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Economic Policy Uncertainty Shocks in Small Open Economies: A Case Study of Ireland

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Abstract: I create a time series of Economic Policy Uncertainty (EPU) for Ireland based on Irish newspaper archives and demonstrate its comovement with other national measures of EPU, such as those available for the US, UK and other euro area countries. I purge the series of its global component and thereby construct the orthogonal domestic component of Irish EPU. I then use a structural vector autoregression to consider the impact of EPU shocks on the Irish economy for the main EPU series and its domestic component. Unanticipated shocks to the Irish EPU series foreshadow declines in investment, consumption, inflation and increases in unemployment. Responses to shocks in the domestic component of the series are similar (though smaller) for investment and employment, but not for consumption. These findings suggest that: (i) uncertainty relating to economic policy in Ireland is heavily influenced by foreign events; (ii) unanticipated shocks have real economic effects whether they stem from foreign or domestic developments, and; (iii) firms respond to both foreign and domestic shocks, while households may respond more to global shocks than domestic shocks.

I INTRODUCTION

Policy uncertainty has remained high for a number of years despite periods of relative calm in financial markets. Events such as the eurozone debt crisis, Greek crisis, U.S "debt ceiling" and the "Brexit" referendum have been key contributors. Research has documented sizeable short-run consequences of heightened policy uncertainty, with evidence of sharp declines in firm investment, output and employment (e.g. Baker *et al.* 2016). In this paper I create a time series of Economic

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Policy Uncertainty (EPU) for Ireland based on Irish newspaper archives and consider whether EPU has implications for the real economy in Ireland. Given the significant contribution of global shocks to the Irish EPU series, I also consider whether domestic shocks (those orthogonal to foreign shocks) have an impact on Irish firms and consumers.

Small open economies are largely exposed to, and have little control over, spillovers of policy uncertainty from abroad. Further, if these economies operate within a monetary union, they are partly constrained in their ability to accommodate these shocks. Ireland has a high level of trade openness, a large presence of multinational corporations, free capital and labour mobility and a large financial sector – characteristics that are typical of well-developed small open economies. Given Ireland's reliance on foreign demand for goods and services and foreign direct investment of large multinationals, sectors of the Irish economy may be particularly responsive to heightened foreign uncertainty. As a member of a currency union, Irish policymakers are also restricted by an inability to counter uncertainty shocks using monetary policy.

In line with Baker, Bloom and Davis (BBD, 2016), I consider economic policy uncertainty as general uncertainty about; (i) who will make policy decisions (e.g. election outcomes); (ii) what actions policymakers will choose to take and when, and; (iii) the potential economic effects resulting from such policy actions. In addition, economic uncertainty may be induced by policy inaction, and in the wake of threats to national security and other policy matters that are not chiefly economic in nature. In this way, the scope of possible factors contributing to economic policy uncertainty is large, and may include uncertainty surrounding policies of various forms (e.g. monetary, fiscal, trade, social and national security, regulation, healthcare, tax, government spending and law). For a small open economy, it is likely that a signicant portion of economic policy uncertainty stems from abroad. Banks, businesses, consumers and policymakers operating in Ireland are likely to be responsive to foreign policy uncertainty where this uncertainty relates to economic outcomes important to them. A sizeable share of domestic firms rely on foreign markets, both as a source of imports, and as consumers of their exports. Similarly, Ireland is an important financial hub, and is home to many multinational companies, with large flows of foreign debt and equity inflows. The financial sector is also an important propagator of uncertainty shocks as financial frictions have negative implications for the real economy (Gilchrist *et al.*, 2014). Relatedly, global uncertainty shocks may reduce capital inflows into small open economies, restricting access to foreign funding (Choi and Furceri, 2018).

To begin I construct an Economic Policy Uncertainty index for Ireland in the spirit of Baker, Bloom and Davis (2016). This index is shown to be strongly correlated with measures of EPU for other developed countries, particularly the UK, euro area and the US. I then construct a global component of EPU using principal components analysis on the range of EPU series available for other

countries. Next, using regression techniques, I obtain an orthogonal Irish-domestic EPU series and, finally, I consider the dynamic effects of the Irish EPU series and its domestic component on Irish economic activity.

Unanticipated shocks to the Irish EPU series foreshadow declines in investment, consumption, inflation and increases in unemployment. Once foreign events are removed from the EPU series, the impact of unanticipated shocks remains similar (though smaller) for investment and employment, but are not present for consumption. These findings suggest that: (i) uncertainty relating to economic policy in Ireland is heavily influenced by foreign events; (ii) unanticipated shocks have real economic effects whether they stem from foreign or domestic developments, and; (iii) firms respond to both foreign and domestic shocks, while households may respond more to global shocks than domestic shocks.

The rest of the paper is organised as follows, Section II discusses the literature, Section III details the construction of the Irish EPU series, Section IV covers the principal components analysis used to construct domestic Irish EPU, Section V covers the empirical analysis, and Section VI concludes.

II LITERATURE

This paper overlaps three strands of literature. Firstly, there is a literature on uncertainty and *real options* and *financial frictions* theories. Real options theory is a means of evaluating an investment for a firm, where this investment usually takes the form of the purchase of new capital, or the hire of new labour. This literature dates back to Bernanke (1983) and is formalised by Dixit and Pindyck (1994), with a theoretical approach to capital investment decisions that stresses the irreversibility of many investment decisions, and the ongoing uncertainty of the economic environment in which these decisions are made. Their approach recognises the value to a firm of waiting for more (but never complete) information before committing to irreversible investment. Bloom, Bond and Van Reenen (2007) and Bloom (2009) show that uncertainty has a sizeable impact on a firms' capital and labour investment. The latter paper constructs a model with time-varying second moment to simulate a macro uncertainty shock. The author finds dynamics consistent with real options theory; higher uncertainty causes firms to temporarily pause their investment and hiring in the short-term and leads to an overshoot of output and employment in the medium term, once the shock has dissipated and pent-up investment ensues. Gulen and Ion (2016) use firm-level data and a news-based measure of policy uncertainty. They observe a negative relation between policy uncertainty and capital investment that is signicantly stronger for firms with a higher degree of irreversible investment, indicating precautionary investment delays consistent with real options theory. Bloom (2017) argues that firms are more

forward looking, more attentive to future events and suffer more from increases in uncertainty than consumers do. Consumers, on the other hand, are more myopic and may only be sensitive to fluctuations in uncertainty where wages and employment are affected, which typically occurs with a few quarters' delay.

Secondly, there is a body of literature specifically focused on policy uncertainty. Closest to this paper is a paper by Zalla (2017), who uses the Baker Bloom and Davis (2016) approach to construct an Irish EPU Index similar to that in this paper. In this paper, along with the main series I develop, I also attempt to replicate Zalla's contribution, comparing my result to his and highlighting the key differences.[1] Rodrik (1991), Higgs (1997) and Hassett and Metcalf (1999), address uncertainty in monetary, fiscal and regulatory policies and negative economic outcomes. Born and Pfeifer (2014) use an estimated New Keynesian model and show that the "uncertainty" effect of policy risk is unlikely to play a major role in business cycle fluctuations, despite the high presence of policy risk itself. Baker, Bloom and Davis (2016), create a time series for Economic Policy Uncertainty (hereafter BBD EPU) for the US based on newspaper articles, and use both firm-level data and macro data to demonstrate the link between economic policy uncertainty and economic activity. Their VAR analysis gives evidence that, for the US, EPU shocks foreshadow declines in investment, output and employment, similar findings to this paper. Bordo, Duca and Koch (2016) exploit cross-sectional heterogeneity in detailed banking data to consider whether economic policy uncertainty restrained US bank lending during key policy events (using the BBD EPU measure). The authors uncover significant evidence, both in cross-sectional data and over time, that heightened policy uncertainty decreases the growth rate of both bank lending and GDP.

Finally, there is a literature on the spillover of uncertainty shocks (e.g. Gourio *et al.* (2013); Cesa-Bianchi *et al.* (2014); Klossner and Sekkel (2014); Armelius *et al.* (2017); Cheng *et al.* (2020); Cerda *et al.* (2018)). Gourio *et al.* construct a RBC model with time-varying uncertainty, where countries have heterogeneous exposure to global uncertainty shocks. They apply their framework to the data by taking averages of volatilities in equity returns for G7 countries and show that spikes in international uncertainty precede a fall, rebound and overshoot response in industrial production for all countries. Cesa-Bianchi *et al.* (2014) use a Global-VAR to consider the impact of volatility on economic activity across multiple countries. Klossner and Sekkel (2014) find evidence of strong linkages of economic policy uncertainty across multiple countries, with the US the largest exporter. Armelius *et al.* (2017) construct an EPU series for Sweden and compare shocks to this series against shocks to the US and German EPU on domestic macro variables. They use VAR analysis and uncover impulse response functions indicating a maximal impact on GDP within the same quarter following Swedish EPU shocks, whereas US and

[1] Ryan Zalla's data series is also available alongside this one on www.policyuncertainty.org.

German EPU shocks affect Swedish GDP with a one-quarter lag. Cheng *et al.* (2020) develop a BBD style EPU index for Hong Kong and find large international EPU spillovers from other major economies to Hong Kong. Furthermore, the authors demonstrate that domestic economic policy uncertainty leads to tight financial conditions and lower investment and vacancy postings.

III CONSTRUCTION OF THE IRISH EPU SERIES

Following the method of Baker, Bloom and Davis (BBD, 2016), I construct an Economic Policy Uncertainty (EPU) in Ireland. The series is monthly and spans from January 1997 to November 2023 and is based on both print and digital newspaper articles from three leading Irish newspapers – *The Irish Times*, *Irish Independent* and the *Irish Examiner*. Founded in 1905, the *Irish Independent* is Ireland's largest selling newspaper. Close behind, *The Irish Times* remains Ireland's second largest selling newspaper and the *Irish Examiner* also has a wide readership. Market shares of these papers have remained relatively stable over time, although physical readership has been declining in recent years, online subscriptions have been increasing. According to the Irish Audit Bureau of Circulations (ABC), recent figures show *The Irish Independen*t has average daily sales of print and digital versions of about 96,000, while the equivalent for *The Irish Times* and *Irish Examiner* were approximately 78,000 and 32,000 respectively.[2]

Specifically, I conduct a keyword search within the electronic archives of both newspapers for articles that contain: 1) one or more of the words "uncertainty" or "uncertain", and; (2) one or more of the words "economic" or "economy", and; one or more of a range of keywords specifically relating to Irish policymaking. I summarise the keywords used in Table 1, where the first two subsets (1. uncertainty and uncertain, and 2. economic and economy) are identical to those used in BBD, while the third subset is based on Irish equivalents of the BBD policy keywords, in addition to a larger range of Irish specific policy-related words, and their variations.

In order to control for the change in newspaper articles over time, I scale the resulting monthly count of flagged articles by the total number of articles published in all newspapers each month, and rescale the data series to have a mean value of 100 over time. Figure 1 shows the resulting annotated series. The series is shown to peak around both domestic and foreign events. For domestic events, there are peaks surrounding close general elections, protests, and the 2008/09 Irish banking crisis. Much of the series, however, appears to be driven by foreign events, with Russian and Asian financial crises, geopolitical events such as 9/11, Gulf War II, and the Russia-Ukraine war, turmoil in Greece, the Brexit vote in the UK and the election of Trump in the US all present in the series.

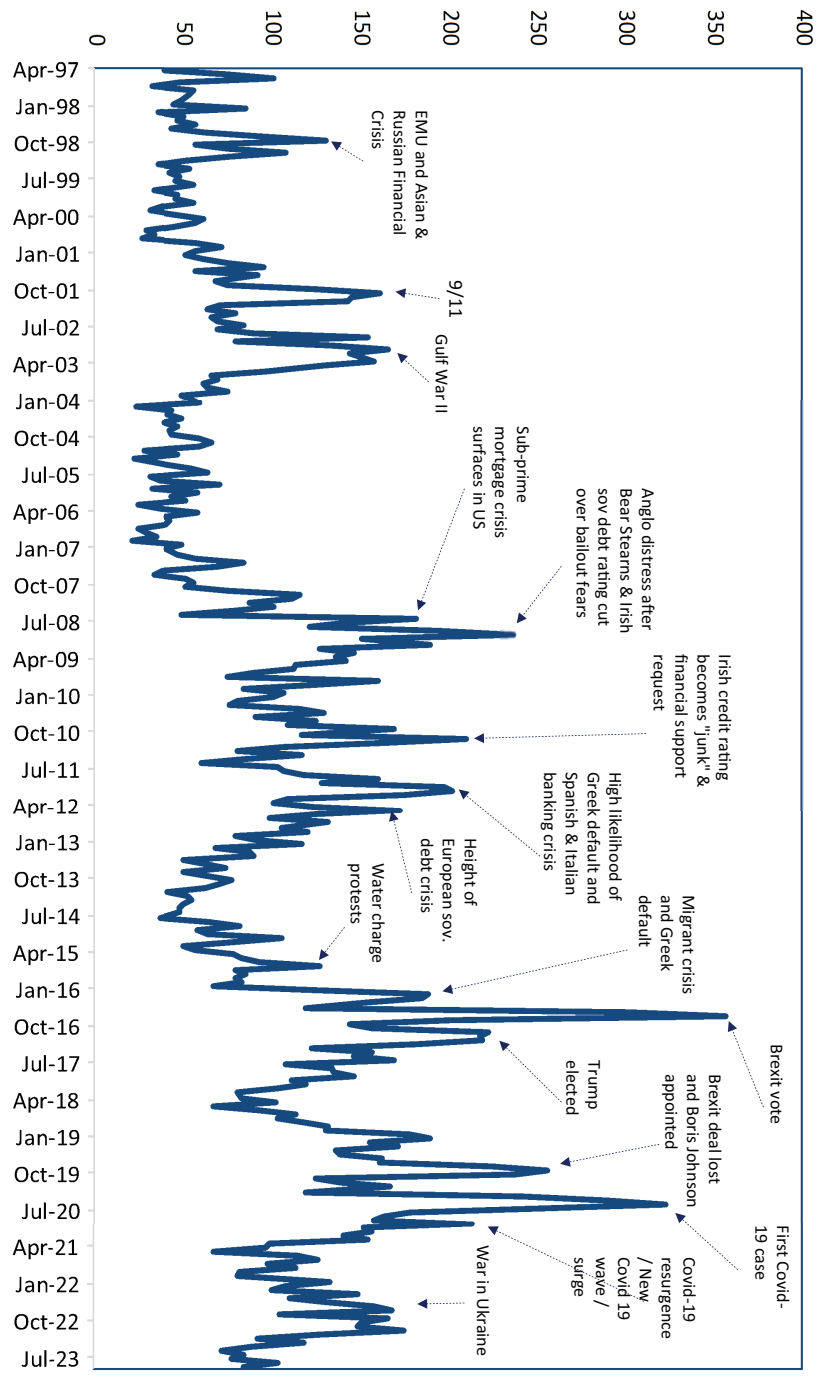
[2] The *Irish Examiner* does not have a digital version available.

Table 1: Irish Keywords and their Variants Versus the BBD Approach for the US

Group	*Category*	*US Keywords (BBD)*	*Irish Keywords*	*Variants*
1. Economic		Economy Economic	Economy Economic	
2. Uncertainty		Uncertain Uncertainty	Uncertain Uncertainty	
3. Policy	General	Legislation Regulation Deficit	Legislation Regulation Deficit	– – Surplus
	US specific and Irish equivalent	Congress	Houses of the Oireachtas Seanad Éireann Dáil Éireann Government	Oireachtas Seanad Dáil –
		White house	Áras un Uachtaráin	–
		Federal Reserve	Central Bank of Ireland	Irish Central Bank
	Additional Irish keywords used in this paper		Policy Taoiseach Tánaiste TD President Local authority Budget Department of Finance Referendum Constitution Minister Fianna Fáil Fine Gael	– – – Teachta Dála – Local authorities, Council – – Referenda Constitutional Amendment – – –

Note: Houses of the Oireachtas, Seanad Éireann and Dáil Éireann are the Irish legislative bodies, forming the national parliament of Ireland. The Oireachtas consists of the President of Ireland, the Seanad Éireann (Senate), and the Dáil Éireann (House of Representatives). The Taoiseach and Tánaiste are the Irish Prime Minister and Deputy Prime Minister, respectively, playing central roles in the government of Ireland. Fianna Fáil and Fine Gael are two of the major political parties in Ireland, known for their historical significance and longstanding presence in Irish politics.

Figure 1: Irish EPU



3.1 Manual Audit of Irish EPU Series

I now turn to consider the accuracy of the BBD approach. To begin I conduct an extensive manual audit whereby I read each of the articles identified in the keyword search above and remove articles which I deem as being irrelevant. From over 6,300 articles I discounted 9 per cent as being irrelevant (such as those referring to historic events and those referring to a reduction in uncertainty), and 3.5 per cent which referred to isolated policy uncertainty in distant developing economies that I deemed as having no economic consequence for Ireland. Figure 2 presents the outcome of this audit. Despite almost 1,000 articles being discounted following the manual search, the correlation between the computer-generated series and the series following manual audit is very high (98.6 per cent). The series are near-identical because articles are discounted during the audit in a uniform manner across the time series and as such, irrelevant articles do not appear to be concentrated in specific periods. One noteworthy critique of the BBD approach is that the keyword search may also be identifying articles which refer to a decrease (rather than an increase) in economic policy uncertainty, but reassuringly there were relatively few of these.[3] For the analysis presented in this paper I use the original series rather than the series following these omissions.[4]

3.2 Testing the BBD Approach on Irish Equity Price Volatility

Next I test the BBD newspaper-based approach on actual data, by using it to generate an artificial newspaper-based equity price volatility series that I can compare to actual volatility in returns. First, I repeat the BBD approach on the archives of the three Irish newspapers, except rather than searching for articles relating to economic policy uncertainty, I run the search for articles that contain at least one of the keywords "volatile" or "volatility", and at least one of the keywords "ISEQ" or "Irish Stock Exchange". As before, I scale the resulting monthly count of relevant articles by the total number of monthly articles published and normalise the resulting series. Next, I estimate the monthly volatility of daily ISEQ returns as follows:

Step 1: Calculate Daily Returns

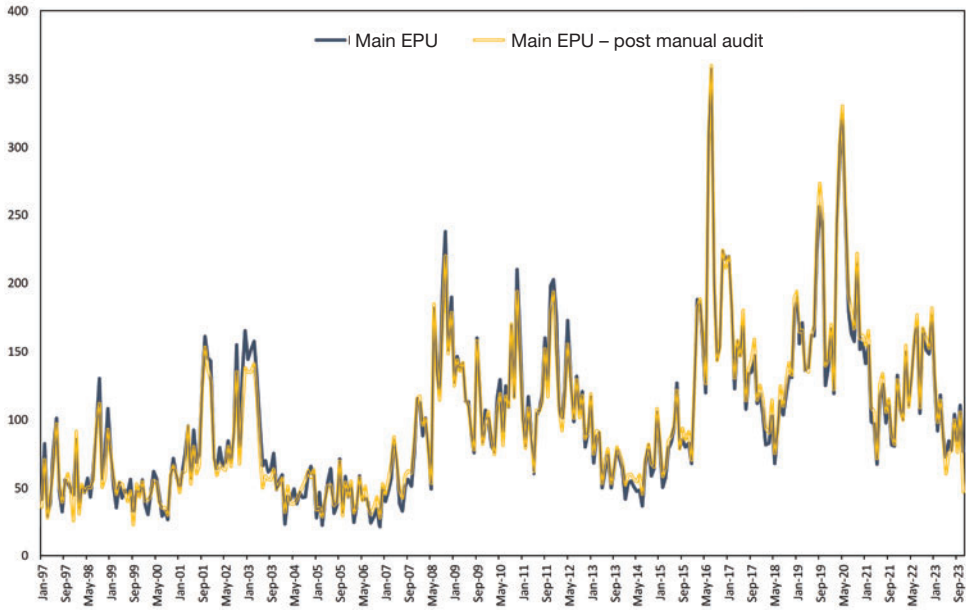
The daily return is calculated as the percentage change in the closing price from one day to the next. The formula for the daily return, r_t, on day t is given by:

$$r_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100 \quad (1)$$

[3] It is noteworthy that here I only consider the presence of Type 2 errors. Since I do not consider articles that were missed by the keyword search, I can say nothing about the presence of Type 1 errors.

[4] The computer-generated version is also the version that is publicly available. Due to resource constraints, I cannot manually audit the series each time the public data series is updated.

Figure 2: Computer-Generated Main EPU Series and Manually Audited Version



Source: Author's analysis.
Note: The series *Main EPU – post manual audit* is the result of subtracting the irrelevant articles from the EPU series. The post-audit series was then rescaled to have the same mean and standard deviation as the main EPU series.

where P_t represents the closing price on day t, and P_{t-1} is the closing price on the previous day.

Step 2: Compute Monthly Volatility

Volatility is often measured as the standard deviation of returns over a specific period. The monthly volatility is calculated by taking the standard deviation of the daily returns within each month. The formula for monthly volatility, σ_m, for month m is:

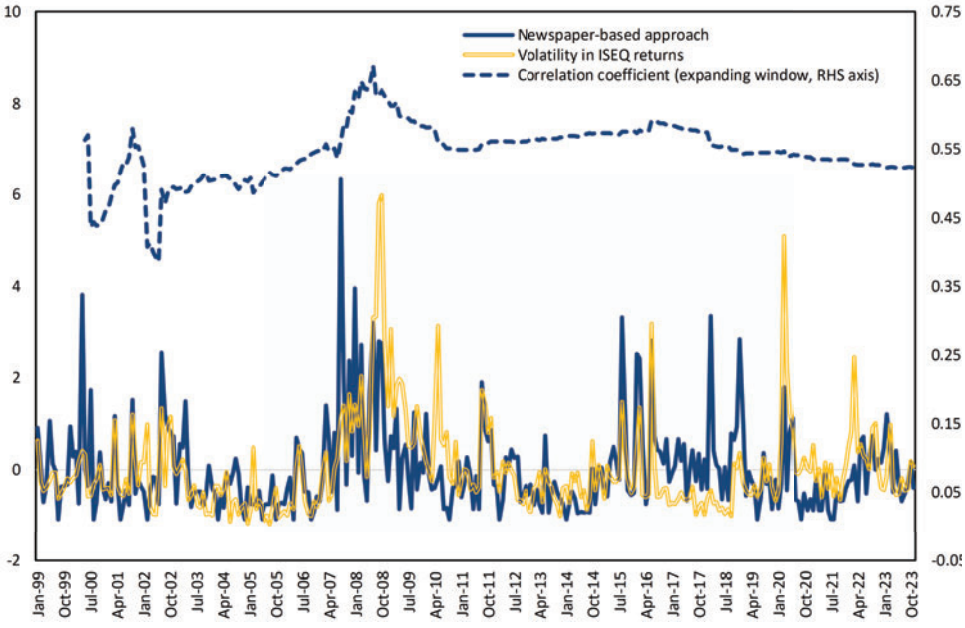
$$\sigma_m = \sqrt{\frac{1}{N_m - 1} \sum_{t=1}^{N_m} (r_t - \bar{r}_m)^2} \tag{2}$$

where N_m is the number of trading days in month m, r_t is the daily return on day t, and $\bar{r}_m$ is the average return in month m.

Figure 3 compares the real data on monthly ISEQ volatility with the data series generated from the BBD newspaper-based approach. The blue line shows the monthly newspaper-based approach and the yellow line shows the monthly volatility of daily ISEQ returns, the dashed blue line shows the expanding window

coefficient of correlation between the two series. While there are a couple of spikes in the newspaper-based approach in 2017-2018 that are not evident in ISEQ volatility, the two series co-move reasonably closely, with the newspaper-based approach able to pick up on several months of high volatility. The expanding window correlation between the two series peaks at 0.66, with an average correlation of 0.53 over the full time sample.

Figure 3: Monthly Volatility of Daily ISEQ Returns and Newspaper-Based Approach For Irish Equity Volatility



In Table 2, I consider the co-movement of the Irish EPU series with EPU series developed for other countries, including a measure of global EPU and the alternate Irish EPU series by Ryan Zalla.[5] The Irish series (*IE Rice*) has a strong positive correlation (correlation coefficient of 0.7) with the global series, and those for the UK, France, Canada, and the US, and is weakly correlated (correlation coefficient of 0.2 to 0.4) with Chile, Greece, India, Korea, Italy and the Netherlands. It is also notable that the comovement between the Irish EPU series developed in this paper and the alternate Irish EPU series *IE* (*Zalla*) is not particularly strong, at 0.6.

[5] All data sourced from www.policyuncertainty.org

Table 2: Correlation Matrix of Various EPU Series

	IE (Rice)	IE (Zalla)	GL	AU	BR	CA	CL	CN	FR	DE	GR	IN	IT	JP	KR	NL	RU	ES	UK	US
Ireland (Rice)	1.0																			
Ireland (Zalla)	0.6	1.0																		
Global	0.7	0.8	1.0																	
Australia	0.6	0.4	0.6	1.0																
Brazil	0.5	0.4	0.5	0.3	1.0															
Canada	0.7	0.6	0.9	0.6	0.5	1.0														
Chile	0.4	0.6	0.7	0.4	0.3	0.5	1.0													
China	0.6	0.7	0.9	0.4	0.5	0.8	0.6	1.0												
France	0.7	0.7	0.8	0.5	0.6	0.7	0.5	0.7	1.0											
Germany	0.5	0.7	0.8	0.5	0.4	0.6	0.7	0.7	0.6	1.0										
Greece	0.2	-0.1	-0.1	0.3	0.1	0.0	-0.2	-0.2	0.2	-0.1	1.0									
India	0.3	0.0	0.1	0.6	0.0	0.2	0.0	-0.1	0.1	0.0	0.4	1.0								
Italy	0.4	0.3	0.5	0.5	0.2	0.5	0.3	0.3	0.4	0.3	0.3	0.4	1.0							
Japan	0.5	0.2	0.4	0.6	0.2	0.3	0.2	0.2	0.2	0.2	0.3	0.6	0.4	1.0						
Korea	0.4	0.4	0.5	0.5	0.1	0.4	0.5	0.4	0.3	0.5	0.0	0.4	0.3	0.5	1.0					
Netherlands	0.3	0.2	0.3	0.6	0.1	0.3	0.3	0.1	0.3	0.2	0.2	0.6	0.5	0.5	0.5	1.0				
Russia	0.5	0.7	0.8	0.4	0.4	0.6	0.7	0.8	0.6	0.7	-0.2	0.0	0.3	0.1	0.4	0.2	1.0			
Spain	0.6	0.6	0.8	0.6	0.4	0.7	0.5	0.6	0.7	0.6	0.1	0.3	0.5	0.3	0.3	0.4	0.7	1.0		
UK	0.7	0.5	0.7	0.5	0.6	0.7	0.3	0.6	0.8	0.5	0.2	0.1	0.3	0.3	0.2	0.1	0.4	0.6	1.0	
US	0.7	0.6	0.8	0.6	0.4	0.8	0.5	0.7	0.6	0.5	0.1	0.3	0.5	0.4	0.5	0.5	0.6	0.7	0.5	1.0

Source: Author's analysis.

Note: Two digit country codes used for the top row to save space, where GL = global. The colour scheme goes from green to yellow to red, with a green box indicating a strong positive correlation, a yellow box denoting an average level of positive correlation and a red box denoting a low positive or negative correlation.

3.3 Comparison to Zalla (2017)

The relatively low correlation between the Irish EPU series developed by Ryan Zalla (2017) and the series developed in this paper may be concerning for users of the Irish EPU series. The two series are currently available side-by-side online at *www.policyuncertainty.org*, but it can be difficult for users to know which series is best to use. It is worth considering the key differences between the two approaches. In order to compare my approach to that of Zalla (2017), I will briefly consider the main differences across three dimensions:

- **Corpus of newspaper archives:** While the approach in this paper is based on three major Irish newspapers, Zalla (2017) is based on just one – *The Irish Times*. A larger number of newspapers included is likely to boost the robustness of the final result due to the reduced potential for small sample bias versus using just one paper. This is particularly the case during periods of low uncertainty, where the count of relevant papers is likely to be low. Zalla (2017) documents periods where the keyword search did not flag any articles for certain months, this did not occur in the approach taken in this paper. Despite this, one advantage of using only *The Irish Times* archives is that the historical coverage is extensive, allowing for a longer time series – Zalla's series dates back to January 1985.

- **Keywords used to identify the newspapers:** Zalla (2017) has a relatively low number (7) of Irish policy specific keywords in his newspaper search. The approach taken in this paper includes 32 keywords, as summarised in Table 1. The inclusion of more keywords improves the likelihood that a relevant article will be flagged in the keyword search, again reducing the potential for small sample bias for months with low uncertainty in the final series.

- **Coding algorithm:** The algorithm used to search through the archives and extract the count of newspaper archives matching the keyword criteria also varies between the two contributions. The inclusion in this paper of an extensive manual audit of the identified archives improves confidence in the success of the algorithm as the appropriateness of the uncovered articles were individually verified. In order to compare the algorithm used in this paper to that used in Zalla (2017), I replicated the approach taken in Zalla (2017), with identical keywords used to identify articles, and using *The Irish Times* archives only. The resulting series had a 0.75 correlation with the series developed by Zalla, and appears to have considerably less volatility. The replica version I developed also appears to intuitively identify periods of high and low uncertainty in line with key historical events. A line plot of the two series is included in Figure A1 in the Appendix.

IV EXTRACTING THE DOMESTIC COMPONENTS OF IRISH ECONOMIC POLICY UNCERTAINTY

As shown above, there appears be a strong common (or global) component in country level EPU data. It is informative to strip out this global component from the Irish EPU series in order to separate global uncertainty from domestic uncertainty, to be used in our empirical specification. I do this using principal component analysis (PCA). Once the global component of EPU is extracted from the EPU series of multiple countries, I use regression techniques to isolate the domestic component of Irish EPU.

PCA extracts the variance structure of a set of variables using linear combinations of the data. It can identify similarities between data series, and compress these data in a way that highlights similarities with minimal loss in information. This technique is useful when one believes that a set of variables contains much of the same underlying information, and where one is interested in deciphering this information from the "noise" contained in individual variables. In my case, this underlying information is global economic policy uncertainty, which I interpret as uncertainty shocks of global importance, while the residual "noise" represents country-level shocks that are not global in nature.

Principal components (PCs) for the set of EPU series are obtained using eigenvalue decomposition of the observed variance matrix. The first PC is interpreted as the linear combination of the observed variables that accounts for the maximal amount of cumulative variance in the series. Each other principal component maximises variance using linear combinations that are orthogonal (or uncorrelated) to the previous components. In this way, as more components are calculated, one is accounting for an increasing amount of the total variance contained in the dataset.

I use monthly data for all 17 countries with EPU data available from 1997 to 2023.[6] Since I am interested in foreign policy uncertainty I exclude Ireland from the PCA analysis.

In Figure A2 in the Appendix, I show marginal and cumulative variance of the underlying EPU series explained by each principal component. There are no rigid rules when deciding on the number of principal components to include. I decided to use the number of components that would ensure a minimum of 70 per cent explained variance in the variables, which was three. I combined the three weighted principal components and rescale the resulting series. In Figure A3 in the Appendix, I compare the resulting global uncertainty component to the Baker, Bloom and Davis "Global Policy Uncertainty Index", demonstrating a close similarity between the two series.

[6] This includes Australia, Brazil, Canada, Chile, China, France, Germany, Greece, India, Italy, Japan, Korea, Netherlands, Russia, Spain, UK and the US.

The next step in constructing the domestic component of the Irish EPU series involves extracting the component of the main Irish EPU series developed in this paper that is not explained by the global component estimated above. In order to estimate domestic EPU, I take the Irish EPU series and regress it on the global component with three monthly lags, as follows:

$$IreEPU_t = \alpha + \beta_1(Gcomp_t) + \beta_2(Gcomp_{t-1}) + \beta_3(Gcomp_{t-2}) + \beta_4(Gcomp_{t-3}) + \varepsilon_t$$

Where *IreEPU* is the main Irish EPU series and *Gcomp* is the global component previously estimated.[7] "Domestic" EPU is recorded in the residuals (vector ε). In other words, that which is not explained by current or past lags of global uncertainty. The resulting series could be interpreted as uncertainty relating to domestic issues, and by construction the domestic series is orthogonal to the global series. Figure 4 plots the resulting annotated domestic uncertainty series. The series behaves as expected, with elevated uncertainty surrounding key domestic events, such as general elections, health crises, public protests; and treaties. There is also a considerable spike following the Brexit vote, suggesting the outsized effect of Brexit uncertainty on the Irish economy, given close economic and political ties to the UK.

V EMPIRICAL ANALYSIS

Estimation of Structural Vector Autoregression (SVAR)

I now investigate the dynamic effects of unanticipated shocks to economic policy uncertainty on macroeconomic variables. In particular I will compare the impact of shocks to the main Irish EPU series to the impact of shocks to the domestic component of the series described in the previous section. The structural vector autoregression (SVAR) model is employed to capture the interdependencies and adjustments of investment, consumption, unemployment, and the consumer price index (CPI). The data encompass seasonally adjusted quarterly observations from Q1 1999 to Q4 2022.

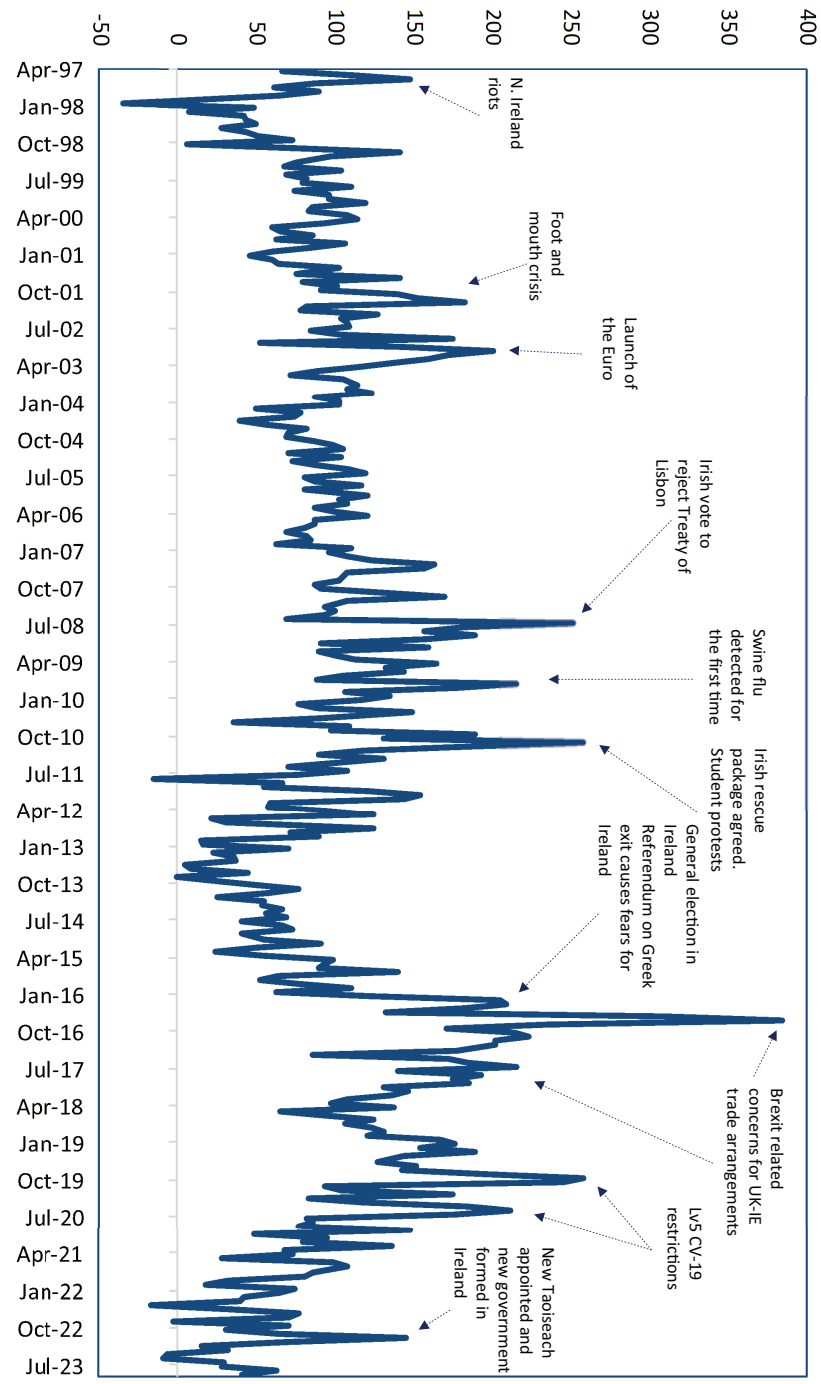
Model Specification

The variables included in the SVAR are transformed into log levels, except for unemployment and interest rates (included as exogenous) which are modelled in levels, to accurately reflect the rate-based measure. The reduced-form VAR model is specified as follows:

$$Y_t = A_0 + A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + BX_t + \varepsilon_t \quad (3)$$

[7]The R-squared of this equation is 0.54.

Figure 4: Domestic EPU



where Y_t is a vector of endogenous variables, A_0 is a vector of constants, A_1 to A_p are coefficient matrices for p lags, X_t represents exogenous variables including the ECB shadow interest rate, and ε_t is a vector of innovations.

SVAR Specification

The optimal lag length p is set to 2, as informed by both the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The SVAR model includes a constant and a linear time trend to account for deterministic trends:

$$Y_t = c + \delta t + \sum_{i=1}^{p} \Phi_i Y_{t-i} + \Gamma X_t + \varepsilon_t \tag{4}$$

where c is the constant, δ is the coefficient of the linear time trend, Φ_i are the autoregressive coefficients, and Γ is the matrix of coefficients for the exogenous variables.

Cholesky Decomposition

To identify the SVAR, I impose a recursive ordering using Cholesky decomposition:

$$A\varepsilon_t = Bu_t \tag{5}$$

A here is a lower triangular matrix, allowing for the interpretation of ε_t as structural shocks, B is a diagonal matrix, and u_t symbolises the vector of reduced-form residuals. The next step is to select an economically meaningful ordering of variables to achieve structural identification. There is no general consensus regarding the appropriate ordering of uncertainty versus other economic variables but in the main specification included in this paper I chose to order EPU last. This ordering reflects a theoretical rationale that economic variables – investment, consumption, unemployment rate, and CPI – can potentially have instantaneous effects on one another and are posited to influence policy uncertainty with a delay. This delay can be attributed to the time necessary for economic agents and policymakers to observe, process, and react to economic developments. The order used is investment, consumption, the unemployment rate, CPI and EPU. In Figure A4 and A5 of the Appendix, I repeat the analysis with EPU ordered first to demonstrate that the empirical results in this paper still hold with the opposite choice of ordering. The data series I use are sourced from the Irish Central Statistics Office and include underlying investment,[8] the general unemployment rate, private consumption, and the consumer price index. The interest rate used in the exogenous block is the ECB shadow rate computed by Wu and Xia (2016). Use of this series ensures that any ECB response spans both conventional and unconventional monetary policies. Table A1 in the Appendix details the specific data series and sources used.

[8] This is a measure of investment for Ireland that strips out intangibles and aircraft related investment. These items are highly volatile and large investments in these areas are often detached from underlying domestic activity

5.1 Results – Impulse Response Functions

Impulse responses from the SVAR specification using the main Irish EPU series (the left column) and its domestic component (the right column) are shown in Figure 5. To aid comparison, the axes for each variable have the same scale between the main and domestic versions. Impulse responses are plotted with centred 95 per cent confidence bands.[9] A one-standard deviation shock is applied to each EPU series and all responses can be interpreted as percentage deviations from initial values.[10]

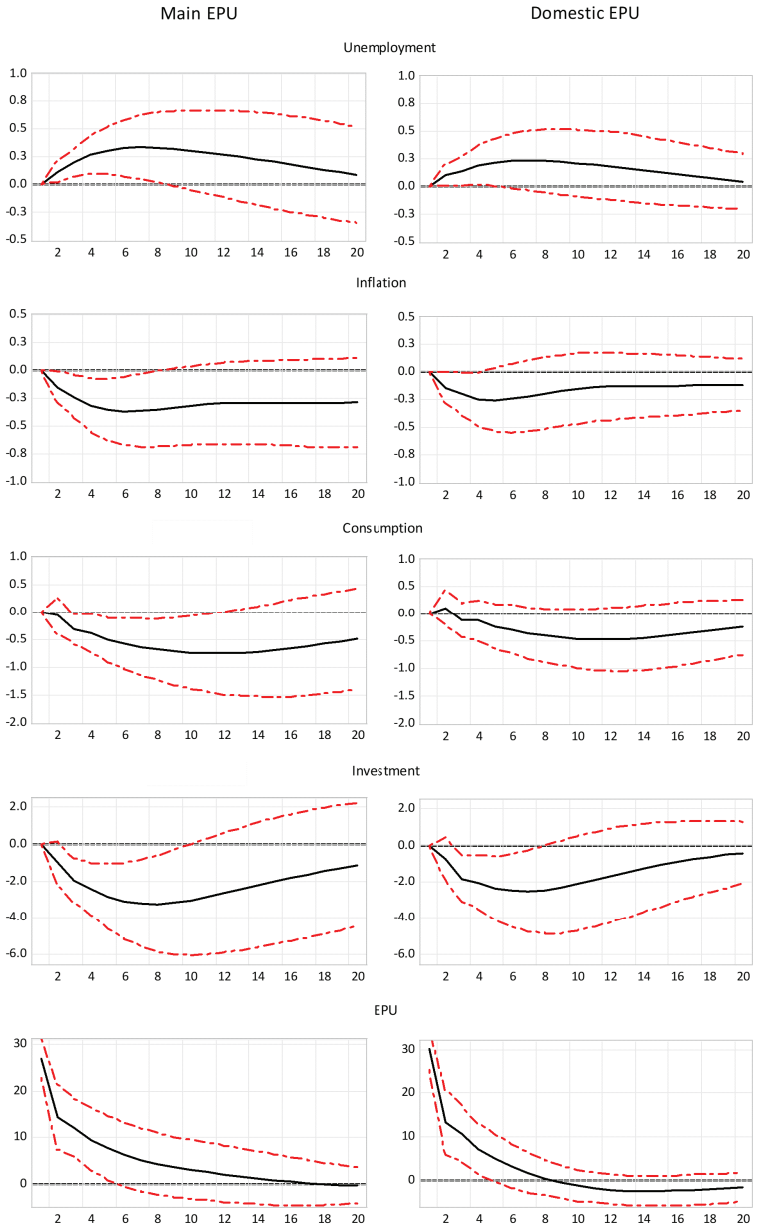
5.1.1 Responses to Shocks in the Main Irish EPU Series

Shocks to the main EPU series foreshadow declines in investment, consumption, inflation and an increase in unemployment. These results are all significant at the 95 per cent level. The scale of the one-standard deviation shock to EPU is roughly equivalent to the uncertainty shock in the months following the Russian invasion of Ukraine. The unemployment rate initially increases, perhaps reflecting a hesitation in hiring or an increase in layoffs due to heightened uncertainty. The peak effect occurs around the 6th quarter before gradually returning to baseline levels. Inflation responses are characterised by an initial decrease, reaching a quarterly trough of –0.4%, possibly reflecting a reduced demand for goods and services in the face of uncertainty, followed by a gradual return to pre-shock levels. This deflationary impact peaks within the first few quarters post-shock. Investment displays the most pronounced reaction, with a sharp and sustained drop (reaching a trough of –3.6%) indicating that businesses may postpone or reduce capital expenditures amidst heightened uncertainty. The negative impact persists throughout the 20-quarter horizon, although the magnitude diminishes over time. Consumption also declines following the shock, reaching a quarterly trough of –0.75%, although the response is rather protracted, suggesting that households may reduce spending in uncertain economic times but at a slower pace than businesses respond in reducing hiring or investment. The trough in the consumption response is observed 10 quarters after the initial shock following which it begins a slow recovery. The shock to the main EPU series decays gradually over time indicating persistence in the propagation of uncertainty shocks.

[9] While the confidence intervals used are tight, it is important to recognise that, for the domestic specification, it is possible that there exists a generated regressor problem (e.g. see Moramarco (2023)) whereby the uncertainty relating to the initial principal component analysis used to generate the domestic series is not incorporated into the confidence intervals used when estimating the impulse response functions.

[10] Note that, while the empirical analysis in this paper is based on assumptions of linearity, both the theoretical literature (e.g. Bernanke (1983)) and empirical literature (e.g. Al-Thaqeb and Algharabali (2019)) suggest that uncertainty shocks can have asymmetric effects.

Figure 5: Irish EPU – Impulse Response Functions



Source: Author's analysis.
Note: Confidence bands at the 95 per cent level, the charts show the impulse reponses to shocks in EPU. IRFs are non-cumulative. The left-side column shows the IRFs to a shock in the main Irish EPU series, while the right-side column shows the IRFs to the domestic component of the Irish EPU series.

5.1.2 Responses to the Shocks in the Domestic Component of EPU

The IRFs to domestic EPU shocks mirror the overall pattern observed for the main EPU specification but with some noticeable differences in scale and duration. The scale of the one standard deviation shock to domestic EPU is roughly equivalent to the uncertainty shock experienced following the Foot and Mouth outbreak in 2001. The response of unemployment is slightly lower, and barely significant, suggesting domestic uncertainty shocks have less influence on the Irish labour market compared to international factors. The response of inflation is similar, but also smaller, with a fairly steep initial drop and a pronounced resurgence, perhaps suggesting a slightly faster assimilation of domestic policy uncertainty into market and pricing mechanisms. The reaction of consumption to domestic EPU shocks is notably lower than that observed for the main EPU specification, and is not statistically significant, suggesting a higher sensitivity of household expenditure to global uncertainty shocks. Despite being smaller in magnitude (reaching a trough of –2.3%), the response of investment is similar in shape and significance to that observed in the main EPU series, demonstrating a lasting cautious approach adopted by businesses in the face of domestic uncertainty. Finally, the shock to the domestic EPU series appears a little less persistent than the main EPU series, with the initial shock dissipating 6 quarters earlier than the shock to the main EPU series.

Overall, these findings demonstrate that both foreign and domestic shocks matter for the Irish real economy. Firms appear to become more cautious in their hiring and investment practices in the face of both foreign and domestic uncertainty. Consumers, on the other hand, appear to be less sensitive to domestic uncertainty shocks, cutting back spending more significantly following uncertainty shocks that include global events.

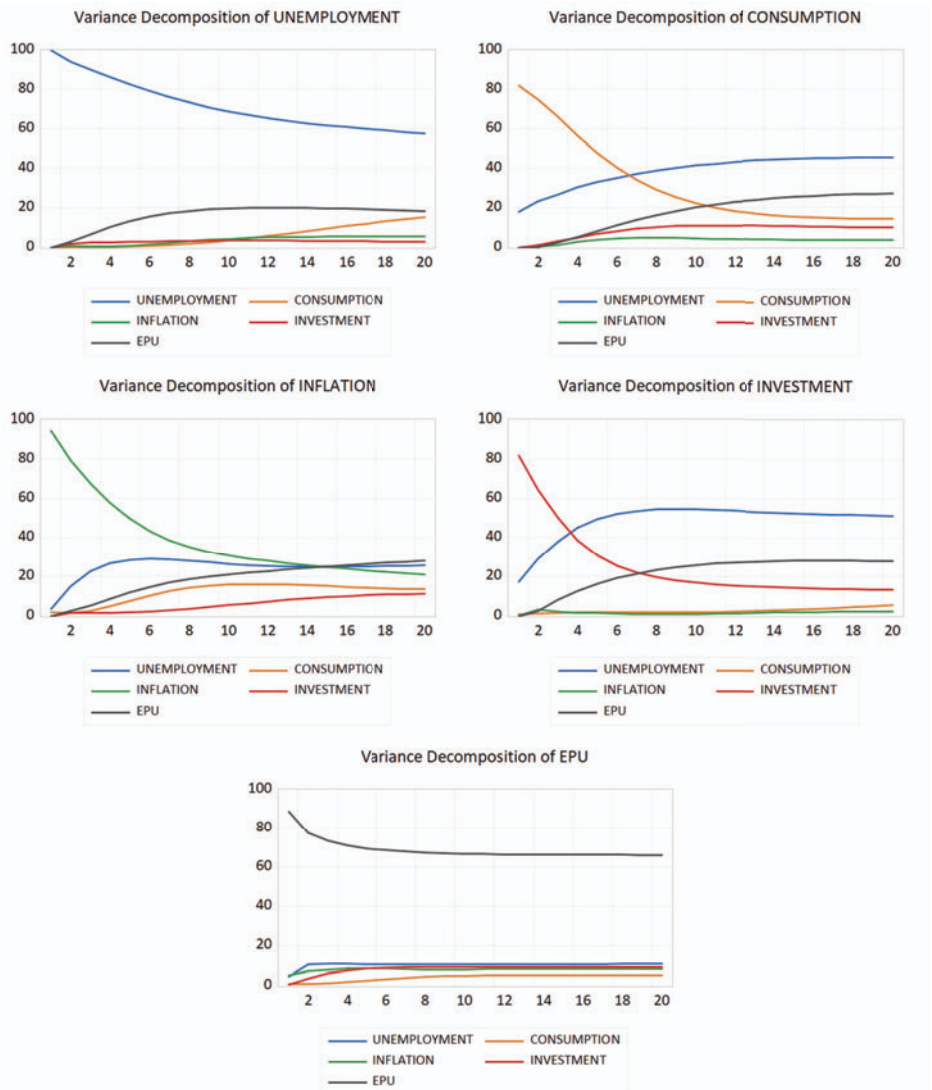
5.2 Variance Decomposition

The variance decomposition from our SVAR model offers valuable insights into the relative importance of different shocks affecting key macroeconomic variables over the horizon of 20 quarters. Figure 6 details the contributions of each shock to the forecast error variance of unemployment, consumption, inflation, investment, and economic policy uncertainty (EPU) for the main EPU specification.

5.2.1 Unemployment

The variance decomposition for unemployment demonstrates that, initially, its own shocks account for a substantial part of the forecast error variance. As the horizon extends, the influence of EPU becomes more significant, suggesting that while labor market conditions primarily drive short-term fluctuations in unemployment, economic policy uncertainty increasingly explains its variability in the medium to long term.

Figure 6: Variance Decomposition



Source: Author's analysis.

5.2.2 Consumption

Consumption's variance is initially dominated by its own shocks although, intuitively, unemployment grows to explain the greatest share of the variance, and economic policy uncertainty also has an important role, highlighting the contribution of first moment shocks (the level of employment) versus second moment shocks (uncertainty, and precautionary behaviour) in household consumption.

5.2.3 Inflation

The decomposition of inflation's variance shows a strong initial influence from its own shocks, with a diminishing trend over time. The contributions from unemployment and EPU become more prominent, indicating that both macroeconomic factors and policy uncertainty are key drivers of inflation, particularly in the medium to long term.

5.2.4 Investment

Investment is highly sensitive to its own shocks at short horizons; however, the contribution of unemployment quickly escalates, eventually surpassing other shocks. Over time, the contribution of EPU grows to account for more than 20 per cent of the variance in investment. This pattern confirms the theory that uncertainty, especially regarding economic policy, can significantly deter investment due to the heightened risks and the value of waiting.

5.2.5 Economic Policy Uncertainty (EPU)

EPU's variance is predominantly explained by its own shocks throughout all horizons, reflecting the autonomous and persistent nature of policy uncertainty.

VI CONCLUSION

In this paper I have constructed a measure of Irish Economic Policy uncertainty using the techniques of Baker *et al.* (2016), carefully tested the approach and resulting series and further developed a measure of domestic Irish EPU that is orthogonal to a global uncertainty series. Irish EPU is shown to be heavily influenced by global policy events, particularly those emanating from the US, UK, and certain large countries in the euro area. I provide evidence that unanticipated economic policy uncertainty shocks foreshadow declines in Irish investment, consumption, inflation and an increase in unemployment and that most of these results also hold following domestic uncertainty shocks, although the response by households is more muted and is not statistically significant.

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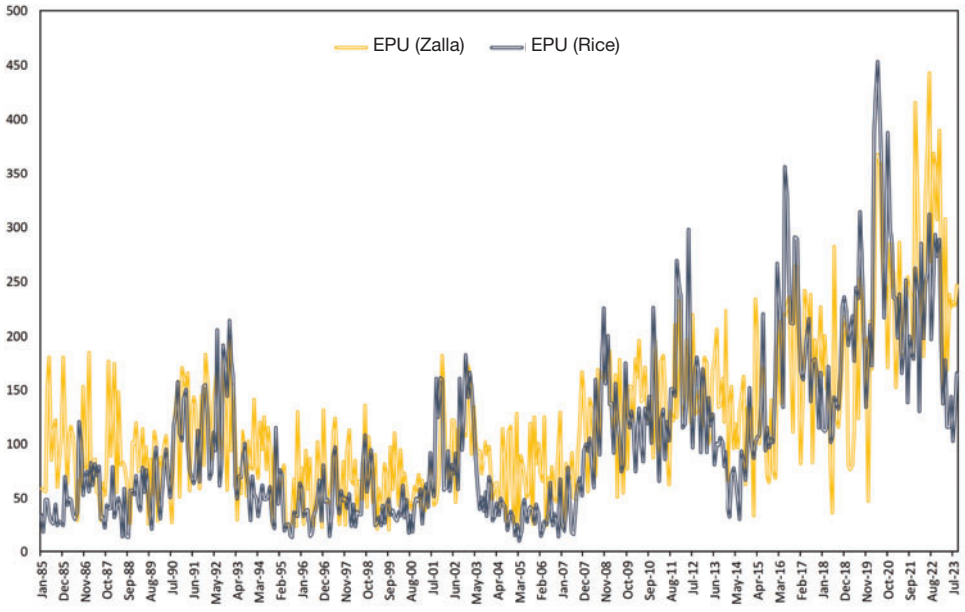
APPENDIX

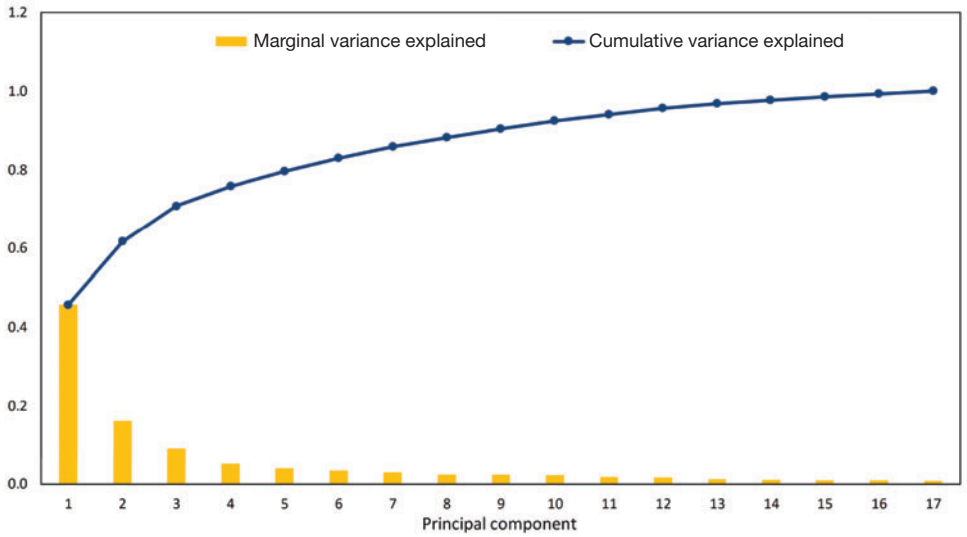
Figure A1: Replication Exercise – Using the Approach of Zalla (2017)



Source: Author's analysis.

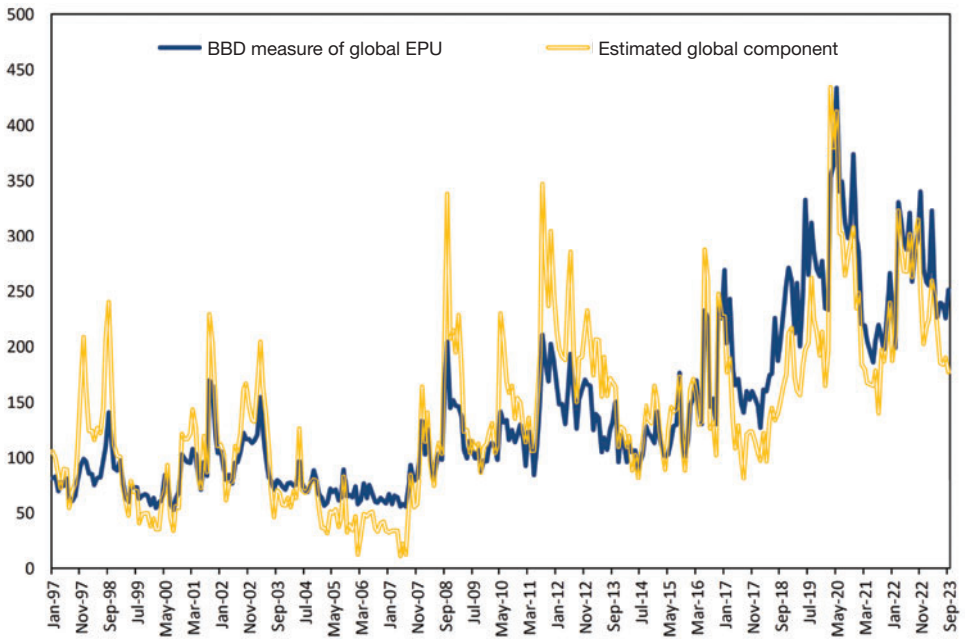
Note: The series EPU (Zalla) is the EPU series developed by Ryan Zalla, downloaded from www.policyuncertainty.org. The series EPU (Rice) is an attempt to replicate the approach of Zalla, using the same newspaper (*The Irish Times*), the same archive source, search keywords, and scaling approach. The correlation coefficient is 0.75, however, the two series should be effectively identical given that the approach was the same. The series *EPU* (Rice) appears to be less volatile and better able to identify intuitive periods of high and low uncertainty.

Figure A2: Marginal and Cumulative Variance Explained Across Principal Components



Source: Author's analysis.
Note: The chart shows the share of variance in the underlying national EPU series that is described using a linear combination of each orthogonal principal component. The number of principal components chosen was informed by the point in which the cumulative explained variance crossed the 70 per cent threshold – after three. The first three components were combined – weighted based on their contribution in explaining the total variance of the underlying series – to generate the global EPU series created in this paper.

Figure A3: Comparison Between the Baker, Bloom, Davis Measure of Global Uncertainty and the PCA-Based Approach

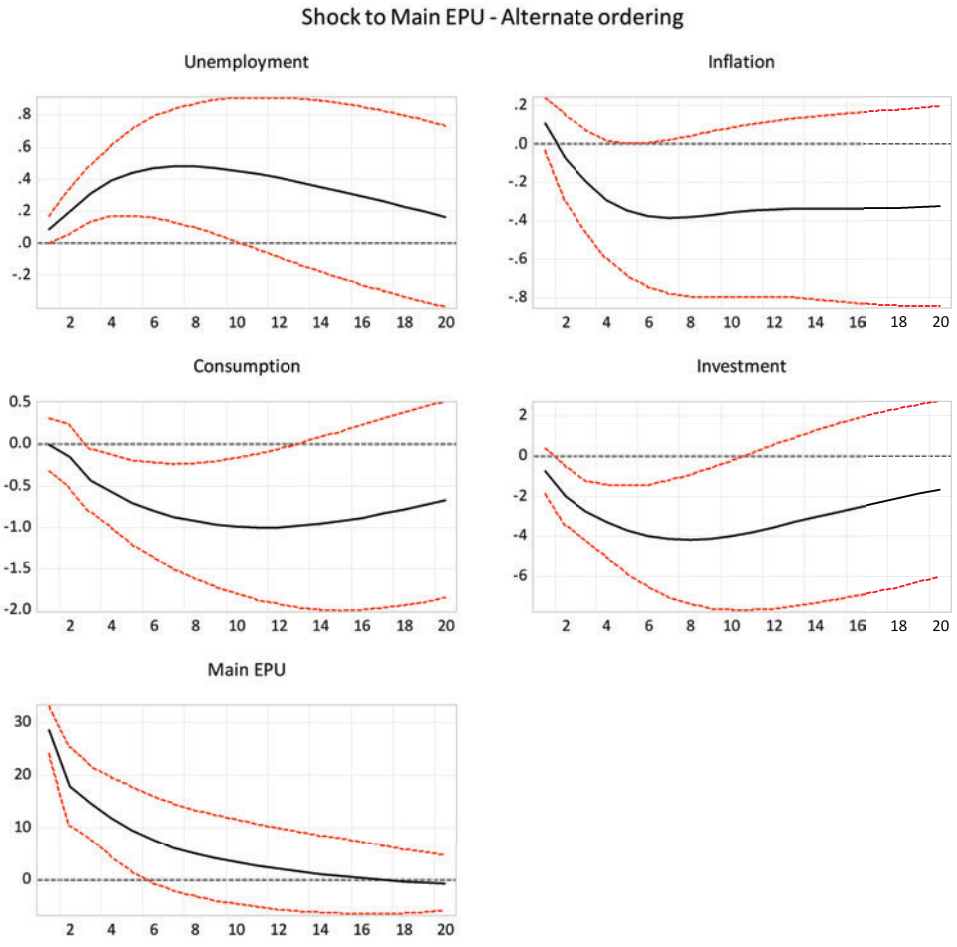


Source: Author's analysis.
Note: There is a stong comovement between the existing Baker, Bloom and Davis (BBD) global uncertainty index and the one estimated in this paper. The BBD series is calculated using the GDP-weighted average of all country-level EPU series available.

Table A1: Data Sources

Variable	*Data source*	*Notes*
Country-level Economic Uncertainty (EPU) indices	www.policyuncertainty.org	Available for 19 countries
Consumer Price Index, all items	Irish Central Statistics Office (CSO)	Base year 2015 = 100
Euro area shadow rate	Wu and Xia (2017)	Available at: https://sites.google.com/view/jingcynthi
Modified gross domestic fixed capital formation	Irish Central Statistics Office (CSO)	At constant market prices and seasofinally adjusted
Monthly unemployment rate	Irish Central Statistics Office (CSO)	15-75, both sexes and seasofinally adjusted
Final consumption expenditure	Irish Central Statistics Office (CSO)	At constant market prices and seasofinally adjusted

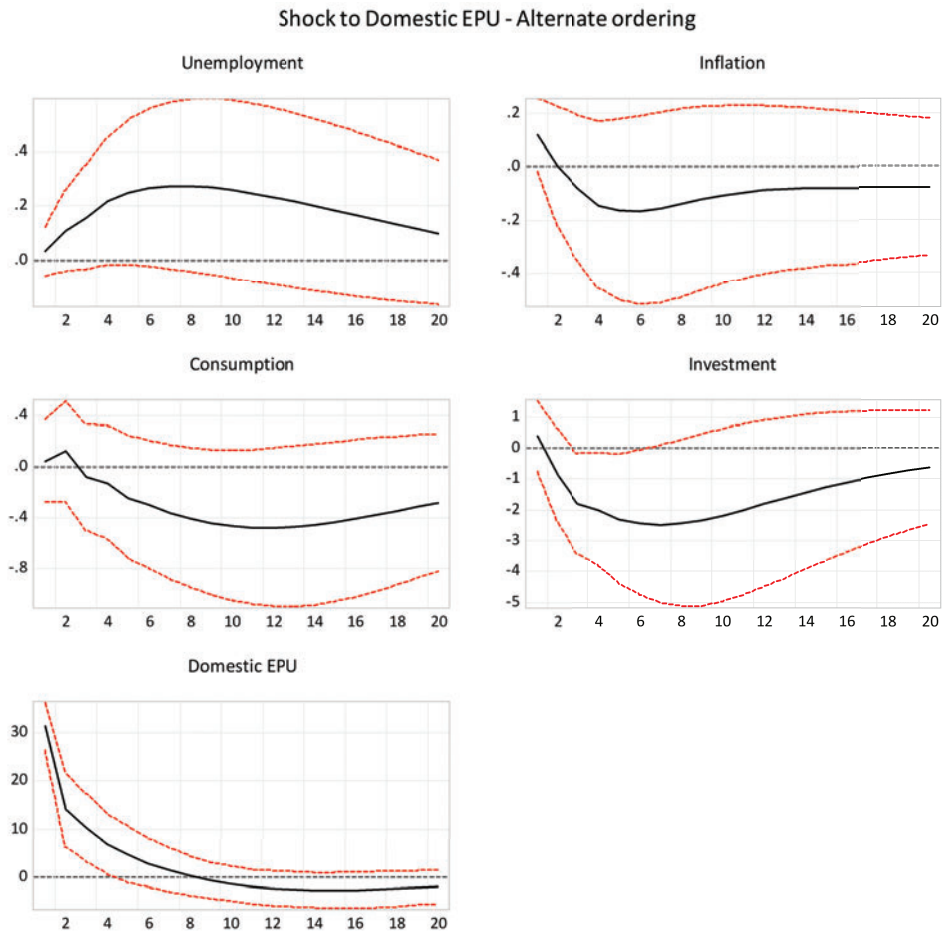
Figure A4: Ordering Main EPU First



Source: Author's analysis.

Note: The above chart shows impulse response functions of macroeconomic variables to shocks in the main Irish EPU series, with a linear time trend and an exogenous series capturing monetary policy, in line with the empirical approach taken in the main specification of the paper. The ordering is changed such that EPU is ordered first. In general the same results hold, although the inflationary reponse is less significant.

Figure A5: Ordering Domestic EPU First



Source: Author's analysis.

Note: The above chart shows impulse response functions of macroeconomic variables to shocks in the domestic EPU series, with a linear time trend and an exogenous series capturing monetary policy, in line with the empirical approach taken in the main specification of the paper. The ordering is changed such that EPU is ordered first. In general the same results hold, although both the unemployment and inflation responses are no longer significant at the 95 per cent level.