Greece"	"Τράπεζα της Ελλάδος"
3	"European Central Bank"	"Ευρωπαϊκή Κεντρική Τράπεζα"
3	"government"	"κυβέρνηση"
3	"parliament"	"βουλή"

Notes: Three groups of words are considered: 1, 2 and 3. The number (frequency) of articles containing at least one word from each of the three groups is used to construct the Economic Policy Uncertainty Index (EPU). If an article contains words solely from the first two groups, it would count in the construction of the broader Economic Uncertainty Index

Source: Gikas A. Hardouvelis* Georgios I. Karalas** Dimitrios I. Karanastasis* Panagiotis K. Samartzis (3 April 2018) "Economic Policy Uncertainty, Political Uncertainty and the Greek Economic Crisis"

Economic Growth and Uncertainty

Table 17: Term Groups for the Greek political uncertainty Index

Group	English term	Greek term
Political Uncertainty (POLU)		
2	"politics"	"πολιτική"
2	"elections"	"εκλογές"
2	"government"	"κυβέρνηση"
2	"prime minister"	"πρωθυπουργός"
2	"ministry"	"υπουργείο"
2	"reshuffle"	"ανασχηματισμός"
2	"opposition party"	"αντιπολίτευση"
2	"polls"	"δημοσκοπήσεις"
2	"political party"	"πολιτικό κόμμα"
2	"trade union"	"συνδικάτο"
2	"unionism"	"συνδικαλισμός"

Source: Gikas A. Hardouvelis* Georgios I. Karalas** Dimitrios I. Karanastasis* Panagiotis K. Samartzis (3 April 2018) "Economic Policy Uncertainty, Political Uncertainty and the Greek Economic Crisis"

Economic Growth and Uncertainty

Table 18: Term Groups for the Greek specific Policy Uncertainty Sub-Indices

Group	English term	Greek term
Fiscal Policy Uncertainty (EPUF)		
4	"government spending"	"δημόσιες δαπάνες"
4	"budget"	"προϋπολογισμός"
4	"deficit"	"έλλειμμα" - "ελλειμματικό"
4	"sovereign debt"	"δημόσιο χρέος"
4	"allowance"	"επίδομα"
4	"taxes" or "tax"	"φόροι" ή "φόρος"
4	"taxation"	"φορολογικό"
4	"taxation"	"φορολογία"
4	"value added tax"	"ΦΠΑ"
4	"taxed"	"φορολογηθέν"
Debt Policy Uncertainty (EPUD)		
4	"government spending"	"δημόσιες δαπάνες"
4	"budget"	"προϋπολογισμός"
4	"deficit"	"έλλειμμα" - "ελλειμματικό"
4	"sovereign debt"	"δημόσιο χρέος"
Tax Policy Uncertainty (EPUT)		
4	"allowance"	"επίδομα"
4	"taxes" or "tax"	"φόροι" ή "φόρος"
4	"taxation"	"φορολογικό"
4	"taxation"	"φορολογία"
4	"value added tax"	"ΦΠΑ"
4	"taxed"	"φορολογηθέν"
Monetary Policy Uncertainty (EPUM)		
4	"cost of money "	"κόστος χρήματος"
4	"money circulation "	"κυκλοφορία χρήματος"
4	"monetary policy"	"νομισματική πολιτική"
4	"interest rates" or "interest rate"	"επιτόκια" or "επιτόκιο "
Currency Uncertainty (EPUC)		
4	"exchange rate"	"ισοτιμία"
4	"drachma" ⁵⁶	"δραχμή"
4	"Eurozone"	"Ευρωζώνη"
4	"national currency"	"εθνικό νόμισμα"
4	"appreciation"	"ανατίμηση"
4	"depreciation"	"υποτίμηση"
Banking Uncertainty (EPUB)		
4	"banks" or "bank"	"τράπεζες" ή "τράπεζα"
4	"banking sector "	"τραπεζικός τομέας"
4	"deposits"	"καταθέσεις"
4	"loans"	"δάνεια"
Pension Uncertainty (EPUP)		
4	"pensions"	"συντάξεις" - "συνταξιοδοτικό"
4	"insurance policy "	"ασφαλιστικό"
4	"pension cuts"	"περικοπές συντάξεων"
4	"social insurance"	"δημόσια ασφάλιση"
4	"insurance contributions"	"ασφαλιστικές εισφορές"
4	" insurance fund"	"ασφαλιστικό ταμείο"
4	"lump sum"	"εφάπαξ"

Source: Gikas A. Hardouvelis* Georgios I. Karalas** Dimitrios I. Karanastasis* Panagiotis K. Samartzis (3 April 2018) "Economic Policy Uncertainty, Political Uncertainty and the Greek Economic Crisis"

Economic Growth and Uncertainty

Table 19: The Relation of Uncertainty to GDP Growth (using time-series regressions and the 2-Stage Least Squares Model) for each Greek specific-category Index

Specific-Category Index	Coefficient	p-values	Results	Relation of Index to GDP Growth
Economic Policy Uncertainty Index(EPU)	-0.000210	0.056<0.1	Reject Null for significance level 10%	Negative and statistical significant Relation
Greek Economic Uncertainty Index(EU)	-0.000217	0.0470<0.05	Reject Null for significance level 5%	Negative and strong statistical Relation
Greek Banking Uncertainty Index(EPUB)	-0.000210	0.0591<0.1	Reject Null for significance level 10%	Negative and statistical significant Relation
Greek currency Uncertainty Index(EPUC)	-0.000918	0.0932<0.1	Reject Null for significance level 5%	Negative and strong statistical Relation
Greek Debt Uncertainty Index(EPUD)	-0.000157	0.0244<0.05	Reject Null for significance level 5%	Negative and strong statistical Relation
Greek fiscal Policy Uncertainty Index (EPUF) (tax+debt)	-0.000140	0.2>0.1	Accept Null	Negative but not statistical significant Relation
Greek Monetary Policy Uncertainty Index(EPUM)	-0.00010	0.3039>0.1	Accept Null	Negative but not statistical significant Relation
Greek Pension Uncertainty Index(EPUP)	-0.000189	0.1868>0.1	Accept Null	Negative but not statistical significant Relation
Greek Tax Uncertainty Index(EPUT)	-0.000104	0.46>0.1	Accept Null	Negative but not statistical significant Relation

Notes: For the above Regressions the same variables were used as for the rest of the countries. With regard to the time period, the data extracted from from 1st quarter of 1998 to the 2st quarter of 2018 for all the variables, while for EPU Index from January 1998 to June 2017

Economic Growth and Uncertainty

Table 20: The results of Vector Autoregressive Model that examine the Impulse Response of GDP Growth after a shock in uncertainty (EPU and its sub-indices).

The impulse Response of GDP Growth after a shock to Uncertainty			
<i>Specific-Category Index</i>	Indirect Response	Immediate Response	
	2 st quarter	1 st quarter	2 st quarter
Economic Policy Uncertainty Index(EPU)	-0.0043	-0.0022	-0.0040
Greek Economic Uncertainty Index(EU)	-0.0039	-0.0023	-0.0035
Greek Banking Uncertainty Index(EPUB)	-0.0038	-0.0029	-0.0042
Greek currency Uncertainty Index(EPUC)	-0.0045	-0.0031	-0.0033
Greek Debt Uncertainty Index(EPUD)	-0.0052	-0.0023	-0.005
Greek fiscal Policy Uncertainty Index (EPUF) (tax+debt)	- 0.0040	-0.0031	-0.0032
Greek Monetary Policy Uncertainty Index(EPUM)	-0.0029	-0.0009	-0.0029
Greek Pension Uncertainty Index(-0.0029	-0.0011	-0.002
Greek Tax Uncertainty Index(EPUT)	-0.0022	-0.0026	-

Notes:1)For this Regression was used the variables GDP Growth, Investment Ratio and EPU Index

2) In column “Indirect effect” we assume no direct effect placing macro-variables GDP Growth *before* EPU Index in the regression

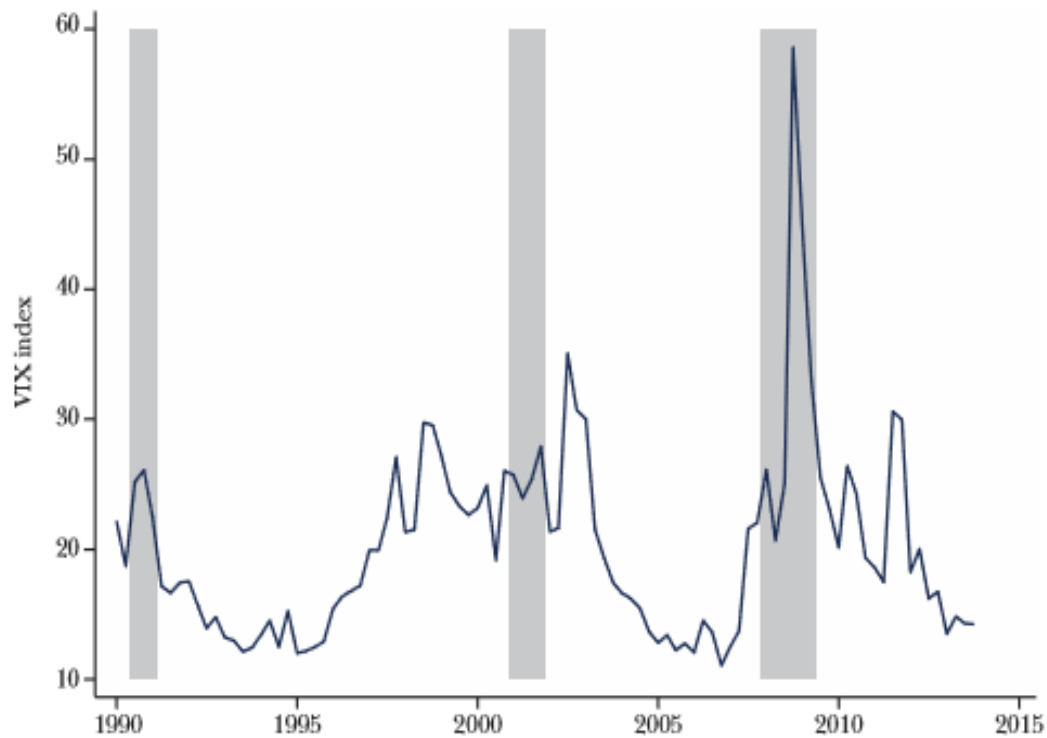
3)In the two last columns we assume immediate effect placing Investment Ratio and GDP Growth *after* EPU Index in the regression

Economic Growth and Uncertainty

FIGURES

Figure 1: Stock Price Implied Volatility overtime

Stock-Market Implied Volatility is Higher in Recessions



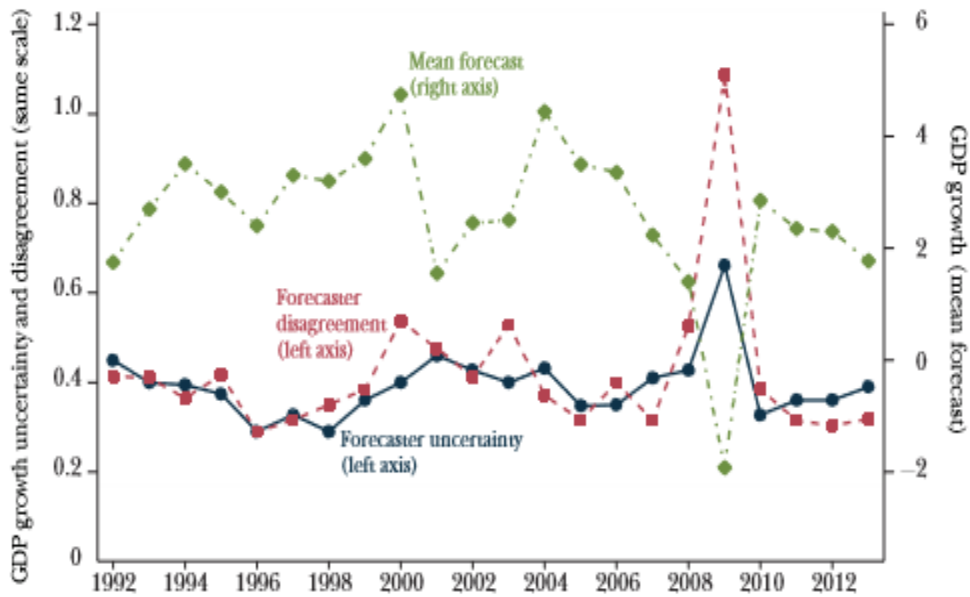
Source: Author using data from the Chicago Board of Options and Exchange.

Notes: Figure 1 shows the VIX index of 30-day implied volatility on the Standard & Poor's 500 stock market index. The VIX index is traded on the Chicago Board Options Exchange. It is constructed from the values of a range of call and put options on the Standard & Poor's 500 index, and represents the market's expectation of volatility over the next 30 days. Gray bars are NBER recessions.

Economic Growth and Uncertainty

Figure 2: Growth Forecaster Uncertainty and Disagreement

GDP Growth Forecaster Uncertainty and Disagreement Both Rose Significantly during the Great Recession

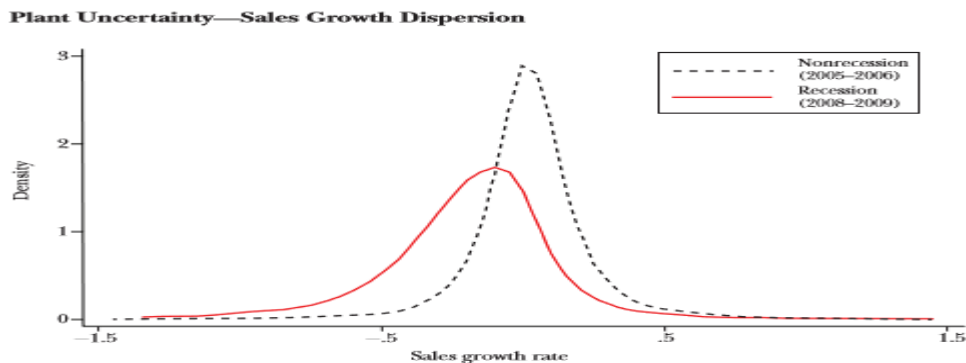


Source: Author using data on the forecaster probability distributions of GDP growth rates from the Philadelphia Survey of Professional Forecasters.

Notes: “Mean forecast” is the average forecaster’s expected GDP growth rate, “Forecaster disagreement” is the cross-sectional standard deviation of forecasts, and “Forecaster uncertainty” is the median within forecaster subjective variance. Data are only available on a consistent basis since 1992Q1, with an average of 48 forecasters per quarter.

Economic Growth and Uncertainty

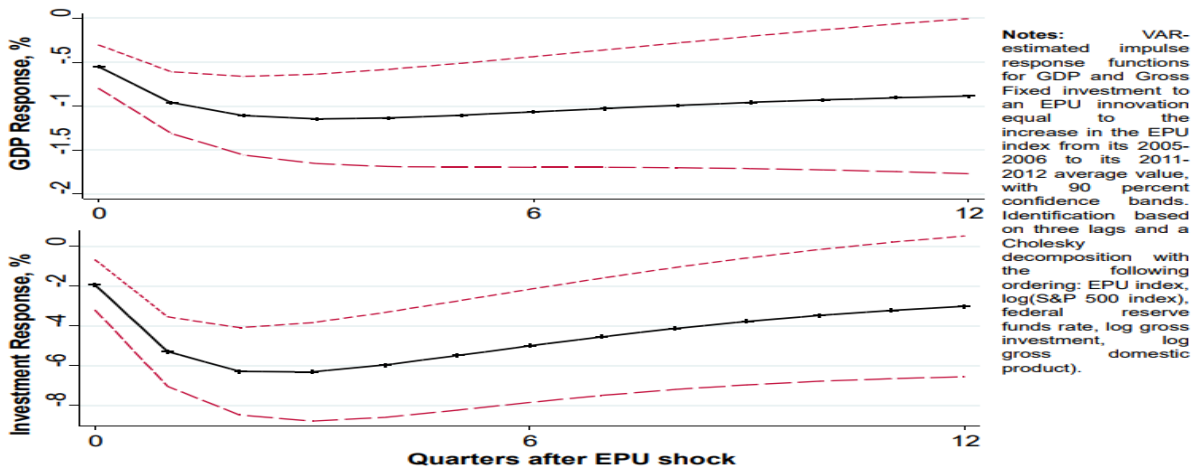
Figure 3: Sales Growth Dispersion (within recession and non-recessions)



Source: Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry (2012).
 Notes: Figure 5 plots the dispersion of sales growth rates for a panel of plants within the US manufacturing for Great Recession of 2008–2009 (the solid line) against their values for the pre-recession period of 2005–2006 (the dashed line). Constructed from the Census of Manufactures and the Annual Survey of Manufactures using a balanced panel of 15,752 establishments active in 2005–2006 and 2008–2009. Moments of the distribution for nonrecession (recession) years are mean 0.026 (–0.191), variance 0.052 (0.131), coefficient of skewness 0.164 (–0.330), and kurtosis 13.07 (7.66). The year 2007 is omitted because according to the NBER the recession began in December 2007, so 2007 is not a clean “before” or “during” recession year.

Figure 4 : GDP and Investment Responses to USA EPU Index Shock

Figure C6: GDP and Investment Responses to EPU Shock, VAR Fit to Quarterly U.S. Data from Q1 1985 to Q4 2012

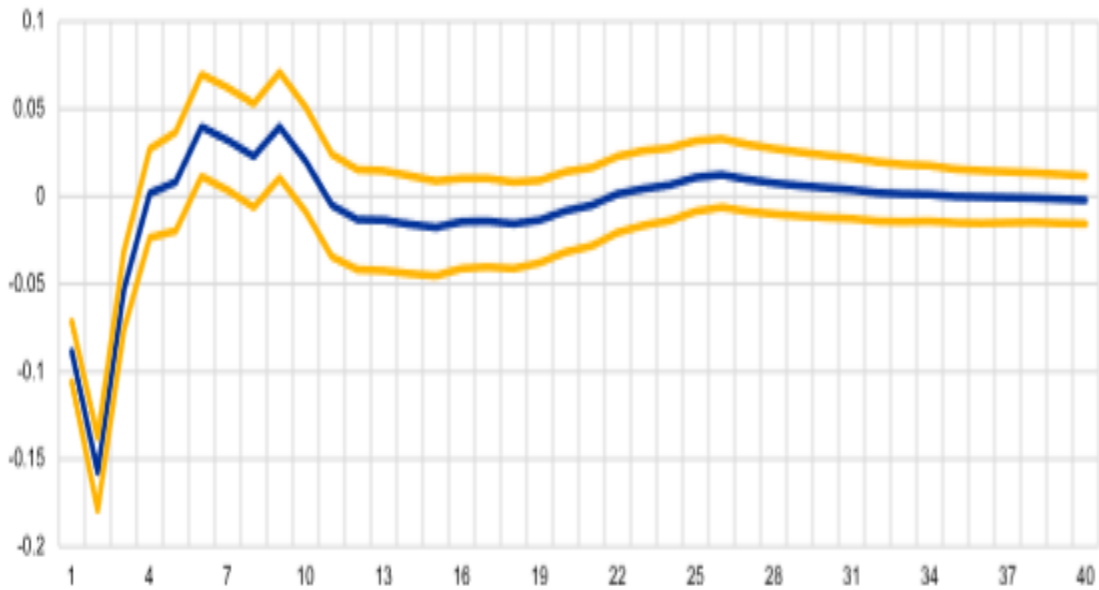


Economic Growth and Uncertainty

Figure 5: Real GDP Response to European Uncertainty shocks

Responses of real GDP growth following a temporary shock on macroeconomic uncertainty

(percentage point)



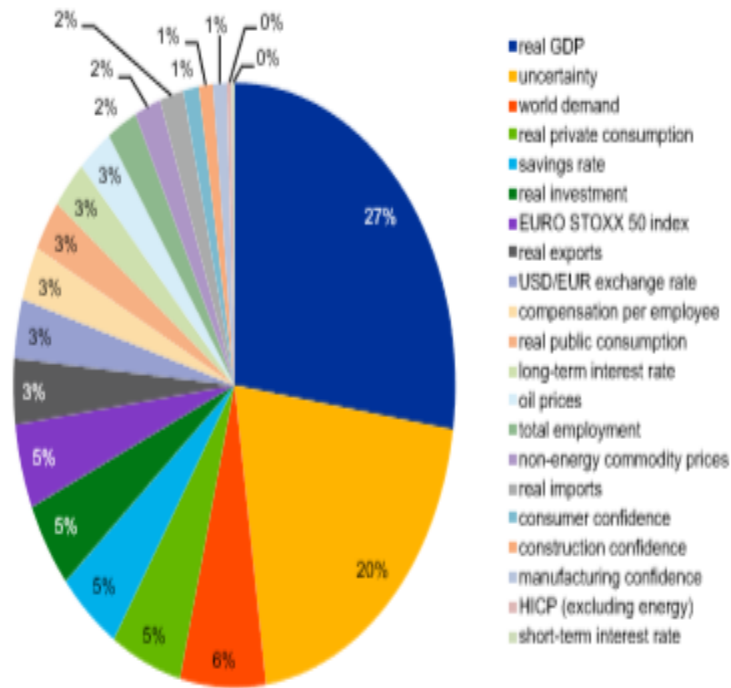
Source: ECB calculations.

Note: The blue line denotes the median response of real GDP growth and the yellow lines denote the 95% one standard deviation confidence bands.

Economic Growth and Uncertainty

Figure 6: Forecast Error Variance Decomposition for real gdp(forty years)-European Area

Average shock contribution to euro area real GDP fluctuations

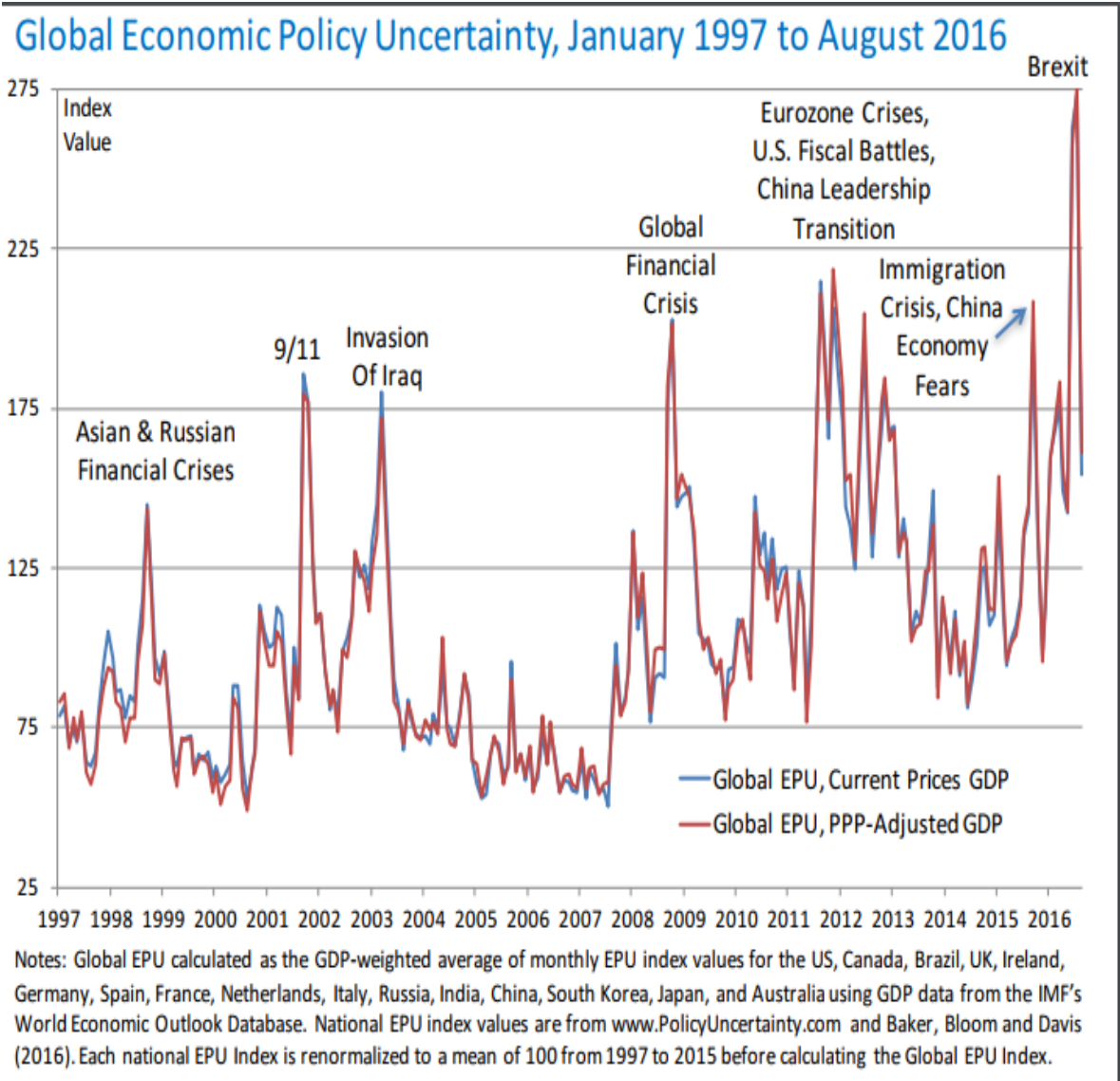


Source: ECB calculations.

Notes: The chart depicts the average shock contribution to real GDP fluctuations (in percentages), computed from a forecast error variance decomposition performed over a horizon of forty quarters. The composite indicator of macroeconomic uncertainty presented in Box 1 has been used as a proxy for uncertainty. The legend (on the right) displays the nature of the shocks according to their level of contribution.

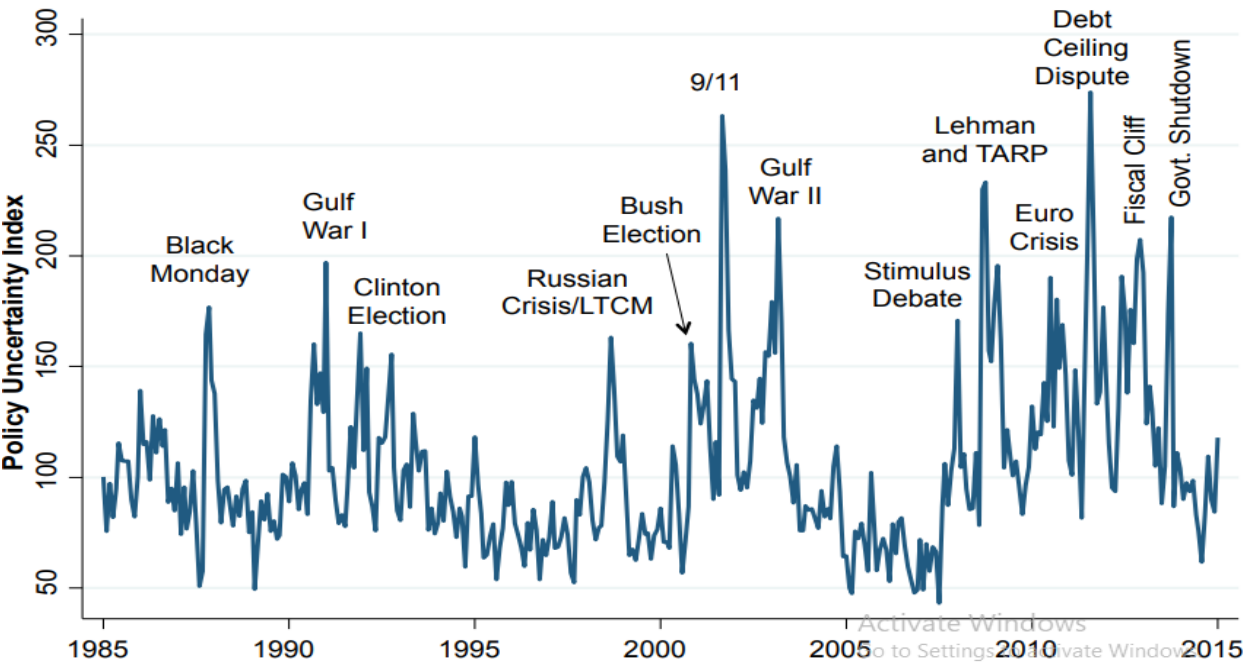
Economic Growth and Uncertainty

Figure 7: Global Economic Policy Uncertainty from January 1997 to August 2016



Economic Growth and Uncertainty

Figure 8: Economic Policy Uncertainty Index for the US

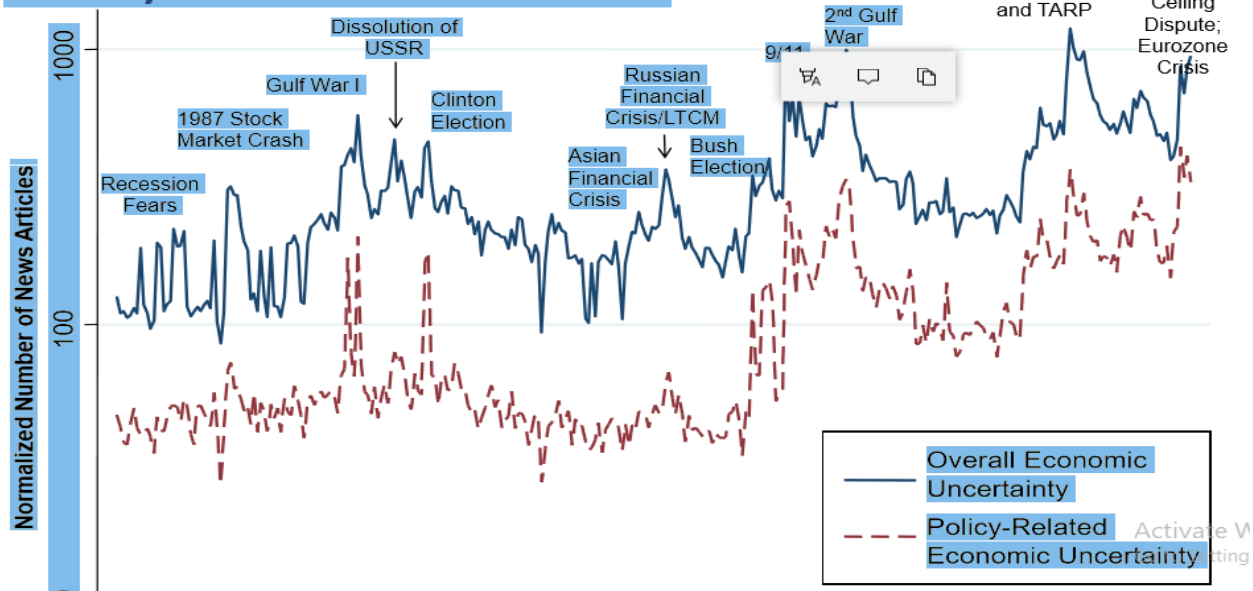


Economic Growth and Uncertainty

Figure 9: Policy Uncertainty and Overall Economic Uncertainty

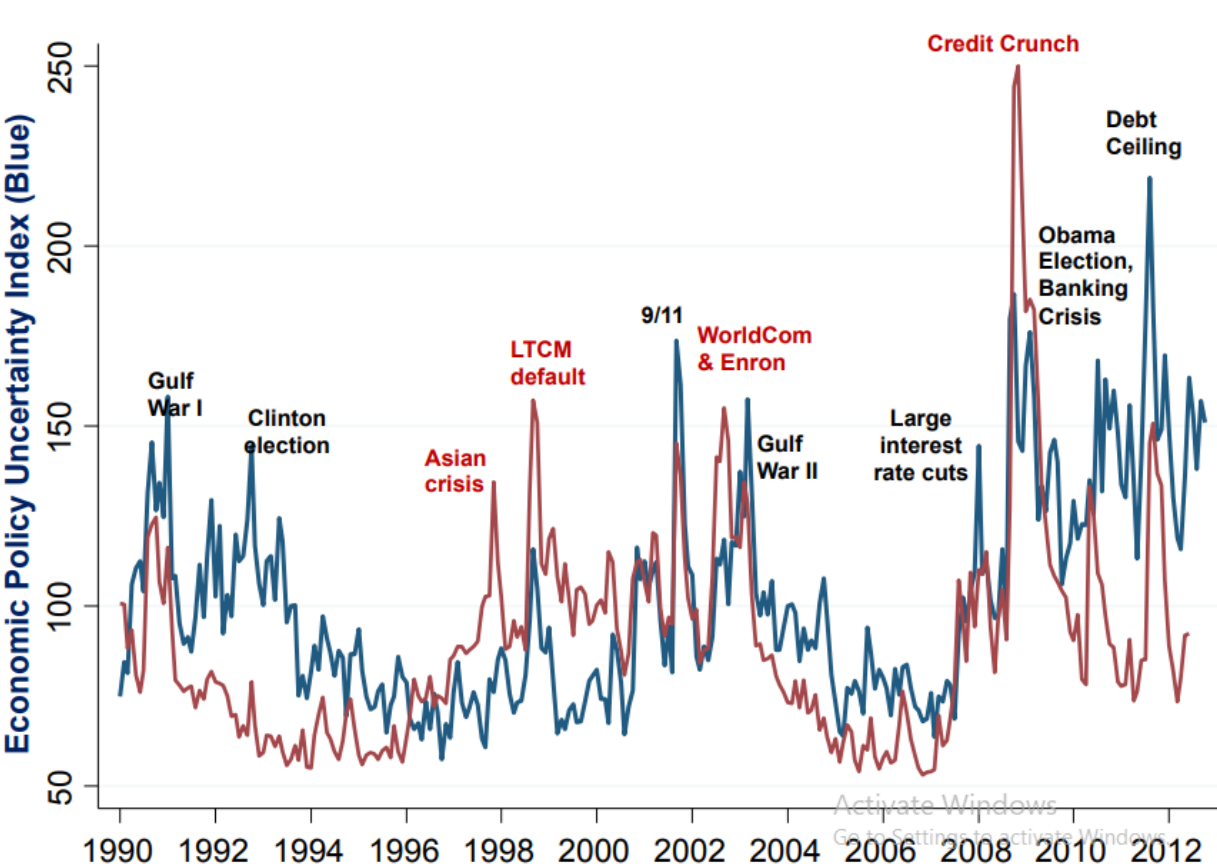
Figure 2: Policy Uncertainty and Overall Economic Uncertainty

January 1985 to December 2011



Economic Growth and Uncertainty

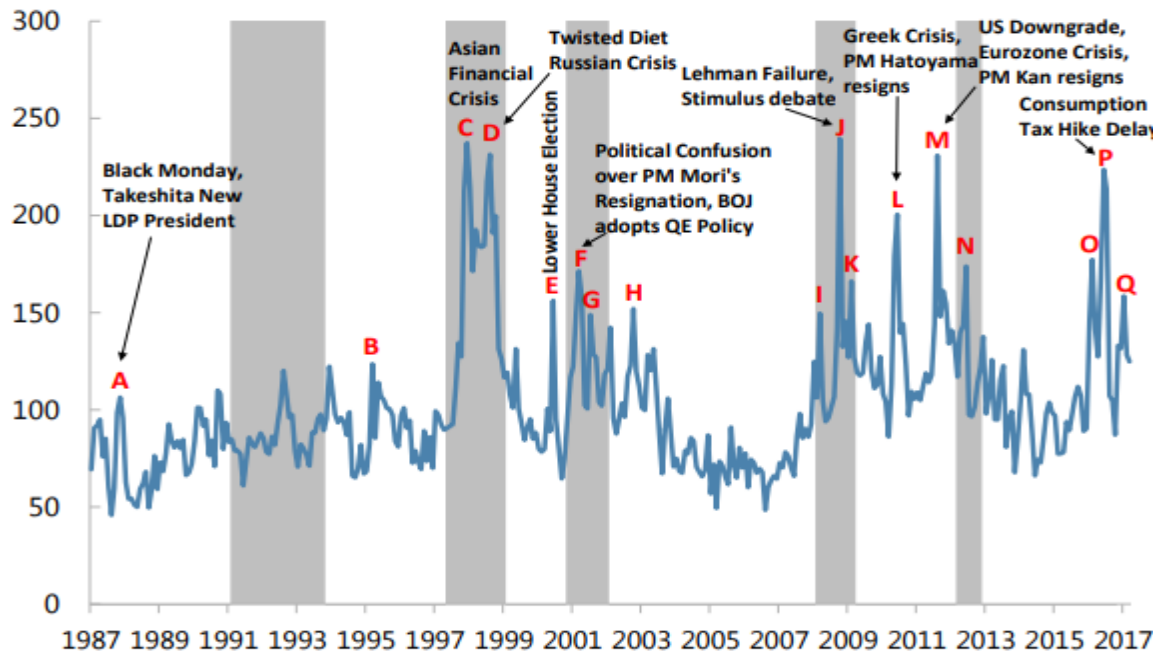
Figure 10: U.S Economic Policy Uncertainty Index and the VIX



Economic Growth and Uncertainty

Figure 11: Japan Economic Policy Uncertainty

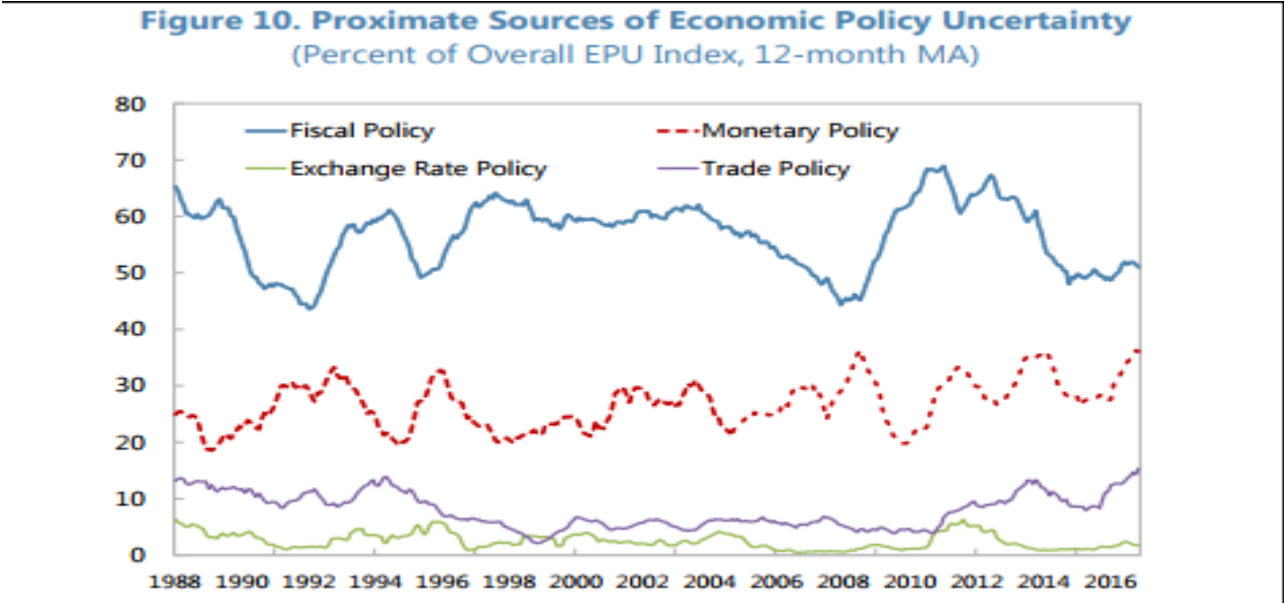
Figure 1. Japan Economic Policy Uncertainty Index (1987M1–2017M3)



Sources: Authors' calculations.

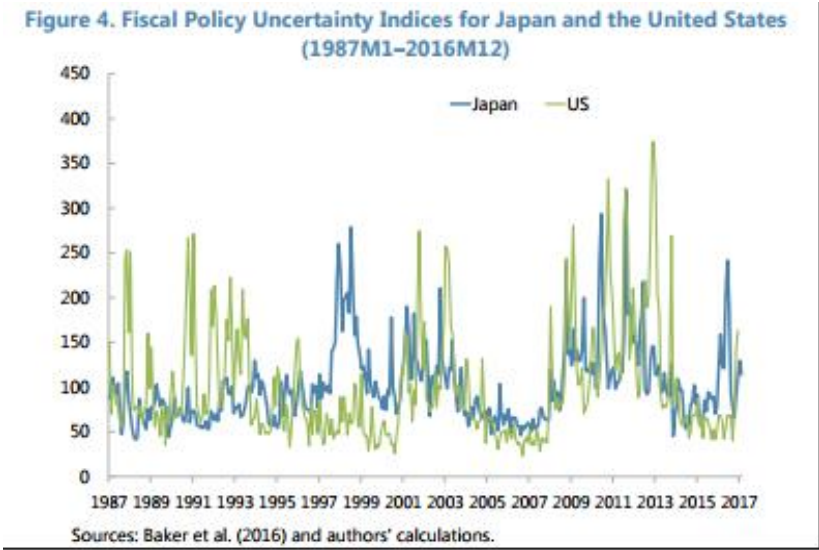
Economic Growth and Uncertainty

Figure 12: Sources of Economic Policy uncertainty



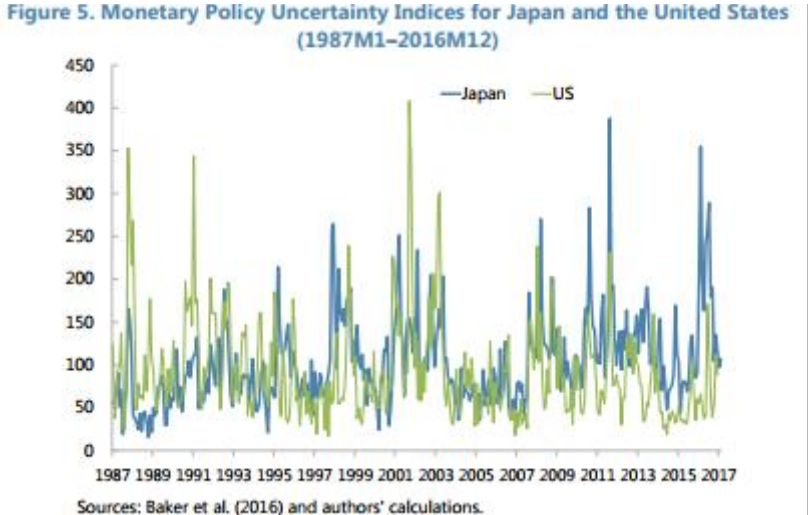
Economic Growth and Uncertainty

Figure 13: Fiscal Policy Uncertainty Indices for Japan and the USA



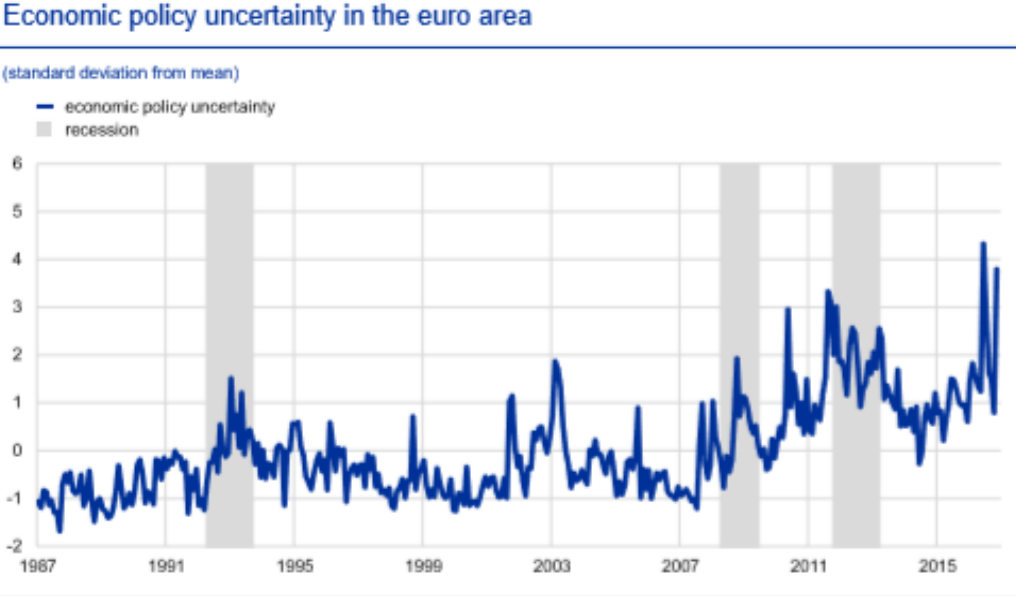
Economic Growth and Uncertainty

Figure14:Monetary Policy Uncertainty Indices for Japan and USA



Economic Growth and Uncertainty

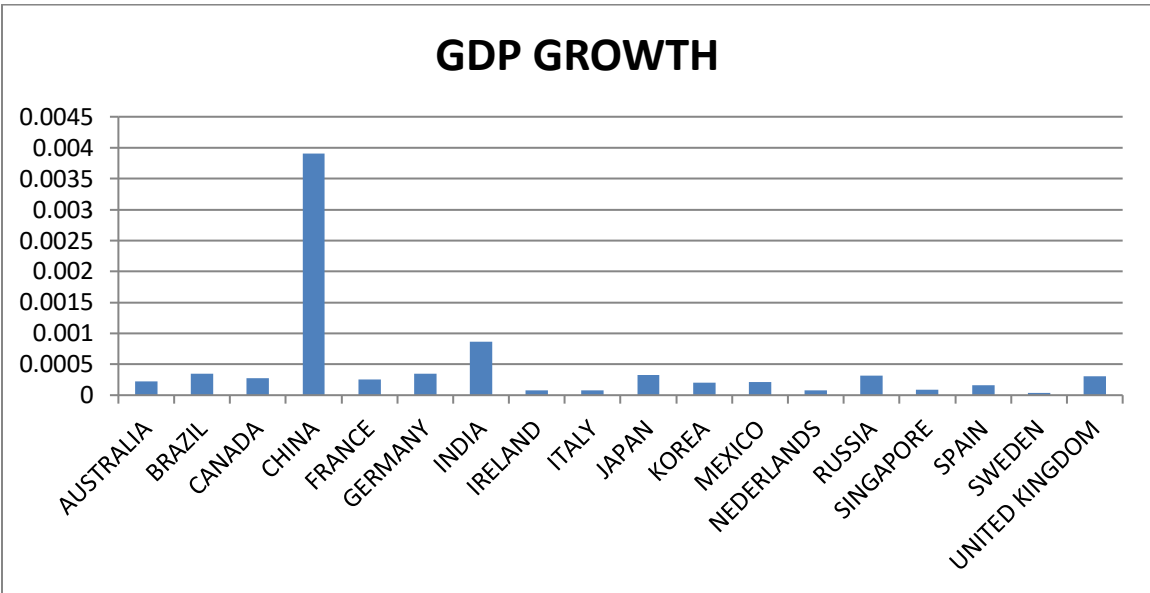
Figure 15: European Policy Uncertainty Index



Sources: Baker, Bloom and Davis, and ECB calculations.
Notes: Areas in grey reflect euro area recessions as identified by the Centre for Economic Policy Research (CEPR). Economic policy uncertainty in the euro area has been calculated as the GDP-weighted average of country-specific data for economic policy uncertainty in Germany, Spain, France, Italy and the Netherlands.

Economic Growth and Uncertainty

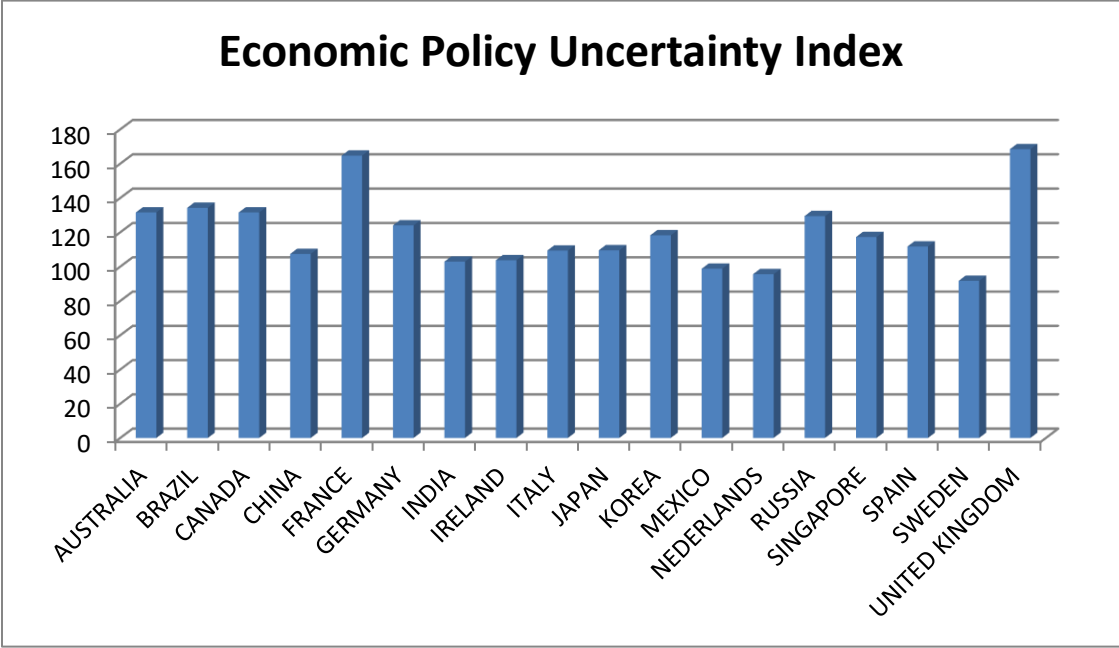
Figure 16: The GDP Growth per country.



Note: The Average GDP Growth per country based on sample sizes in table 2

Economic Growth and Uncertainty

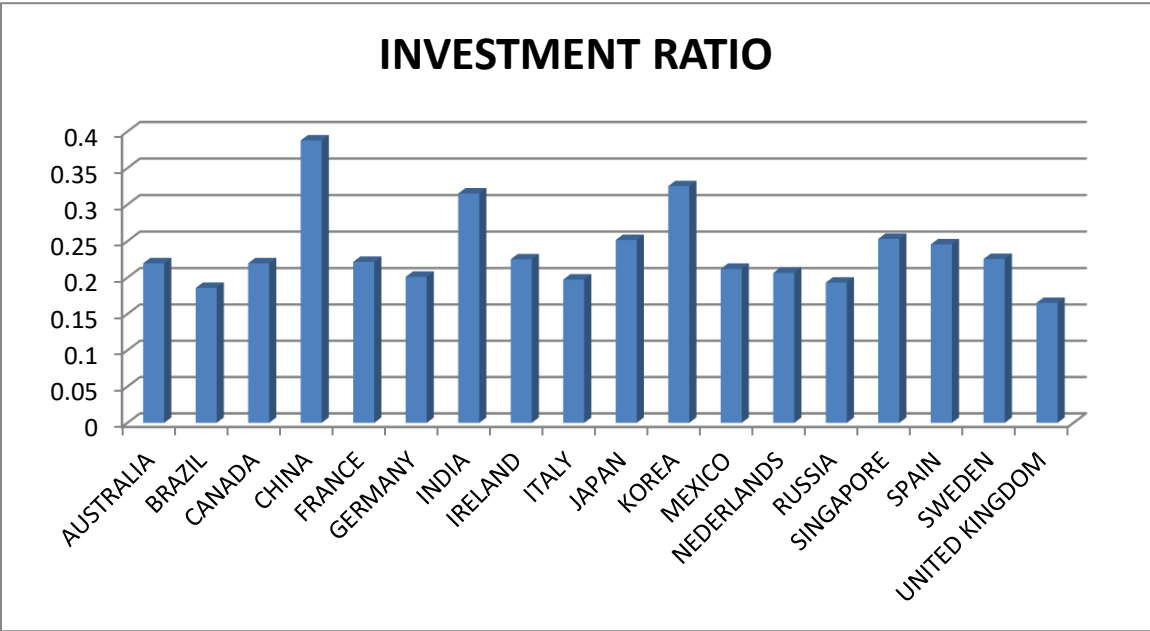
Figure 17: Average Economic Policy Uncertainty per country



Note: The average Economic Policy Uncertainty per country based on sample sizes in table 2

Economic Growth and Uncertainty

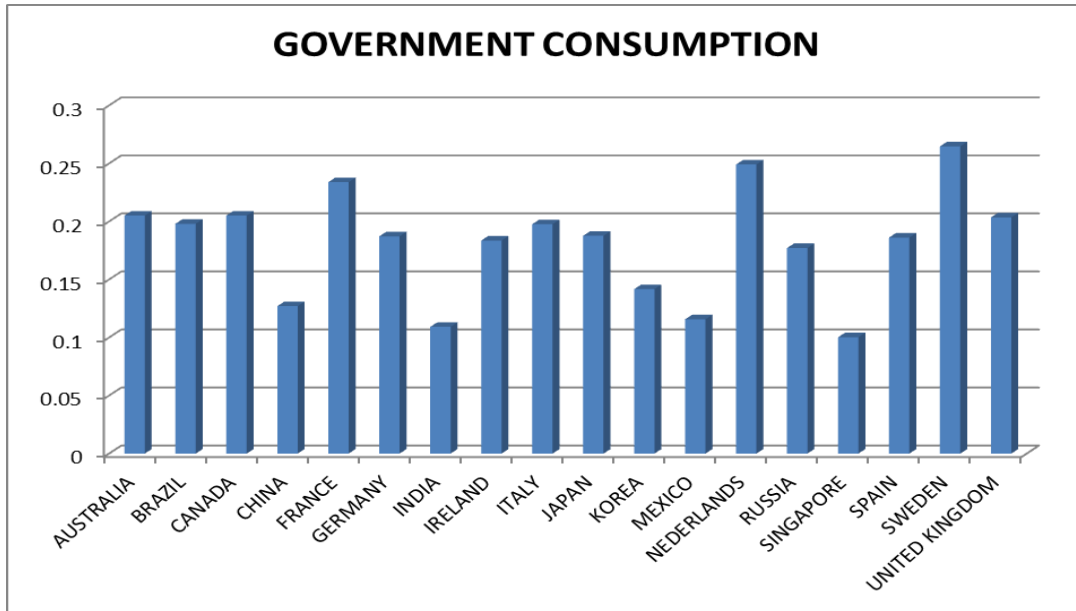
Figure 18: The Investment Ratio per country



Note: The average Investment Ratio per country based on sample sizes in table 2

Economic Growth and Uncertainty

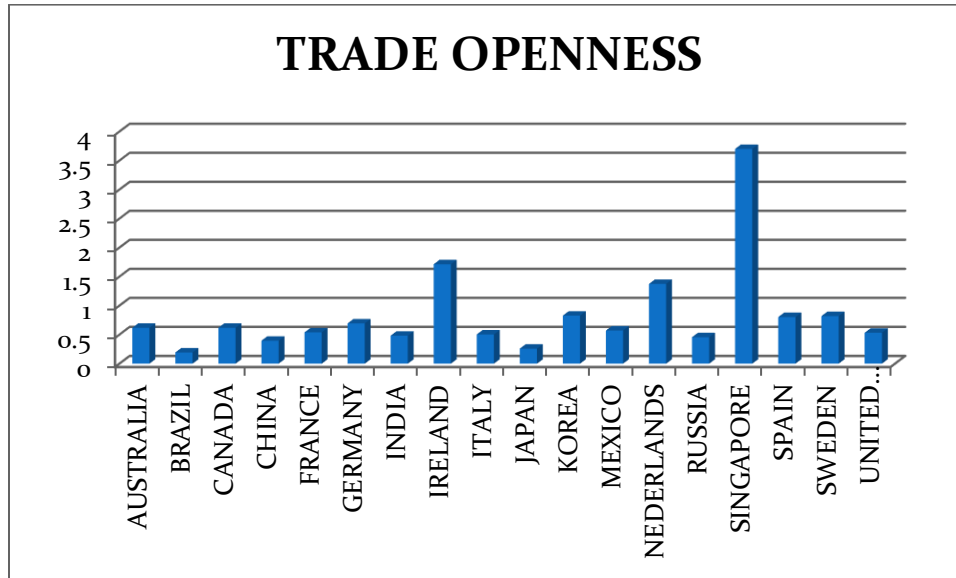
Figure 19: Government Consumption per country



Note : The Average Investment Ratio per country based on sample sizes in table 2

Economic Growth and Uncertainty

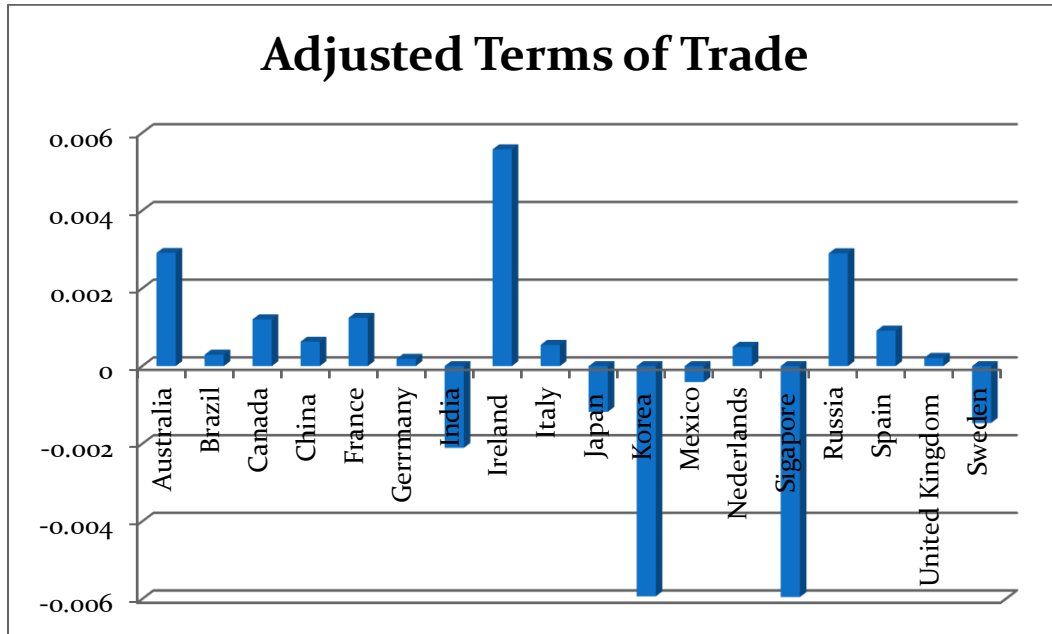
Figure 20: Average Trade openness per country



Note : The average Trade openness per country based on sample sizes in table 2

Economic Growth and Uncertainty

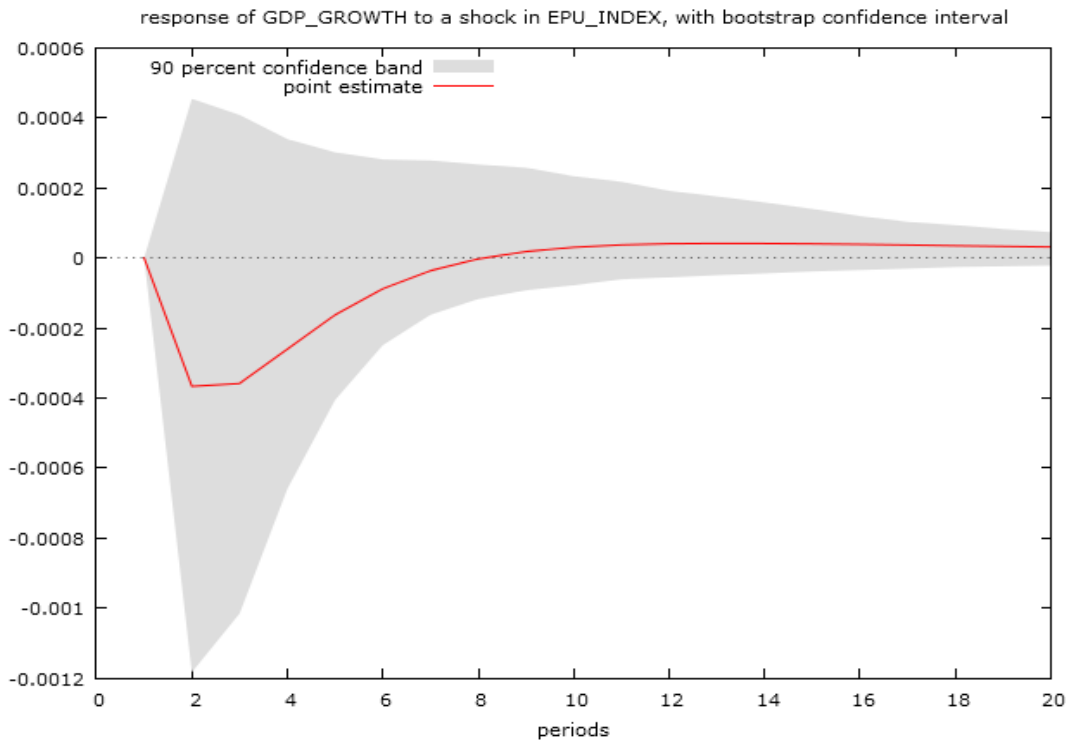
Figure 21: The Adjusted Terms of Trade per country



Note: The average Adjusted terms of trade per country based on sample sizes in table 2

Economic Growth and Uncertainty

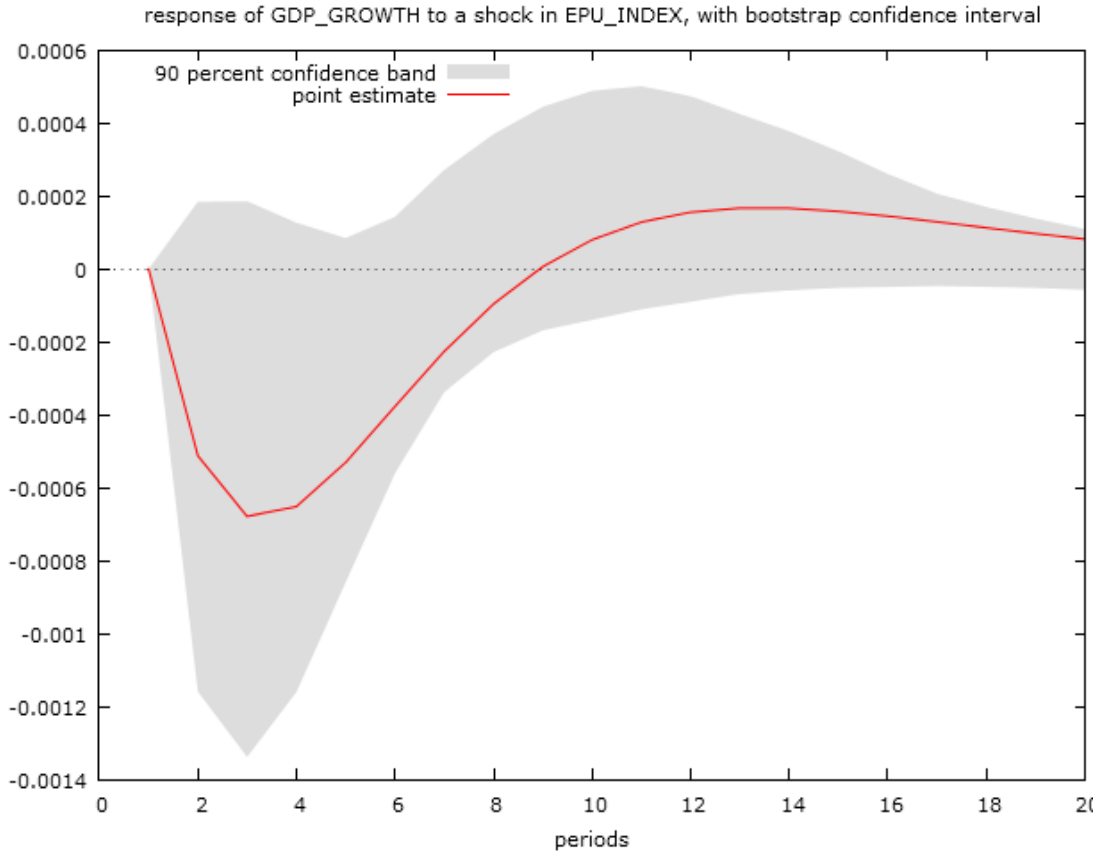
Figure 22: Impulse Response of GDP Growth to a shock in EPU Index in Global level (Result of VAR Model with the assumption of indirect response)



Notes: This graph is a result of the regression shown in table 12 and refers only to the global time-series

Economic Growth and Uncertainty

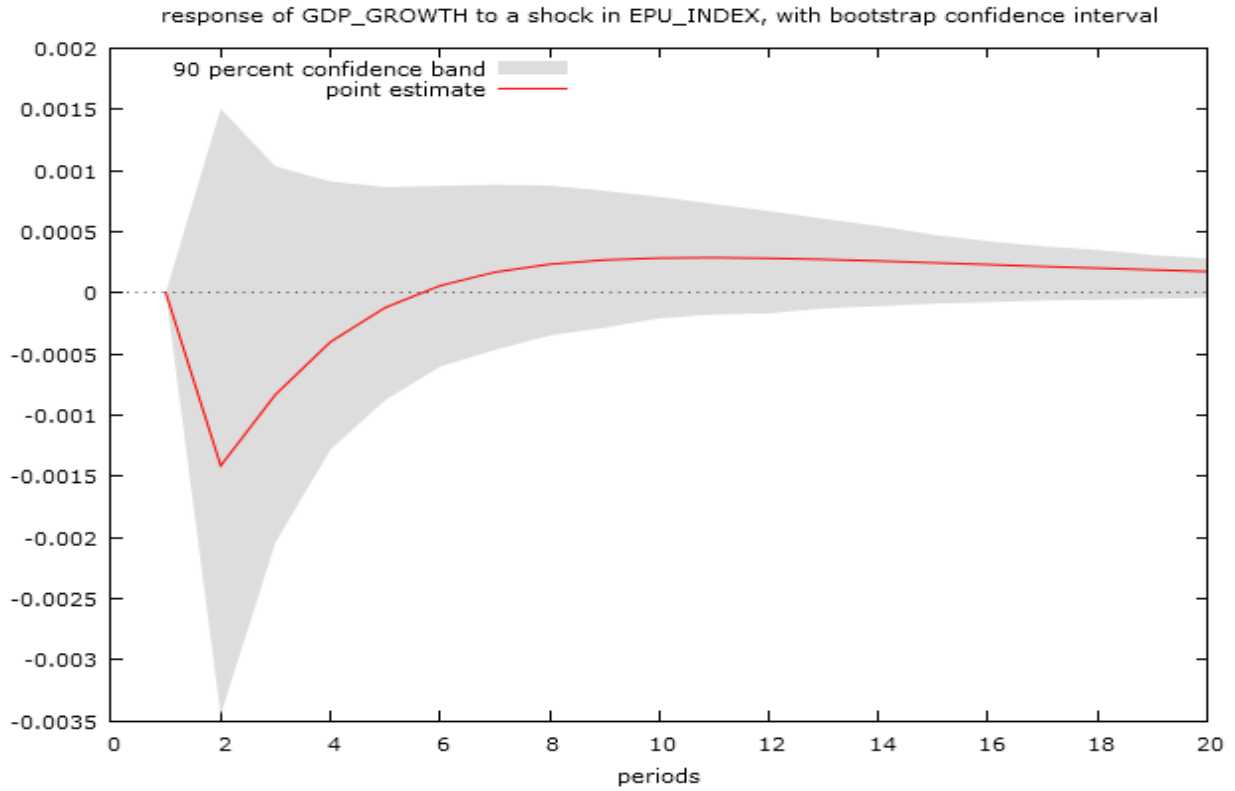
Figure 23: Impulse Response of GDP Growth to a shock in EPU Index for European countries (Result of VAR Model with the assumption of indirect response)



Note: This graph is a result of the regression shown in table 12 and refers only to the European time-series

Economic Growth and Uncertainty

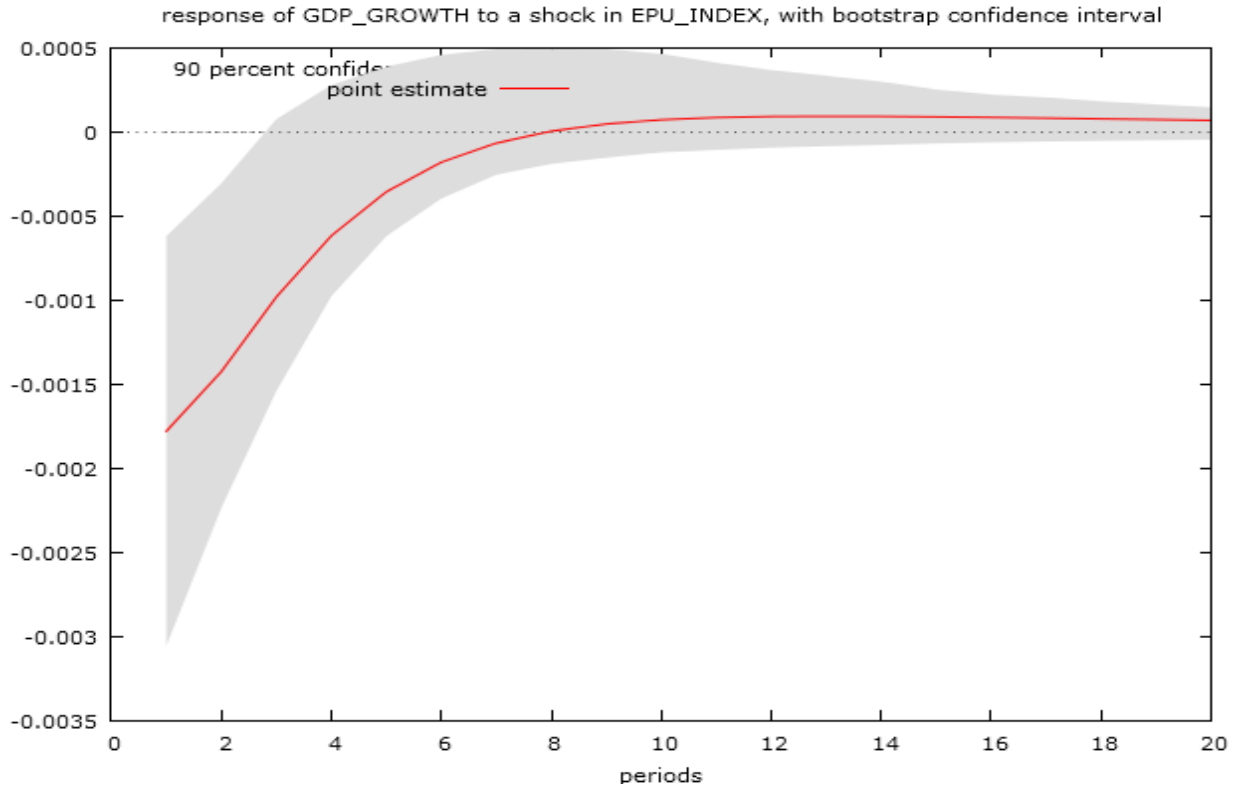
Figure 24 : Impulse Response of GDP Growth to a shock in EPU Index for Asia (Result of VAR Model with the assumption of indirect response)



Note: This graph is a result of the regression shown in table 12 and refers only to the Asian time-series

Economic Growth and Uncertainty

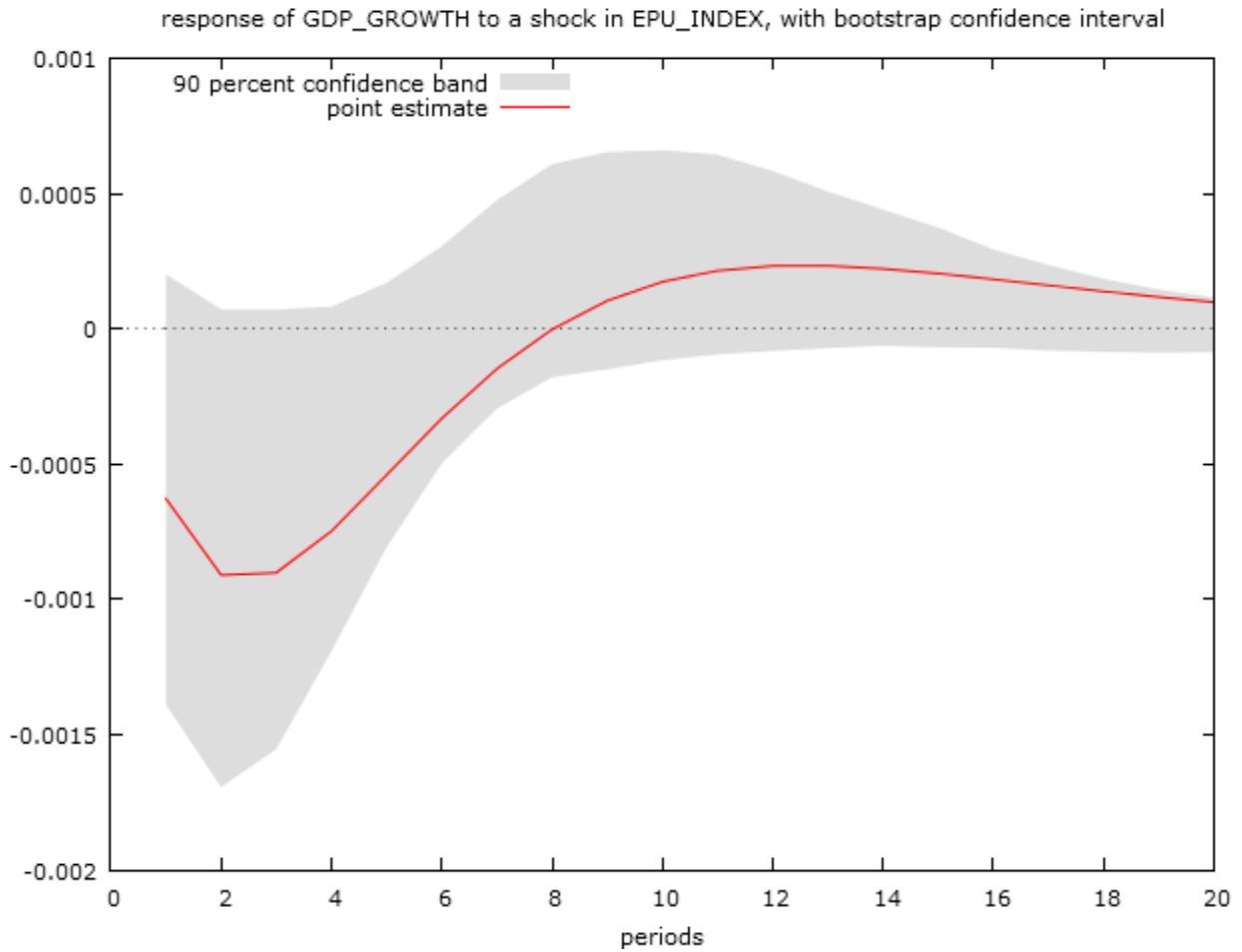
Figure 25: Impulse Response of GDP Growth to a shock in EPU Index in Global level (Result of VAR Model with the assumption of immediate response)



Note: This graph is a result of the regression shown in table 13 and refers only to the Global time-series

Economic Growth and Uncertainty

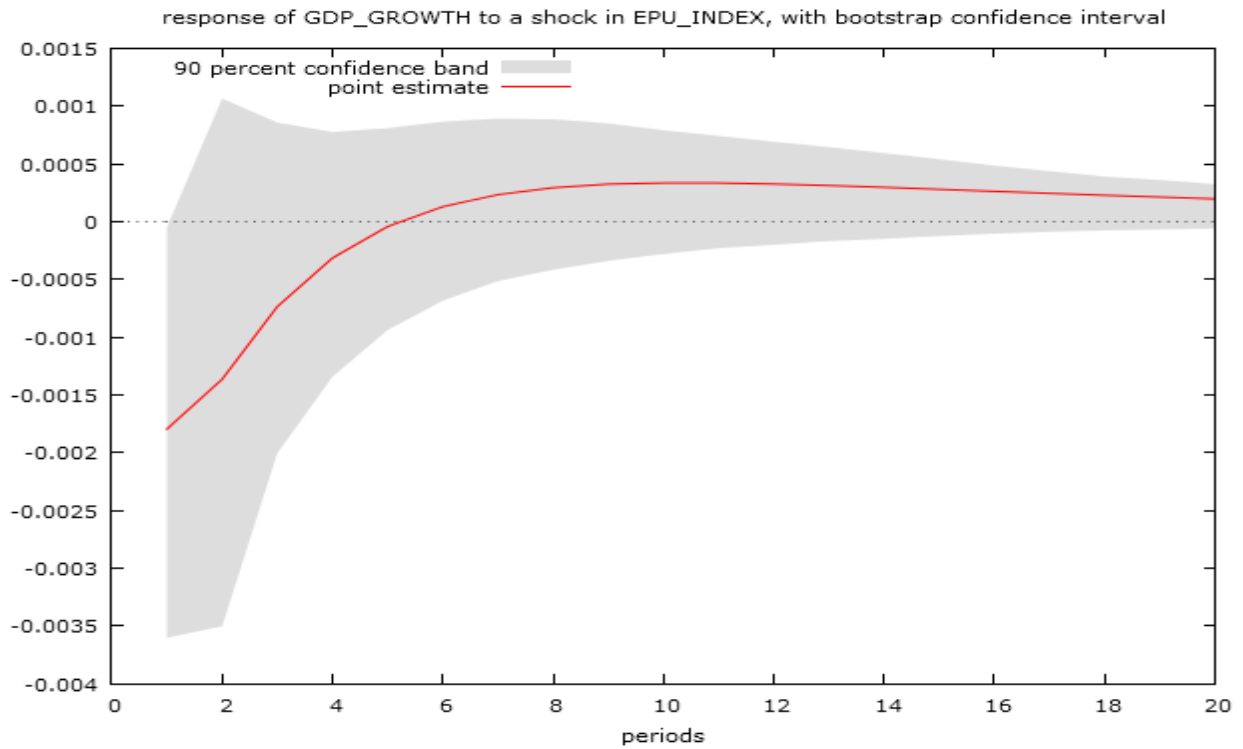
Figure 26: Impulse Response of GDP Growth to a shock in EPU Index for European countries (Result of VAR Model with the assumption of immediate response)



Note: This graph is a result of the regression shown in table 13 and refers only to the European time-series

Economic Growth and Uncertainty

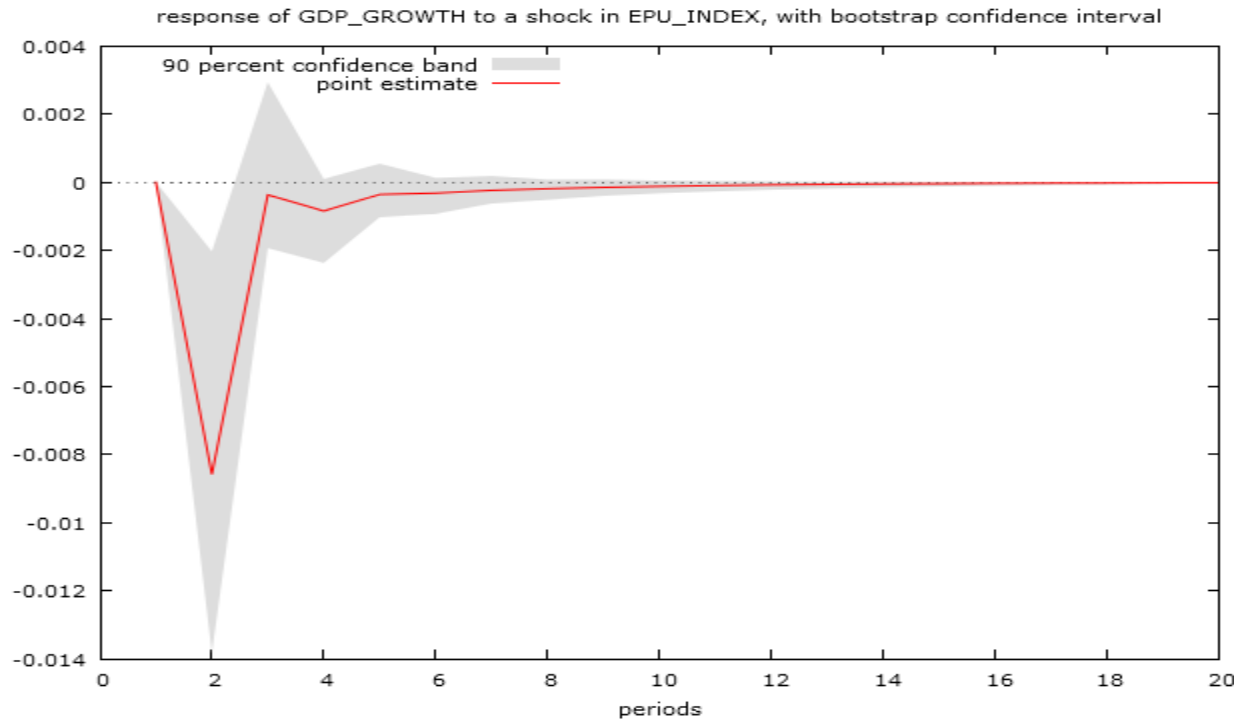
Figure 27: Impulse Response of GDP Growth to a shock in EPU Index for Asia (Result of VAR Model with the assumption of immediate response)



Note: This graph is a result of the regression shown in table 13 and refers only to the Asian time-series.

Economic Growth and Uncertainty

Figure 28: Impulse Response of GDP Growth to a shock in EPU Index for Ireland (Result of VAR Model with the assumption of indirect response).

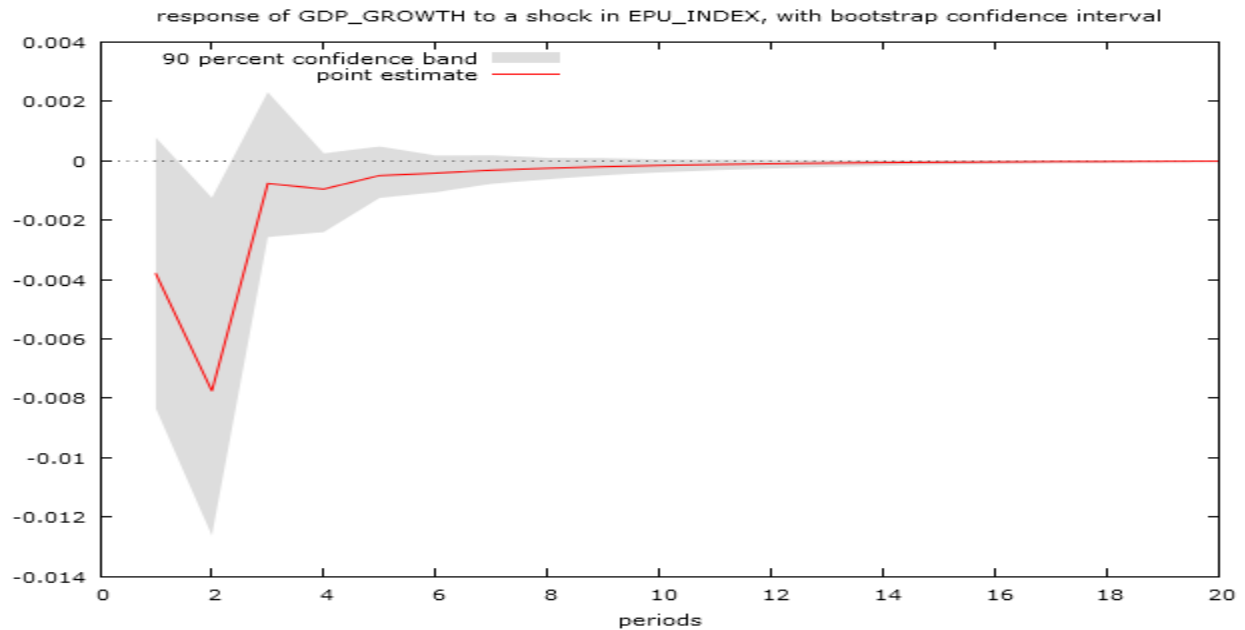


Note: 1) This graph is a result of the regression shown in table 12 and refers only to the Irish time-series

2) Ireland appears to have the greatest indirect response from all countries with a reduction of GDP by 0.83% in the second quarter after the shock, while in the next quarters the effect is statistically insignificant

Economic Growth and Uncertainty

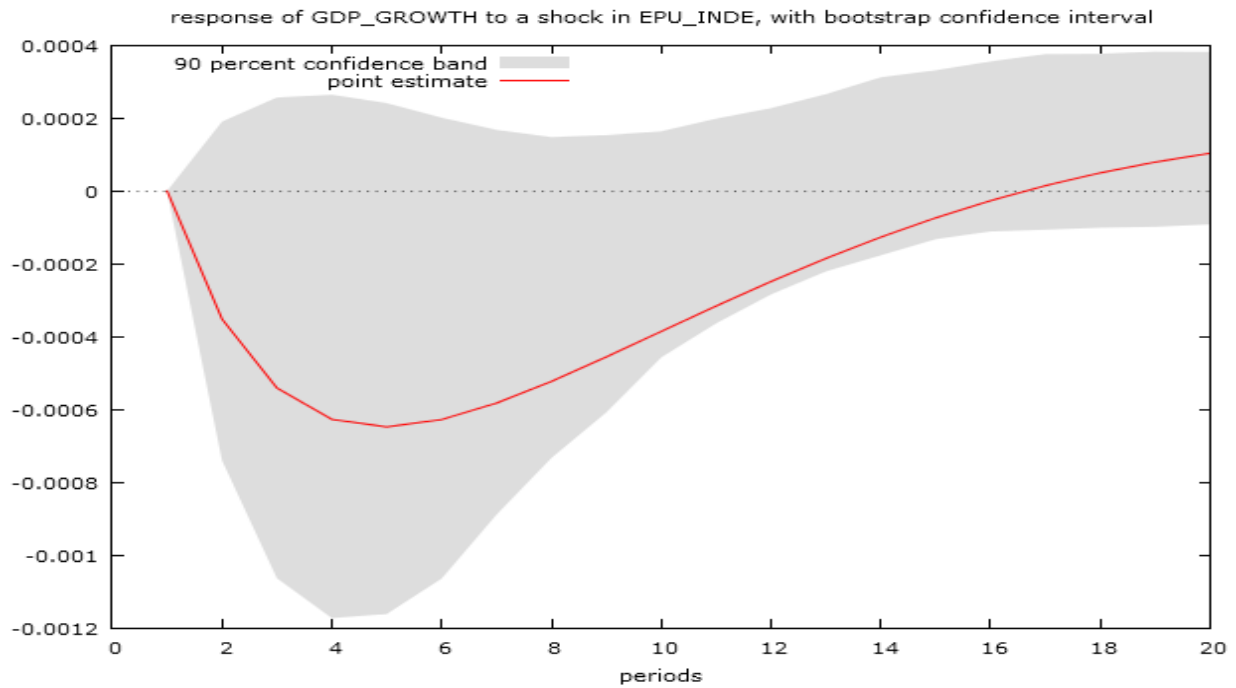
Figure 29 : *Impulse Response of GDP Growth to a shock in EPU Index for Ireland (Result of VAR Model with the assumption of immediate response).*



Note: 1) This graph is a result of the regression shown in table 13 and refers only to the Irish time-series
2) Ireland appears to have the greatest immediate response with cumulative reduction of GDP by 1.17% (0.39% in the first quarter and 0.78 second%) while in the next quarters the effect is statistically insignificant

Economic Growth and Uncertainty

Figure 30: Impulse Response of GDP Growth to a shock in EPU Index for Spain (Result of VAR Model with the assumption of indirect response).

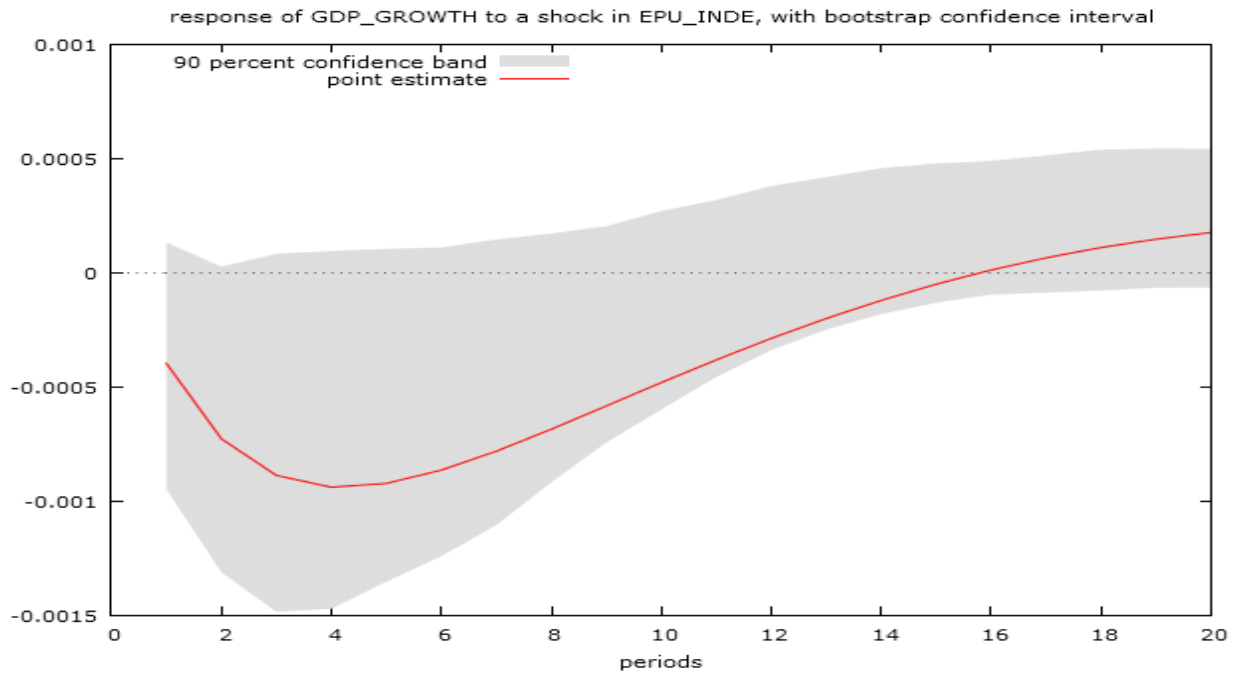


Note: : 1) This graph is a result of the regression shown in table 12 and refers only to the Spanish time-series

2) Spain is a special case because response is extended to the sixth quarter after the shock in contrast to other countries that limited until the fourth quarter

Economic Growth and Uncertainty

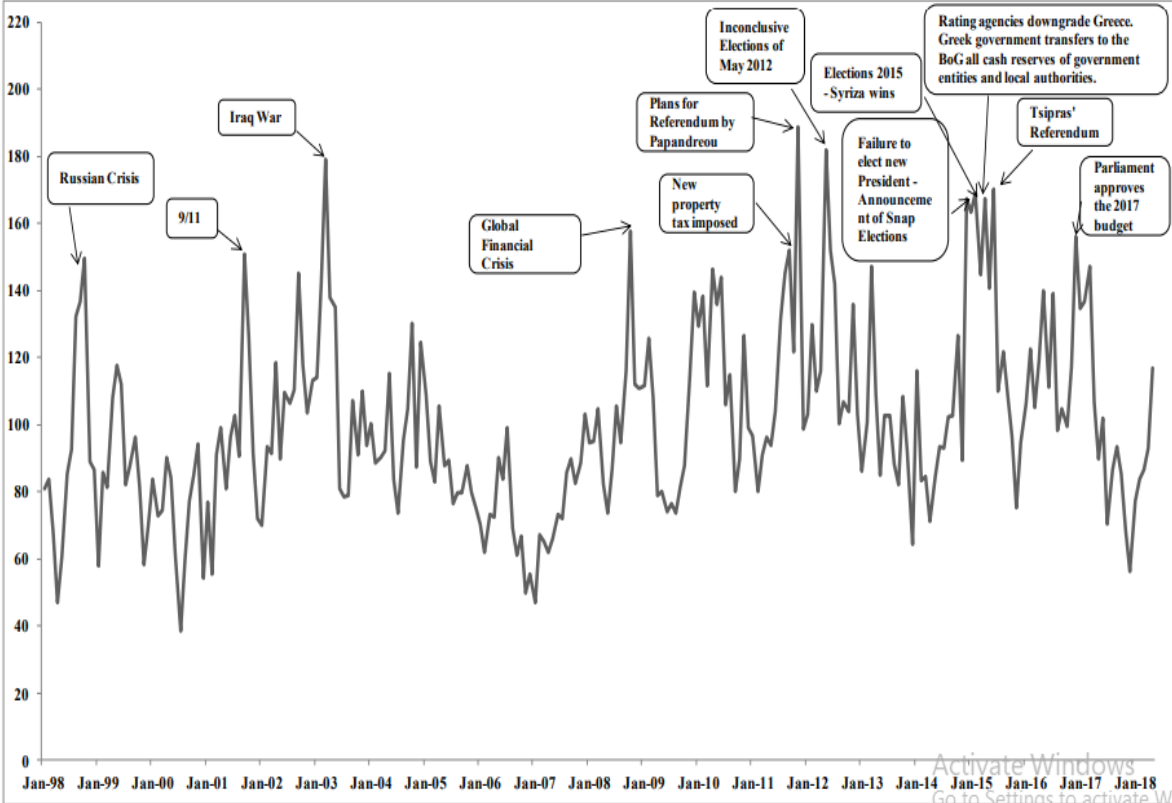
Figure 31: Impulse Response of GDP Growth to a shock in EPU Index for Spain (Result of VAR Model with the assumption of immediate response).



Note: 1) This graph is a result of the regression shown in table 13 and refers only to the Spanish time-series
2) Spain is a special case because response is extended to the fifth quarter after the shock in contrast to other countries that limited until the third quarter

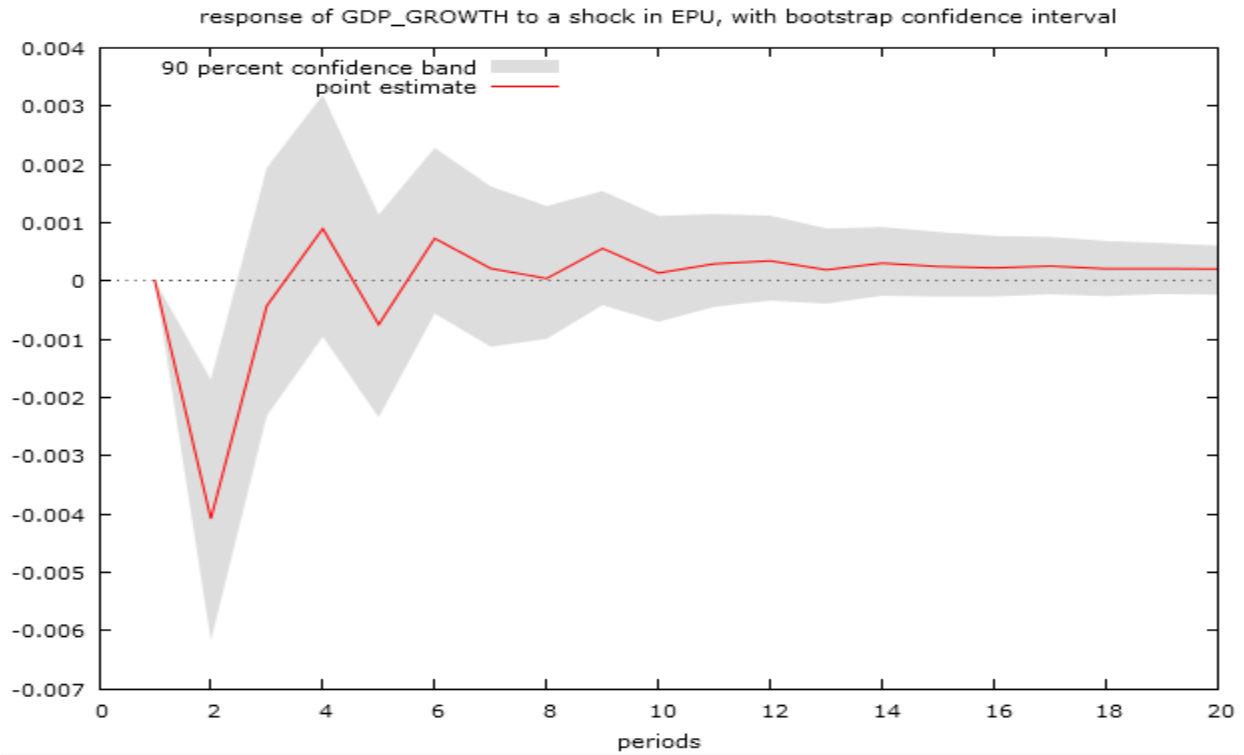
Economic Growth and Uncertainty

Figure 32: The overtime evolution of Greek policy uncertainty Index



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Figure 33` : Impulse Response of GDP Growth to a shock in EPU Index for Greece (immediate Response)



Note:1)This graph is a result of the regression shown in table 18 and refers to the Greek Economic Policy Uncertainty index

2) Greece appears to have a reduction of GDP by 0.41% in the second quarter after the shock

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