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Uncertain trends in economic policy uncertainty

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UNCERTAIN TRENDS IN ECONOMIC POLICY UNCERTAINTY

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IES Working Paper 1/2024

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Uncertain Trends in Economic Policy Uncertainty

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Abstract:

The news-based Economic Policy Uncertainty indices (EPU) of Germany, France, and the United Kingdom display discernible trends that can be found neither in other European countries nor in other uncertainty indicators. Therefore, we replicate the EPU index of European countries and show that these trends are sensitive to the rather arbitrary choice of normalizing the raw counts of news related to economic policy uncertainty by the count of all newspaper articles. We show that an alternative normalization by news on economic policy leads to different long-term dynamics with less pronounced trends and markedly lower uncertainty during recent periods of uncertainty such as Brexit or the COVID-19 pandemic. Consequently, our results suggest that the effects of uncertainty related to these events on economic activity may have been overestimated.

JEL: D80, E66, E32

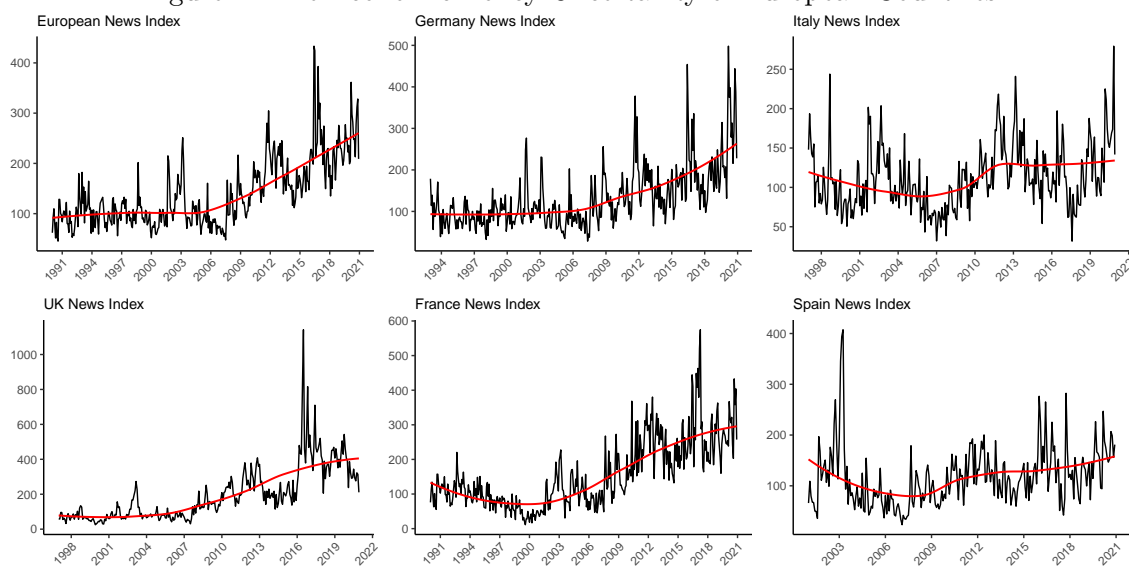
Keywords: economic policy uncertainty, trend-cycle decomposition, reproducibility, reliability

1 Introduction

In recent years, there has been widespread interest in estimating the impact of uncertainty on economic performance. Bloom (2009) and Justiniano and Primiceri (2008), among others, presented theoretical models in which uncertainty fluctuations decrease output growth, increase unemployment, and contribute significantly to overall variations in the business cycles. Fernández-Villaverde and Guerrón-Quintana (2020) provide a comprehensive survey of the literature that estimates the effects of uncertainty shocks. However, measuring uncertainty remains challenging, and multiple conceptually different indicators are used in the literature to track uncertainty in financial markets, forecast disagreements, or more general uncertainty in the economy (see Castelnuovo et al. (2017) and Ferrara et al. (2018) for surveys).

One of the most popular proxies for uncertainty in economic models is the Economic Policy Uncertainty Index (EPU) developed by Baker et al. (2016), with more than 9000 citations since its publication.¹ This EPU index is based on the count of newspaper articles containing a set of words associated with uncertainty related to future economic policies. The popularity of this index comes from its success in matching historical data, particularly in the United States, where increases in the EPU index indicate historical periods of economic and political instability. Moreover, the EPU index is available at a monthly frequency and for almost 30 countries, allowing for many different types of analysis.

Figure 1. The Economic Policy Uncertainty of European Countries



Note: Data from https://www.policyuncertainty.com/europe_monthly.html, retrieved on April 13, 2021. The trends were obtained using the Loess non-parametric method.

¹Google Scholar as of March 2023.

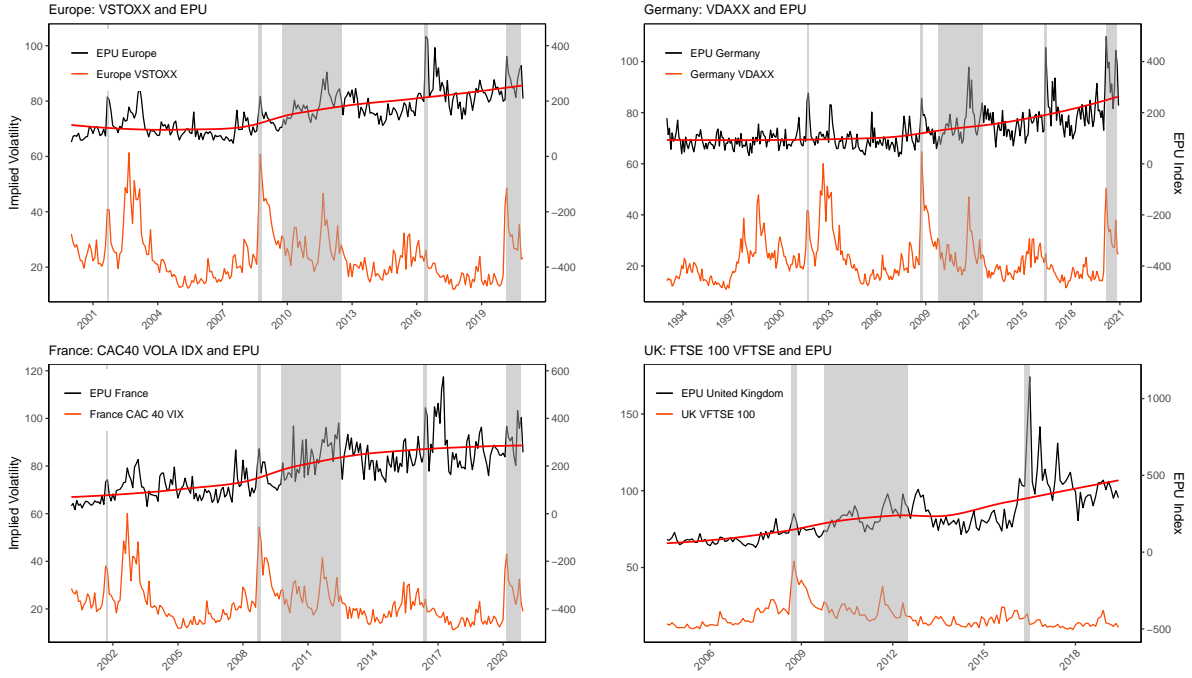
In this paper, we focus on the properties of the EPU indices of the major European economies: Germany, France, Italy, Spain, and the United Kingdom. We focus in particular on the long-term trends in the EPU indices that are apparent in the United Kingdom, Germany, France and the aggregate European EPU index, but not in Italy or Spain (Figure 1).² However, the absence of trends in Italy and Spain is counterintuitive, considering the turmoil of the EU debt crisis and the subsequent political instability in both countries. Furthermore, EPU trends are inconsistent with the uncertainty measures derived from the implied volatilities in financial markets (Figure 2) and with the World Uncertainty Index of Ahir et al. (2018) (Figure 3).³ Other uncertainty proxies for EU countries also tend to be mean-reversing. Meinen and Röhe (2017) show the developments of the macroeconomic uncertainty indices of Germany, France, Italy, and Spain in two versions of the index, one inspired by Jurado et al. (2015), the second follows Rossi and Sekhposyan (2015). In all cases, macroeconomic uncertainties had returned to pre-2008 levels by 2014. Also, the forecast dispersion in production uncertainties (following Bachmann et al., 2013) returned to pre-crisis levels. The EPU dynamics is also exceptional at the euro area level. The European Central Bank (2016) shows that financial market uncertainty, forecast disagreement, and survey-based proxies for economic uncertainty based on both consumer and business surveys returned to pre-Great Recession levels. The forecast uncertainty from the Survey of Professional Forecasters stabilized at a higher than pre-crisis level, possibly due to a change in forecasters' risk perception after the Great Recession, which was not expected by the majority of forecasters participating in the surveys. Therefore, the comparison of uncertainty measures constructed through various approaches shows discrepancies and raises doubts about the reliability of the increasing trends observed in the EPU indices.

Our goal is to investigate why the trends in the EPU arise in some countries and not in others, whether these trends are reliable, and whether the values of the EPU can be used for policy guidance as an indicator relevant for short-term predictions of economic activity. Thus,

²The presence of trends is corroborated by conventional stationarity tests (ADF, ADF-GLS, and KPSS) even for the sample ending before 2020, i.e. before the COVID-19 pandemic. The *KPSS test* rejects the null of stationarity for Europe, Germany, France, and the United Kingdom, but does not reject stationarity in Italy and Spain. The *ADF test* does not reject the unit root for Europe, France, and the United Kingdom, but rejects the unit root for Germany, Italy, and Spain. However, when we account for *heteroskedasticity* using the ADF-GLS, the unit root cannot be rejected for Germany, Italy, and Spain as well (for the results of the stationarity tests, see the Appendix, Table A1).

³Note that in contrast to the EPU, the World Uncertainty Index (WUI) has been calculated for almost all countries in the world, which has made this index appealing for cross-country analyses (Ahir et al., 2020 and 2021). However, the WUI also has several drawbacks. First, it is available on a quarterly frequency (the EPU is available on a monthly frequency), and the spikes in the EPU appear (much) earlier than the spikes in the WUI, which is admitted by Ahir et al. (2018). On the other hand, in the case of European countries, the WUI leads to more intuitive trends than the EPU.

Figure 2: Economic Policy Uncertainty and Implied Volatility Indices in Europe

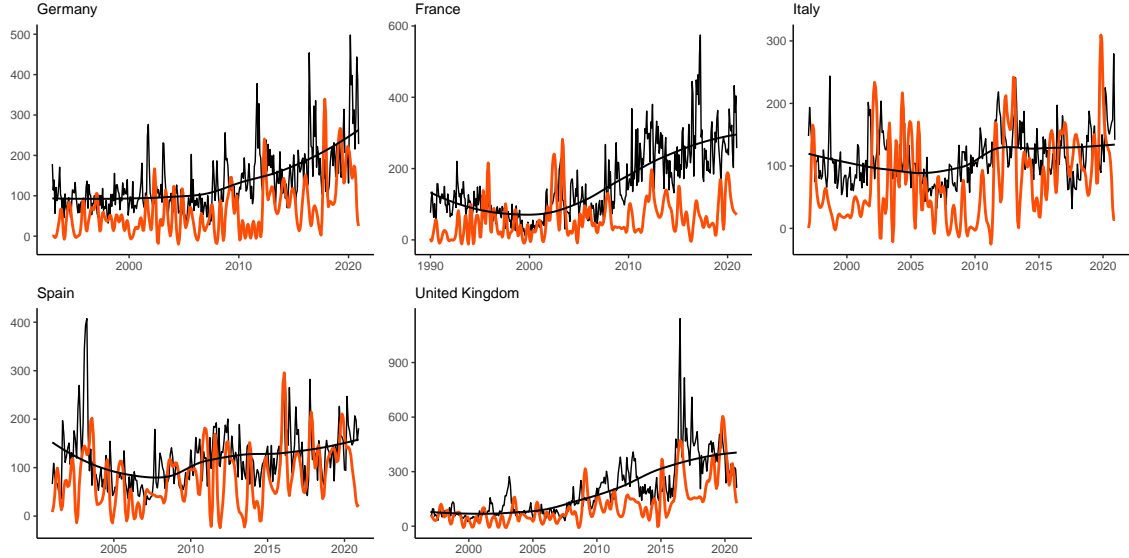


Note: Implied volatility - red (VSTOXX, derived from the Eurozone’s EURO STOXX 50, VDAX based on the German DAX index, CAC40 VOLA IDX (VCAC) based on the French CAC40, and the FTSE 100 VIX index (VFTSE) based the British FTSE 100 index, left axes. EPU index - black, right axes. Notice the trend in the EPU that is absent in implied volatilities representing risk assessment on financial markets.

we focus mainly on the construction of the EPU index. Baker et al. (2016) first extract the raw counts of articles related to uncertainty from the leading newspapers in the countries, then divide these counts by the counts of all articles published each month.⁴ This normalization was used to control for part of the variation in the counts of articles related to uncertainty arising from changes in the count of all articles over time. However, the composition of newspaper articles and their relative counts also evolved markedly for reasons not related to uncertainty. For instance, the counts of German newspaper articles in *Handelsblatt* and *Frankfurter Allgemeine-Zeitung* - which are used to calculate the German EPU – have gradually decreased over the past two decades. There was a shift in the composition of newspapers toward longer, more in-depth analyses, and the overall article count related to economic policy increased. These changes in composition were driven by changes in readers’, journalists’, and editors’ preferences due to the rising importance of online editions and social media platforms, along with possibly greater interest in economic policy after the Global Financial Crisis. Although these changes are not necessarily caused by uncertainty, they affect the count of all articles and confound the EPU index through the denominator.

⁴To facilitate interpretation, this ratio is normalized so that the pre-2010 mean equals 100.

Figure 3: Economic Policy Uncertainty and World Uncertainty Indices in Europe



Note: The World Uncertainty Index was introduced by Ahir et al. (2018). The WUI index reflects the frequency of the word “uncertainty” in the reports by the Economist Intelligence Unit that are scaled by the total word count in each report. It is available at a quarterly frequency for all countries covered by the EIU reports. The values of the WUI were multiplied by 1000 to make the scale comparable with the EPU.

To disentangle the changes driven by fluctuations in uncertainty-related articles from those in the count of all articles, which are inputs for scaling the EPU index by Baker et al. (2016), we replicate the text mining procedure for the major European economies. Next, we test the sensitivity of the EPU index to alternative normalization. We take the ratio of the raw count of uncertainty-related articles to the count of economic policy-related articles instead of all articles. This alternative scaling removes the effects of structural changes in the publication policies of newspapers, as well as changes in the share of articles not related to economic policy. Although this alternative has pros and cons, the comparison between EPU indices based on two alternative normalizations shows the sensitivity of the EPU to a scaling factor that has not been discussed previously. Furthermore, we discuss the robustness of the index to relatively arbitrary changes in the selection of newspapers and databases used for text mining. To anticipate our results, we find that the trends of the EPU index are relatively sensitive to these changes and that the overall index is difficult to replicate.

Our work is closely related to the literature that discusses the properties of the EPU index and addresses potential biases in the index by using refined algorithms to select articles related to uncertainty⁵. This literature employs language processing methods to select the most appro-

⁵The other biases treated in this literature are related to the pitfalls connected with selecting the appropriate keywords for constructing the EPU index in non-English speaking countries. These biases are related to linguistic differences, differences in journalistic styles, conventions, and the overall social context (Charemza et al., 2022).

appropriate keywords and eliminate irrelevant articles from simple text searches. Azqueta-Gavaldón (2017) uses machine learning to eliminate irrelevant articles from those selected by a simple text search by Baker et al. (2016) for the United States; however, the differences between his uncertainty index and the original EPU are relatively minor. Azqueta-Gavaldón et al. (2023) use machine learning to develop an EPU index for the euro area, Tobbäck et al. (2018) for Belgium, and Larsen (2021) for Norway. Charemza et al. (2022) construct the EPU index for Russia, where they extend the approach of Azqueta-Gavaldón et al. (2023) for sentiment analysis. They add specific positive and negative weights to the relevant keywords to determine whether articles about uncertainty indicate increasing or decreasing uncertainty. Overall, this literature implies that a more precise extraction of the raw count of uncertainty-related articles leads to EPU dynamics closer to those obtained by human evaluation of the articles. Nevertheless, this literature takes the normalization of the count of uncertainty-related articles by all articles as given, while our analysis shows that the choice of scaling factor matters for some countries and for the overall European EPU.

Finally, we recommend several adjustments to the calculation of the EPU index of European countries to improve its reliability when employed in short-term forecasting, for example, within central banks. The EPU index has the advantage over alternative uncertainty indicators in that it captures different types of uncertainty than uncertainty indices calculated based on the dispersion in predictions or associated with financial instability. First, we recommend scaling the raw count of uncertainty-related articles by economic policy articles rather than all articles. Such adjustment in normalization leads to less pronounced trends and more consistent searches across databases, especially since Factiva does not allow the extraction of the count of *all* articles.⁶ We show that using an alternative normalization for the EPU index leads to a quantitatively smaller impact of uncertainty shocks on economic activity and implies lower estimates of Brexit- and COVID-related economic policy uncertainty. Second, we suggest expanding the coverage of newspapers. In the current editions, the EPU indices of European countries are based only on two leading newspapers from the respective country. Considering that adding or changing the selection of newspapers affects the overall index, two newspapers seem insufficient for reasonable, robust, and credible approximations of uncertainty. Third, the same database should preferably

⁶Factiva's search engine does not allow "blank" searches to obtain all articles published in a given month. Baker et al. (2016) address this issue by searching for the word "today" instead; however, it appears that when we search for the article "the" ("la" in Italian and French), the count of retrieved articles differs (is larger) from the search results using "today."

be used for text mining of uncertainty-related articles to ensure consistency across countries.

The remainder of the paper is organized as follows. The second section provides more details on the construction of the Economic Policy Uncertainty Index. Section three presents a replication of the EPU index and examines the impact of alternative normalizations and a different selection of newspapers. Section four studies the implications of alternative EPU normalizations on the quantitative effect of uncertainty shocks on economic activity and Brexit-related uncertainty. Finally, section five concludes with several recommendations for utilizing the EPU indices.

2 The Economic Policy Uncertainty Index

Baker et al. (2016) constructed the EPU index for Germany, France, Italy, Spain, and the United Kingdom using the relative frequency of articles reflecting the uncertainty of economic policy in two leading newspapers for each country. Thus, the authors turned to full-text databases of newspaper articles and counted the articles retrieved with the following search query for each month:

*(economic OR economy OR business OR industry OR commerce OR commercial) AND (spending OR policy OR deficit OR budget OR tax OR regulation OR "Bank of England" OR war OR tariff) AND (uncertain OR uncertainty)*⁷

This query implies that an article is considered an indicator of economic policy uncertainty if it contains at least one word from all three parts of the search query. The first subset of keywords implies that the selected articles are related to economic affairs, the second to policy, and the final one refers to uncertainty.⁸ To account for shifts in newspaper composition, the article count is normalized by the total article count published in a particular newspaper in a given month, that is, $x_{it} = \text{uncertainty articles}_{it} / \text{all articles}_{it}$. The ratio is further normalized by the variance of x_{it} until December 2009 to avoid the effect of new observations on the historical

⁷These keywords are used for the calculation of the index for the United Kingdom. The queries for other countries are equivalent, but obviously in the language of the particular newspaper. The exact specification of the keywords is provided in Baker et al. (2016) and this paper's Appendix.

⁸Baker et al. (2016) explain their selection in Section 2 of their paper: "We aim to capture uncertainty about who will make economic policy decisions, what economic policy actions will be undertaken and when, and the economic effects of policy actions (or inaction) – including uncertainties related to the economic ramifications of "noneconomic" policy matters, e.g., military actions. Our measures capture both near-term concerns (e.g., when will the Fed adjust its policy rate) and longer-term concerns (e.g., how to fund entitlement programs), as reflected in newspaper articles." Brandt (2021) has explored the extent to which the selection of keywords affected the index.

values of the index. Next, the ratio x_{it}/σ_i^2 is averaged across newspapers within a given country or, in the case of the European EPU, across all newspapers from European countries. Finally, these averages are rescaled, so the mean until December 2009 is 100. Therefore, the EPU value of 100 reflects the average level of uncertainty in a country of interest until the Great Recession. Since the EPU for European countries usually starts in the 1990s, it mainly reflects the uncertainty during the NICE (non-inflationary, consistently expansionary) decade before 2007.

The construction of the index relies on relatively strong implicit assumptions. First, it is assumed that the same keywords consistently represent the uncertainty of economic policy over time. However, the use of contemporary vocabulary for keyword selection can lead to increasing trends, as some words are used more frequently in more recent times than at the beginning of the sample, for example, because of the evolving perception of the importance of various policies for the economy. Nevertheless, this assumption is not as problematic for samples spanning over a few decades as for historical EPU indices, with samples ranging over many decades.

The second and more important assumption is that the relative frequency of keywords represents changes in uncertainty related to economic policy and does not represent surges in pure interest in macroeconomic factors. There is relatively fresh evidence that readers' preferences evolve and depend on the state of the economy. Jha et al. (2021, 2022) analyze millions of books published in eight countries over more than one hundred years to investigate popular sentiment toward financial institutions. In addition to persistent differences between countries, the authors document systematic movements in sentiments following wars, epidemics, natural disasters, and other major shocks. Sentiment usually improves when insurance coverage mitigates the shock and the financial sector helps to spread the burden of the shock. On the other hand, when a shock is uninsured and contracts cannot be renegotiated, people tend to perceive the financial sector more negatively. In line with these considerations, Duca and Saving (2018) show that the EPU is not exogenous to macroeconomic developments. They argue that macroeconomic fundamentals and political fragmentation cause around 40% of long-run and short-run fluctuations in the EPU indices of the US and Europe.⁹ According to these findings,

⁹ “Nevertheless, the Baker et al. (2016) index is often met with skepticism by economists who are concerned that EPU either reflects other economic factors or is so endogenous as to be meaningless. One particular and common shortcoming of studies that analyze EPU is that long-term trends in EPU are ignored or omitted. Accounting for these trends is important because they could shed light on the factors underlying time series, helping social scientists better interpret and gauge short- and long-term movements in economic policy uncertainty.” (Duca and Saving, 2018). Some skepticism toward the EPU index was also expressed in the Deutsche Bank report: “For the European EPU index, the BBD weights the EU countries equally and does not distinguish between local

Ludvigson et al. (2021) assert that uncertainty is not only a source, but also a consequence of business cycle fluctuations. They highlight the importance of uncertainty in propagating other macroeconomic shocks in addition to being the primary cause of business cycle fluctuations.

Importantly, Baker et al. (2016) do not control for the structural changes in the newspaper industry that affect the composition and content of newspapers and thus affect the counts of all articles that serve as the denominator of the EPU index. However, the composition of newspapers has evolved dramatically over the past decades, in part because the Internet and social networks have taken up a large part of the market share of the print media. The online space has led to a continuous decrease in the circulation of newspapers and gradual changes in their content. Short articles, such as sports news and news often reprinted from press agencies, have moved to online editions. In addition, there has been a shift by journalists to more detailed and lengthy analyses than before. Consequently, the article count has mostly decreased, although with varying intensity across countries and newspapers. But even a modest drop in the count of sports articles, for example, affects the denominator, the count of all articles, and increases the EPU index independently of the article count related to uncertainty (nominator). This drop in the count of sports articles can be illustrated by the Frankfurter Allgemeine Zeitung. We have compared the article count in different categories in the first week of May in 2000, 2005, 2010, 2015, and 2019. In all years, the highest article count was in the section Economy, but its count decreased from more than 100 in 2000 to below 60 in 2019. The count of sports-related articles also decreased from about 40 in 2000 to about 10 in 2019. Thus, while the article count in both categories decreased, the relative share of economic articles increased.

Overall, a significant shift in the preferences of readers, journalists, and editors materialized in the structural changes in newspapers. These changes in relative counts of articles could affect the development of the EPU independently of fluctuations in fundamental uncertainty. In the following sections, we will show how the counts of uncertainty-related, economic policy-related, and all articles have evolved. The trends in all series will stand out clearly.

and international policy uncertainty. Put differently, German newspapers writing about Brexit and associated economic uncertainty in the UK are counted towards an increasing EPU in Germany and contribute to the European index. International news coverage in local newspapers probably inflates index values during major events such as Brexit. Another caveat is the representativeness of the newspapers taken for index construction. BBD uses two major newspapers from each country, which usually have a specific economics and finance focus (and, as such, tend to be more internationally oriented). During episodes of economic uncertainty, this may magnify the surge in EPU.” (Kaya et al. (2018)).

3 Replication of the EPU Index

3.1 Text Mining Exercise

To investigate the reasons behind the differences in EPU trends across countries, we replicate the construction of the EPU index. We performed a full-text search of articles related to uncertainty as specified by Baker et al. (2016) and selected the newspapers and period as close to theirs as possible. However, minor modifications were inevitable, given the availability (or lack thereof) of newspaper archives and databases to us. In particular, the composition of the newspapers used for the EPU index has also evolved over time. The current edition of the European EPU available at https://www.policyuncertainty.com/europe_monthly.html is based on a different selection of newspapers than in the index in Baker et al. (2016). We follow the EPU available online, which is regularly updated and used in the literature. Therefore, we use the term "original EPU" for the EPU on the EPU website, despite some small differences from the EPU in the published paper.

The original EPU relies on Le Monde and Le Figaro for France, Handelsblatt and Frankfurter Allgemeine Zeitung for Germany, Corriere Della Sera and La Stampa for Italy¹⁰, El Mundo and El Pais for Spain, and The Times of London and the Financial Times for the United Kingdom. In the case of German newspapers, we use their online archives in line with Baker et al. (2016). We used the Factiva database for other countries. Given the license restrictions, we adjusted the selection of newspapers. Specifically, Le Monde is not available under our Factiva license, so we replaced it with the leading economic newspaper in France, Les Echos.¹¹ For the same reasons, instead of the Financial Times, we opt for The Guardian, which Baker et al. (2016) used in calculating the Historical EPU index for the United Kingdom.¹² Moreover, The Guardian represents a progressive political stance, while The Times of London is more conservative-leaning. Therefore, the replicated EPU index encompasses conservative and progressive perspectives. Additionally, Baker et al. (2016) use the NewsBank Access World News database for the United Kingdom instead of Factiva, which is used in our replication. Consequently, the replicated indices in this paper are not based on exactly the same underlying data as those used by Baker

¹⁰La Stampa appears in the current EPU published at [policyuncertainty.com](https://www.policyuncertainty.com), the journal version of Baker et al. (2016) uses Corriere Della Sera and La Repubblica.

¹¹Baker et al. (2016) used the Lexis Nexis database to access the archive of Le Monde. However, this database was not available to us either. As a sensitivity check, we scraped Le Monde's online archive, and these results show the sensitivity of the EPU index to the choice of newspaper article database.

¹²The Historical index for the United Kingdom is available at www.policyuncertainty.com.

et al. (2016). On the other hand, the changes document the sensitivity of the EPU indices, including differences in the search engine and in the selection of newspapers. The text mining specifications are summarized in Table 1.

Table 1: Text Mining Specifications of the EPU

	Newspapers		Database	
	<i>Baker et al. 2016</i>	<i>Replication</i>	<i>Baker et al. 2016</i>	<i>Replication</i>
Germany	Frankfurter Allgemeine Zeitung, Handelsblatt		Newspapers' online archives	
France	Le Monde Le Figaro	Les Echos Le Figaro	Lexis Nexis Factiva	Factiva Factiva
UK	The Times Financial Times	The Times The Guardian	NewsBank Access World News Database	Factiva Factiva
Italy	Corriere Della Sera, La Stampa		Factiva	
Spain	El Mundo, El País		Factiva	
France Sensitivity Check	Le Monde Le Figaro	Le Monde Le Figaro Le Monde Le Figaro Les Echos	Lexis Nexis Factiva	Online Archive Factiva Online Archive Factiva Factiva

Note: This table summarizes the differences in text mining between Baker et al. (2016) and this paper. We performed three alternative searches for France, using the text mining in Les Echos and Le Figaro as a baseline. The other searches in Le Monde's archive were used in the sensitivity analysis presented in Section 3.4.

In contrast, we used the same search queries as Baker et al. (2016) to obtain uncertainty-related articles:

Query 1: (*economic OR economy OR business OR industry OR commerce OR commercial*)
AND (spending OR policy OR deficit OR budget OR tax OR regulation OR "central bank"
*OR war OR tariff) AND (uncertain OR uncertainty)*¹³

The article count obtained from Query 1 was then scaled by the count of all articles or, in the case of Factiva, by articles containing the word "today" because Factiva does not permit searching for all articles in a given period. To address the role of changes in newspaper composition,

¹³The country-specific queries can be found in the Appendix.

we propose an alternative index, referred to as the *adjusted EPU* that differs from the original EPU in the denominator. Instead of dividing the count of uncertainty-related articles by all articles, we used the count of articles discussing economic policy, obtained using query 2, as the denominator.

Query 2: (*economic OR economy OR business OR industry OR commerce OR commercial*)
AND (spending OR policy OR deficit OR budget OR tax OR regulation OR "central bank"
*OR tariff OR war*¹⁴)

Query 2 is equivalent to Query 1 up to the third part, with uncertainty-related keywords excluded from Query 2.

The benefit of our adjusted EPU is that normalization removes articles not related to economic policy from the denominator and infers uncertainty from fluctuations of uncertainty-related articles relative to the writings on economic policy. The underlying assumption of this choice of normalization is that the words in Query 2 are related to economic policy in general and do not necessarily indicate uncertainty. The first set of words (*economic OR economy OR business OR industry OR commerce OR commercial*) is less debatable than the second set of policy-related words (*spending OR policy OR deficit OR budget OR tax OR regulation OR "Bank of England" OR tariff*), and in the case of the United Kingdom, *war*. The context matters, and noise and arbitrariness are inherent in all text-mining exercises. Although there are attempts to tackle this problem with machine learning techniques, see Azqueta-Gavaldón (2017) or Charemza et al. (2022), we stick to straightforward text mining due to its transparency and for a direct comparison of the impact of modified specification with the original index by Baker et al. (2016). Additionally, either the counts of economic policy articles do not increase with major events, such as the European debt crisis, or the pattern is similar to that of *all* articles. The only exception is Germany during the COVID-19 pandemic at the end of the sample.

Our adjusted EPU, with uncertainty-related articles normalized by economic policy articles, is similar to the Monetary Policy Uncertainty Index by Husted et al. (2020) who use text mining to obtain articles relevant to the uncertainty of future monetary policy and scale the count of relevant articles by articles on the Federal Reserve rather than by the count of all articles. Moreover, the scaling by economic policy articles is also similar to Baker et al. (2014). Their

¹⁴Following Baker et al. (2016), the keyword *war* is used only for the United Kingdom and not for other countries, presumably because military spending is associated mainly with increased military spending and expansionary fiscal policy rather than with uncertainty.

work is one of the earlier iterations of papers on the EPU index, where the authors discuss the long-term trends in the US EPU index. As a robustness test, they normalized the EPU index by the frequency of articles with the words (*economic OR economy*) instead of all articles. In the case of this alternative normalization, the rise of the EPU in the United States after 2007 is not as evident as with the baseline EPU index normalized by *all* articles. We use a more restrictive search query for the adjusted EPU to increase the chance that uncertainty fluctuations are driven primarily by articles related to economic policy uncertainty and that the impact of the evolving composition of newspapers is minimized. The comparison between the replicated EPU and the adjusted EPU provided in the following sections of this paper reveals qualitative and quantitative differences and how the policy implications of both indices differ.

3.2 Case Studies: Raw Counts for Germany, Italy, and the United Kingdom

Figure 4 presents the raw results of the three search queries to demonstrate the trends in the inputs of the EPU index for Germany, Italy, and the United Kingdom. To keep the discussion concise, we skip the presentation of the raw counts of France and Spain, as their patterns are similar to those of Germany (France) and Italy (Spain). The “uncertainty-related articles” are the denominator of the index ratio, whereas the “all” and “Economic Policy” articles are two alternatives for the denominator.

In Figure 4a, we present the raw counts of the components of the EPU index for Germany. Since the mid-2000s, the count of uncertainty-related articles has increased in line with the EPU index in both German newspapers (Frankfurter Allgemeine Zeitung and Handelsblatt), while the count of all articles has decreased. In the case of Frankfurter Allgemeine Zeitung, the data reveal a dramatic drop in the count of all articles between 2002 and 2003. This drop is related to significant losses at F.A.Z. Group, the parent company of Frankfurter Allgemeine Zeitung following a drop in advertising revenue. The customized sections for Berlin and Munich were scrapped, and an eight-page, English-language edition, published six days a week, was reduced to weekly tabloid format. The Saturday issue shrank from 234 pages at its peak to 40 pages within two years; see Landler (2004). Thus, the ratio of uncertainty-related articles to all articles increased, partly due to a decrease in the denominator and not just because of the count of articles directly pointing towards uncertainty. Conversely, the count of articles related to economic policy (the second candidate for the denominator) increased, moving inversely to the count of all articles. This result indicates that the EPU index calculated using the count

of all articles as a denominator is, to some extent, driven by changes in the composition of newspapers.

Italy is an entirely different case, as shown in Figure 4b. Unlike Germany, the dynamics of articles for Italy containing the word "Oggi" (Italian for today) resembles that of economic policy articles.¹⁵ Furthermore, the series act counterintuitively, given that the future of economic policies was rather unpredictable during the 2010s.¹⁶ The Italian economy descended into an unprecedented triple-dip recession, unemployment, and a banking crisis that even threatened its membership of the Eurozone.¹⁷ Despite political turmoil and instability after the Great Recession, the count of uncertainty-related articles remains fluctuating around its mean throughout the sample (particularly in *La Stampa*). These developments contrast with those in Germany, where we observe a significantly higher increase in the count of economic policy uncertainty-related articles, although its economy evolved relatively smoothly under Chancellor Angela Merkel and recovered quickly from the 2008 Great Recession. A comparison of the German and Italian raw counts shows that the evolution of articles related to uncertainty does not necessarily reflect the intuition behind long-term changes in the uncertainty of economic policy in different countries.

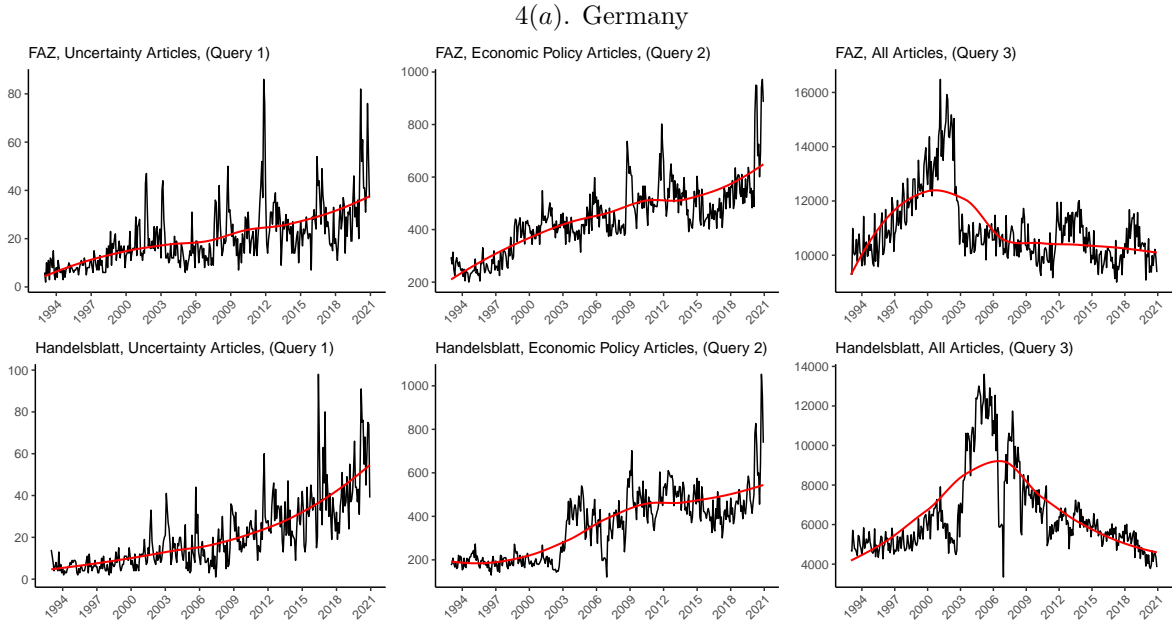
In the case of the United Kingdom (Figure 4c), the count of uncertainty-related articles peaks with the Brexit referendum and subsequent negotiations, while the count of "economic policy" articles compared to articles with the word "today" evolves differently across newspapers. Thus, fluctuations in the denominator contribute to the dynamics of the overall EPU index. Furthermore, the count of economic policy articles is higher than that of articles with the word "today." Therefore, we can conclude that the search result for the word "today" is not equivalent to the count of all articles published in a given month. The approach to scaling the search count of articles related to uncertainty by the count of articles that contain the word today is different

¹⁵A strong seasonal pattern is particularly evident at *Corriere della Sera*. There is a periodic, systematic decline in the article count in August, coinciding with Italy's holiday season.

¹⁶In response to the crisis, the Italian government led by Mario Monti adopted strict austerity policies that were opposed by the general public. This led to a rise in both the left- and right-wing populist parties (Five Star Movement and the League). After the 2013 snap elections following Monti's resignation, Italy experienced a series of political crises. The cabinet was led first by Enrico Letta and then by Matteo Renzi (both members of the Democratic party). The government passed several structural reforms and gradually softened some of its austerity measures. At the same time, Renzi ran a campaign to change the Italian constitution; however, the new constitutional rules were rejected in a referendum in December 2016. Renzi resigned and Paolo Gentiloni was appointed new prime minister. The Democratic party gradually lost public support. Two populist and Eurosceptic movements (the League and the Five Star Movement) won the 2018 elections, forming a government led by an independent prime minister Giuseppe Conte. The government collapsed in 2019; however, Conte continued as prime minister in a new coalition of the Five Star Movement with the Democratic Party until 2021.

¹⁷In particular, Beppe Grillo, the leader of the Five Star Movement, attempted to initiate a referendum over Italy's euro area membership in 2014.

Figure 4: Counts of Articles Underlying the EPU Index (monthly frequency)



Note: The article counts of the three search queries used to construct the EPU index. Each country is represented by two leading newspapers. The first column shows the results for the first query of uncertainty-related articles. The second column shows the count of all articles (Germany) and articles containing the word “today” (Italy and the UK). The third column depicts the series used for an alternative normalization by the third query (economic policy-related articles). The sample is determined by the availability of articles in the archives. Trends: The Loess non-parametric method.

from scaling by all articles, contributing to the inconsistencies between countries.¹⁸

Overall, the raw counts underlying the EPU index reveal non-trivial differences across countries and normalization choices. The cross-country differences are most prominent between Italy and Germany’s EPU indices. Moreover, there are significant differences in the developments of the scaling factors (“all,” “today,” or “economic policy” articles) used in normalizations of the raw count of uncertainty-related articles. These findings cast doubt on the reliability of the EPU index in representing uncertainty since it is not clear how much of the EPU fluctuations are caused by uncertainty per se and how much by the evolving structures of the newspapers.

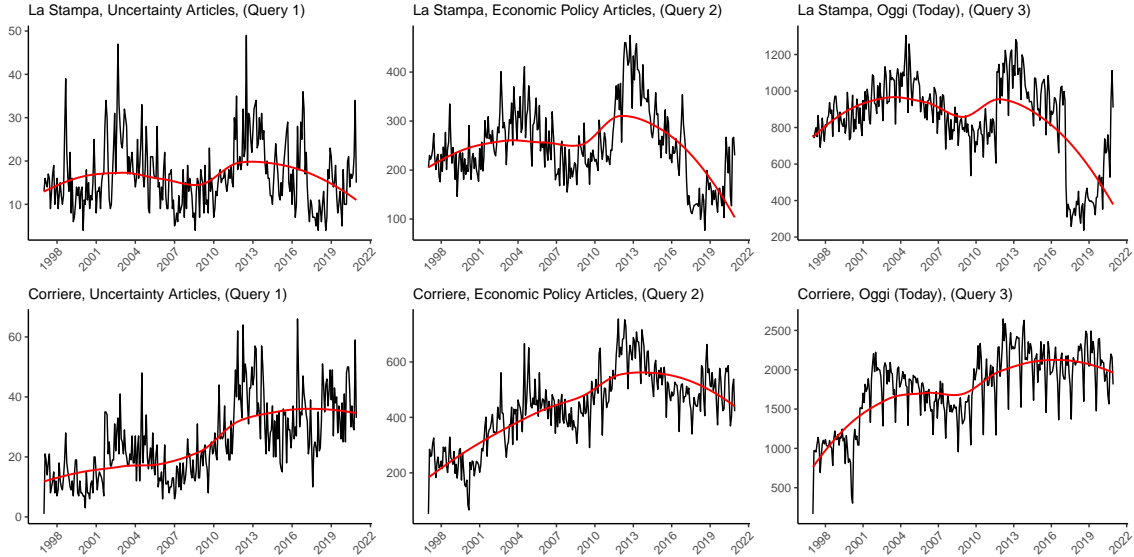
3.3 Replicated EPU Indices

We present our replicated EPU indices in Figure 5, along with the series provided by Baker et al. (2016) on the <https://www.policyuncertainty.com/> web page. In the case of the European EPU, our replicated EPU (the gray area) closely matches the original index, although some discrepancies appear in the severity of several uncertainty peaks, including during the EU debt

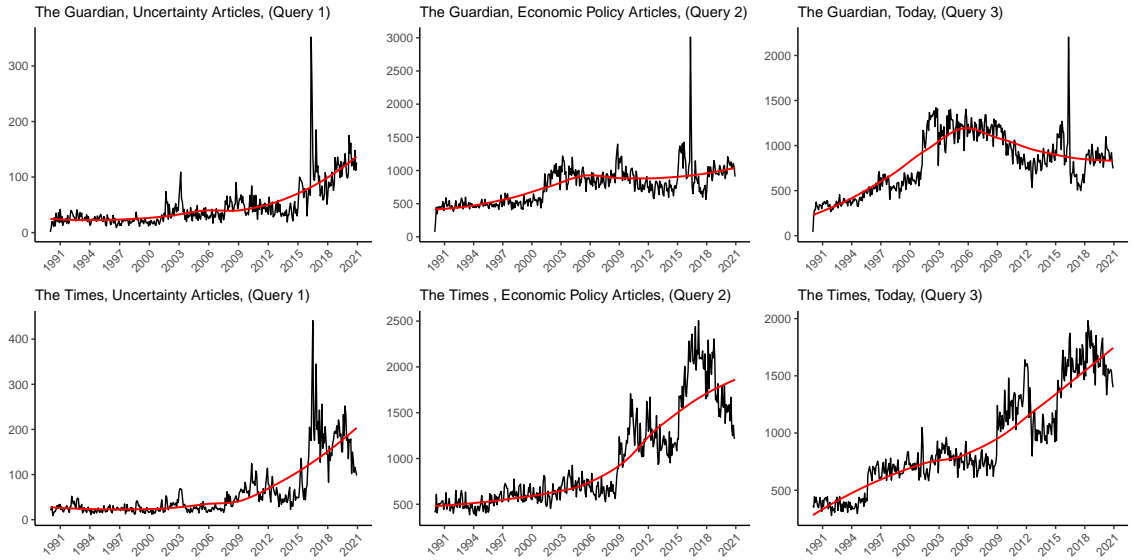
¹⁸Similarly, searching for articles such as “la” in Italian results in a higher article count than with the equivalent of “today.”

Figure 4: Counts of Articles Underlying the EPU Index (monthly), Cont.

4(b): Italy



4(c): United Kingdom



Note: The counts of articles of the three search queries used for the construction of the EPU index. Each country is represented by two leading newspapers. The first column shows the results for the first query for uncertainty-related articles. The second column shows the count of all articles (for Germany) and articles containing the word 'today' (in the case of Italy and the United Kingdom). The third column shows the series used for alternative normalization by the third query (economic policy-related articles). The sample is determined by the availability of articles in the archives. Trends: The Loess non-parametric method.

crisis and the Brexit referendum. These discrepancies arise from text mining specifications and time periods different to those used to calculate the European EPU. Although Baker et al. (2016) constructed their index starting in 1987, it is based only on a subset of countries and newspapers up to 2001. In addition, the period 1987-1990 is based solely on the French newspaper *Le Monde*. Our approach is different. We construct the European EPU only for the period which is based on the complete set of newspapers and countries. The difference in the period before 2009 implies that the standard errors and averages used to scale the index differ.¹⁹

The alternative *adjusted EPU* relies on normalization by “economic policy” articles. It mimics the original and replicated indices reasonably well until the Global Financial Crisis of the late 2000s. However, the gap between the two differently normalized EPU indices widens after 2009. Our “adjusted EPU” index increases with the 2007 financial crisis and remains at a similar level in the following years despite the turmoil of the European debt crisis. Furthermore, no additional major increases are visible in the original index until all EPU indices peak with the Brexit referendum. However, the adjusted EPU index peaks around 270 points, while the original index reaches 440 points (60% higher).

More apparent discrepancies arise at the country level between the original, replicated, and adjusted EPU indices. The most striking case is Germany. Despite relying on the same newspapers, archives and queries, we were unable to closely replicate the Germany EPU index by Baker et al. (2016). Although the short-term fluctuations are very similar, the long-term growth in the original EPU that motivated our analysis is even more pronounced in the replicated index. To achieve closer replication to the original EPU, we performed thorough checks of our search exercise, repeated web-scraping, and tried some additional sample restrictions in March 2023. Although such modifications are not mentioned in Baker et al. (2016), we repeated text mining with additional restrictions on search specifications. We selected only printed articles and excluded additional media that are covered by the archives of *Handelsblatt* and *Frankfurter Allgemeine Zeitung*, such as the business weekly *Wirtschaftswoche* and the regional *FAZ* edition *Rhein-Main-Zeitung*. However, we were unable to reproduce the original index. Our tentative explanation for these differences is the limited reliability of search results within newspapers’ online archives, with possibly unstable article counts over time. The recheck in March 2023

¹⁹However, we do not have access to the raw data used by Baker et al. (2016), so we cannot assess how much the difference in time periods contributes to the differences in the resulting EPUs.

led to different article counts in the Frankfurter Allgemeine Zeitung and slightly changed the trajectory of the German EPU. Baker et al. (2016) also experienced this phenomenon with the New York Times archive. These additional results are provided in Appendix C.²⁰

The alternative adjustment of the German EPU removes a large portion of the long-term trends compared to the original and replicated EPU indices. Moreover, unlike the other two indices, in the case of the adjusted EPU, the implied level of uncertainty in the 2010s appears to be higher than in the previous decade. This is despite a relatively broad consensus on macroeconomic policy and the German economy's successful rebound from the Great Recession. However, the increase in the adjusted EPU with the COVID-19 pandemic is less pronounced than in the original and replicated EPUs. The dynamics of the adjusted EPU is also reasonably robust to additional restrictions to include only print articles and the strict focus on Handelsblatt and Frankfurter Allgemeine Zeitung without additional resources that appear in their online archives (Appendix C).

The French case illustrates the sensitivity of the EPU index to newspaper selection. Our sample is shorter than that of Baker et al. (2016), and we replaced the leading newspaper Le Monde with the leading economic newspaper Les Echos. These two largely arbitrary changes were enough to produce very different long-term trends in the French EPU. Even our replicated EPU lacks most of the trend increase of the original EPU, whereas the normalization of uncertainty-related articles by economic policy articles removes an additional portion of trend growth (adjusted EPU). In the next section, we will show that this result remains robust even after the inclusion of Le Monde in the sample.

The results are similar for the United Kingdom to those of France. Changes in newspaper selection - note that we have replaced the Financial Times with the Guardian - and in the database lead to a persistently lower EPU index in the latter part of the sample. We do not observe prominent peaks during the European debt crisis, and the uncertainty related to Brexit decreased compared to the original EPU. On the other hand, the difference between the replicated series and the alternative normalization is relatively small.

Finally, in the cases of the two southern countries, Italy and Spain, both the replicated and adjusted EPU indices produce similar dynamics to the original series without apparent increases in the long-run trend. We attribute this similarity to the fact that our search specifications

²⁰We performed both automated scraping and manual searching, and the results were identical. We have also experimented with different logical operators to verify whether the search engine interprets them as we expect, but even this exploration did not uncover the cause of the differences.

match perfectly with those used by Baker et al. (2016), who also rely on the Factiva database. However, even in this case, our replicated EPU index does not align perfectly with the original EPU index.

3.4 Sensitivity Analysis: French EPU Based on Alternative Newspapers.

In our replication of the French EPU, we rely on the newspapers Le Figaro and Les Echos, since both are available in the Factiva database. As a sensitivity check, we regenerate the index for France constructed using Le Monde, retrieved through the online scraping of its archives. This option allows exploring the impact of different sets of newspapers and databases on the EPU index.²¹ Interestingly, replacing Les Echos with Le Monde results in an even greater difference between the replicated and original EPU indices (Figure 6 (a)). Despite the same composition of the newspapers as in Baker et al. (2016), the long-term trend is much less apparent in the replicated index. Furthermore, contrary to the original EPU index by Baker et al. (2016), the European debt crisis does not stand out as a major period of uncertainty.

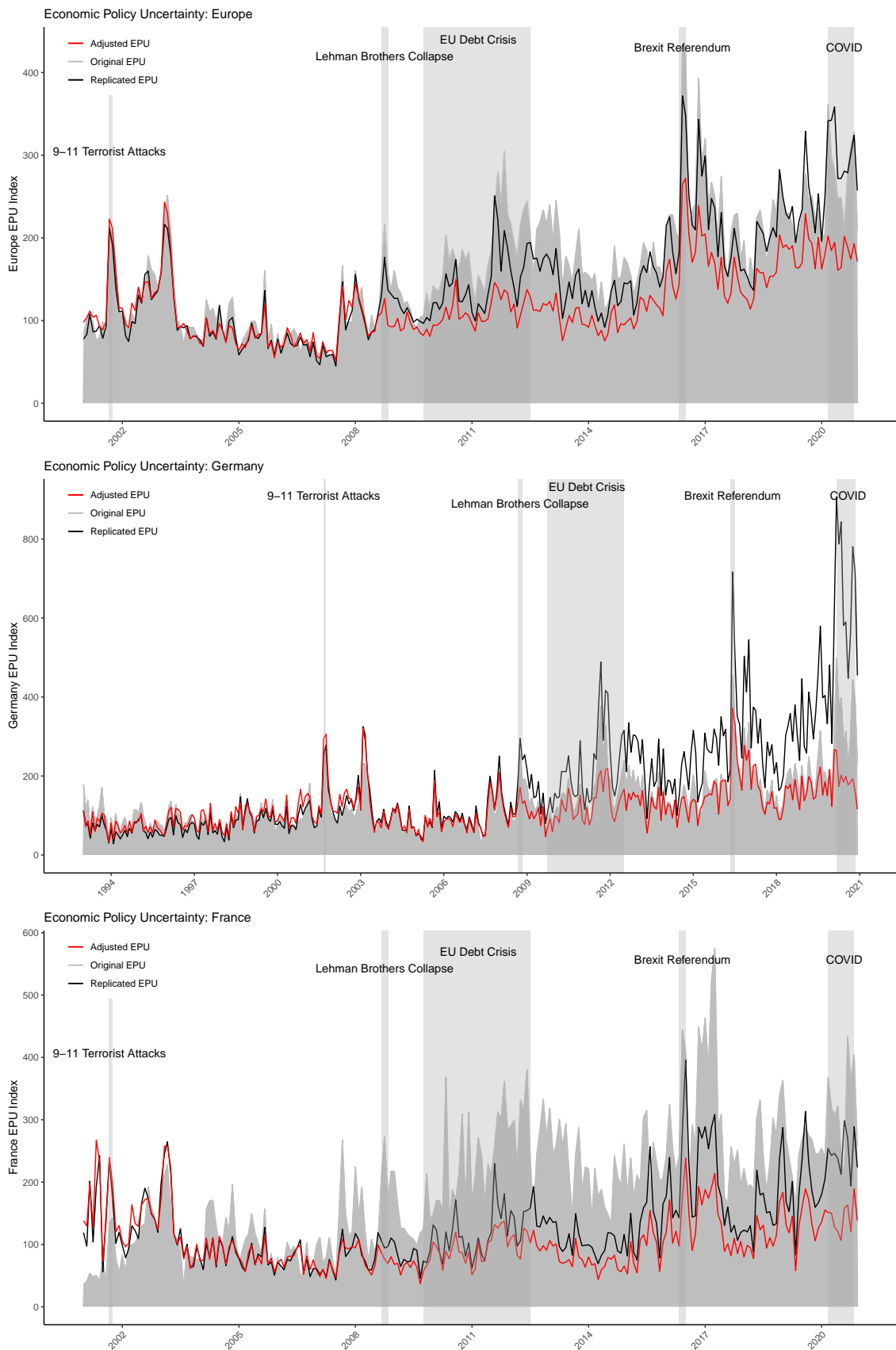
We also calculated the French EPU from all three newspapers, Le Monde, Les Echos, and Le Figaro, to present the impact of extended newspaper coverage. This index constructed using three newspapers is between the indices based on two newspapers. Therefore, the EPU index is sensitive to newspaper selection, but the difference is not as pronounced as the utilization of different archives and search engines. Along with the original EPU index, the bottom panel of Figure 6(b) shows adjusted EPU indices normalized by “economic policy” articles for different combinations of French newspapers. The rising trend of the original EPU index is almost completely absent from the replicated indices.

3.5 Implications

Our calculations show that it is not easy to replicate the EPU index by Baker et al. (2016). We obtained the closest, albeit imperfect, match between our replication and the original index in the cases of Italy and Spain, where we used identical newspapers and databases. Additionally, although we used the exact specification of text mining and sources for Germany, our replicated index is very different. This suggests that the choice of database plays a more important role

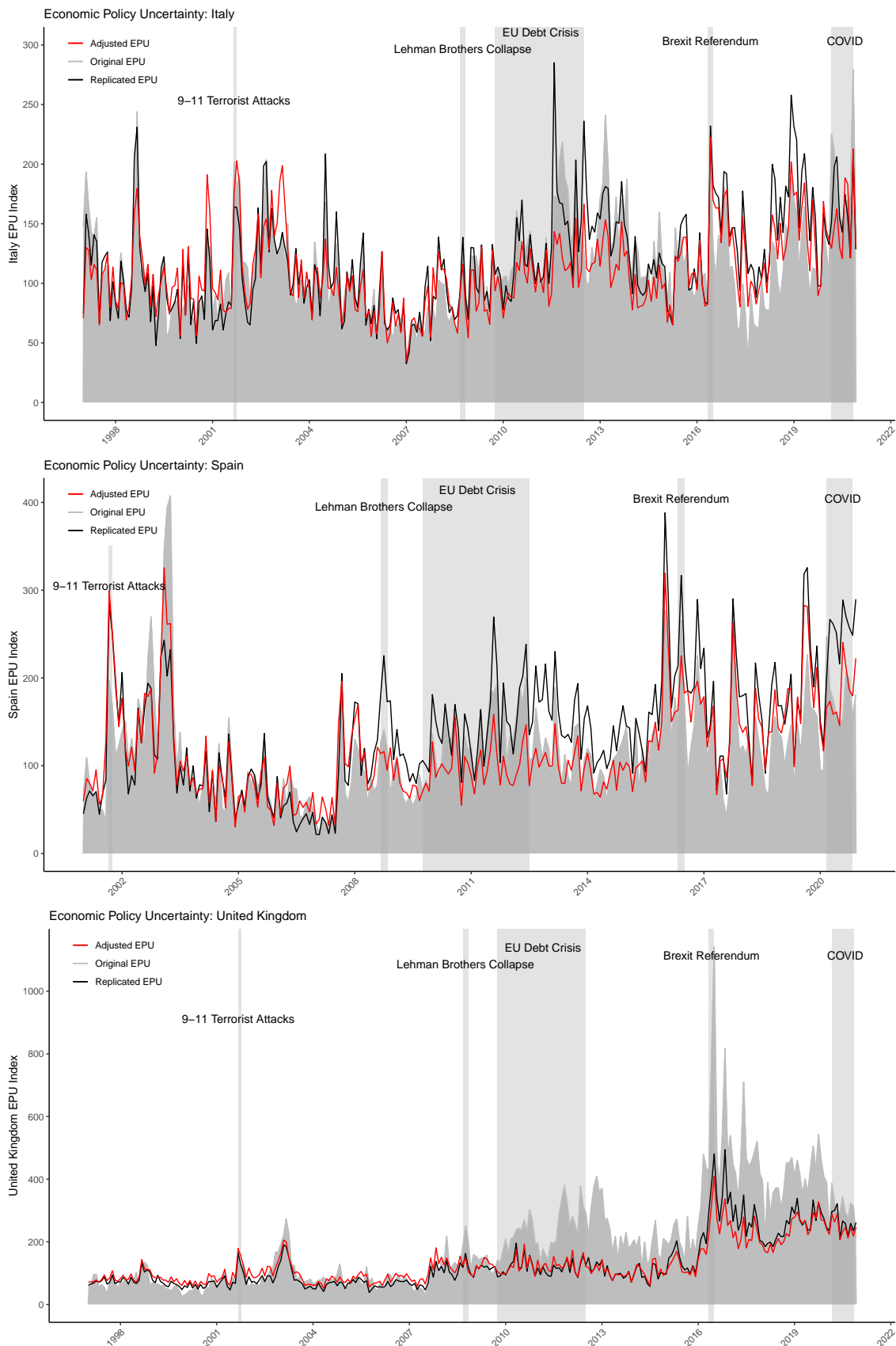
²¹Since we have higher confidence in the completeness of the Factiva database than in the scraped archive, we prefer to use the same database for both newspapers in one country to avoid the bias caused by different scopes of articles, such as whether sport-related news are included or not. Also, as mentioned in Section 3.1, we do not have the opportunity to access the Lexis Nexis database used by Baker et al. (2016) as a source of Le Monde articles.

Figure 5: Comparison of the Original, Replicated, and Adjusted EPU Indices



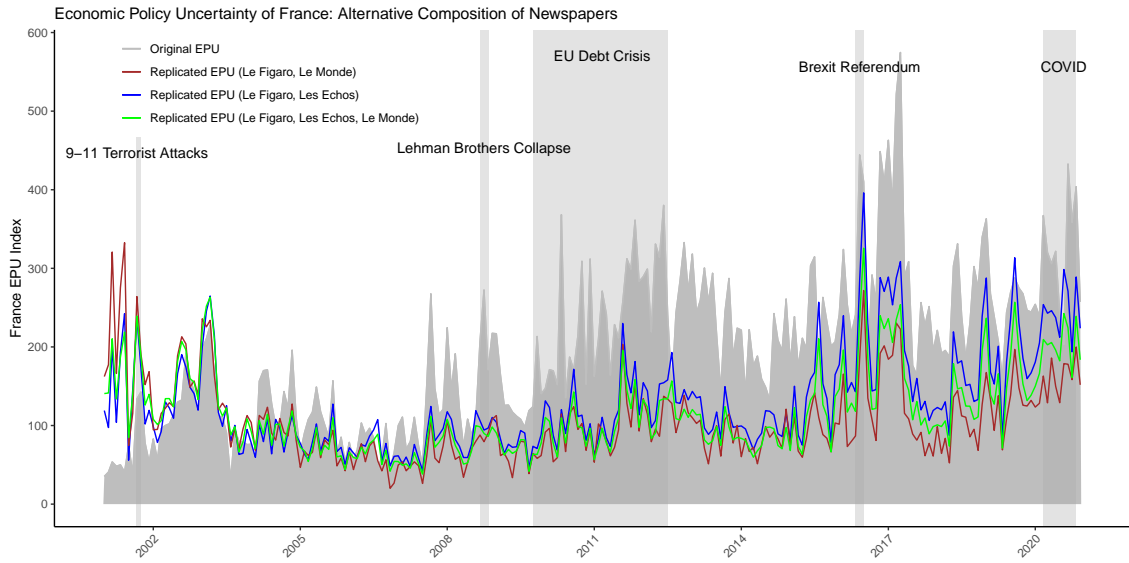
Note: The grey area shows the original EPU published at <https://www.policyuncertainty.com/>. The black line presents the replicated EPU, i.e. is based on the count of uncertainty-related words scaled by all articles. The red line - adjusted EPU - shows the EPU index based on the count of uncertainty-related articles scaled by economic-policy-related articles.

Figure 5: Comparison of the Original, Replicated, and Adjusted EPU Indices, Cont.



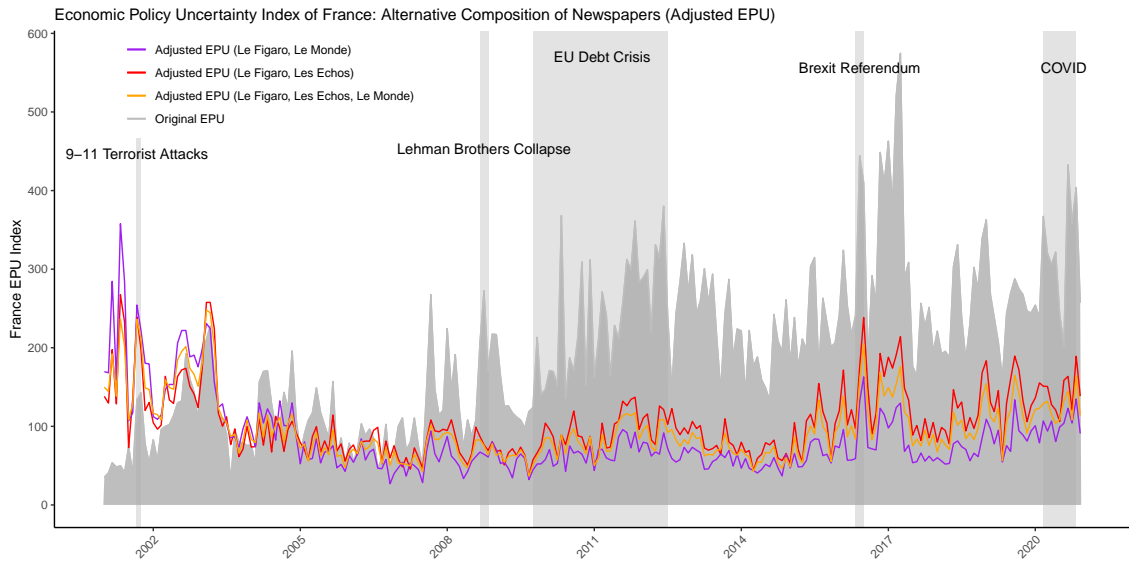
Note: The grey area shows the original EPU published at <https://www.policyuncertainty.com/>. The black line presents the replicated EPU, i.e. is based on the count of uncertainty-related words scaled by all articles. The red line – adjusted EPU – shows the EPU index based on the count of uncertainty-related articles scaled by economic-policy-related articles.

Figure 6(a): French EPU Indices Based on Alternative Newspaper Selections



Note: The grey area shows the original EPU published at <https://www.policyuncertainty.com/> (both panels). Top panel: Blue = replicated EPU based on the Factiva database, with Le Figaro and Les Echos. Green = replicated EPU, Le Figaro (Factiva), Le Monde (own archive scraped using Google). Brown = all three newspapers. Bottom panel: Original EPU and replicated EPUs normalized by economic-policy articles. Red = Le Figaro and Les Echos; orange = Le Figaro and Le Monde; purple = all three newspapers.

Figure 6(b): French Adjusted EPU Indices Based on Alternative Newspaper Selections



Note: The grey area shows the original EPU published at <https://www.policyuncertainty.com/> (both panels). Top panel: Blue = replicated EPU based on Factiva database, with Le Figaro and Les Echos. Green = replicated EPU, Le Figaro (Factiva), Le Monde (own archive scraped using Google). Brown = all three newspapers. Bottom panel: Original EPU and replicated EPUs normalized by economic-policy articles. Red = Le Figaro and Les Echos; orange = Le Figaro and Le Monde; purple = all three newspapers.

than the selection of newspapers in replicating the French EPU. However, a change in the selection of newspapers also impacts the EPU.

Lastly, we show that the alternative normalization of the count of “uncertainty” articles by “economic policy” articles leads to less pronounced trends in the EPU indices of Germany and France while remaining relatively inconsequential to indices in the other countries. Furthermore, the most prominent differences between the original and adjusted EPUs appear in recent years, around the Brexit referendum and at the beginning of the COVID-19 pandemic. In the cases of Germany, France, and the United Kingdom, the peaks of the adjusted EPU are about one-half of the peaks of the original EPU.²² On the positive side, all variants are highly correlated, notably at higher frequencies. The correlation coefficients are provided in the Appendix, Table A.3.

4 Applications

4.1 EPU and Economic Activity in Europe

Next, we estimate panel VAR models to investigate how the alternative normalization of the EPU translates into estimates of the impact of uncertainty shocks on economic activity. Our benchmark specification contains the EPU index, the log of stock prices, the 10-year government bond yield, the short-term interest rate, the unemployment rate, and the log of industrial production in manufacturing. The choice of variables and their ordering is inspired by the specification in Baker et al. (2016), who conducted a similar exercise for a wider range of countries.²³

The panel VAR model was estimated on monthly data beginning in January 2001 and ending in December 2019, prior to the COVID-19 pandemic. We adopted a pooled estimator, which is more suitable for panel VAR models with larger T than the GMM estimator (Canova and Ciccarelli, 2013), and the model was estimated using Bayesian techniques based on the Normal-Wishart prior (Dieppe et al., 2016).²⁴ We used three lags for estimation. Regarding the identification of orthogonal shocks, we rely on the Cholesky identification, although timing

²²Table A.1 in the Appendix shows the differences in peaks for different EPU indices.

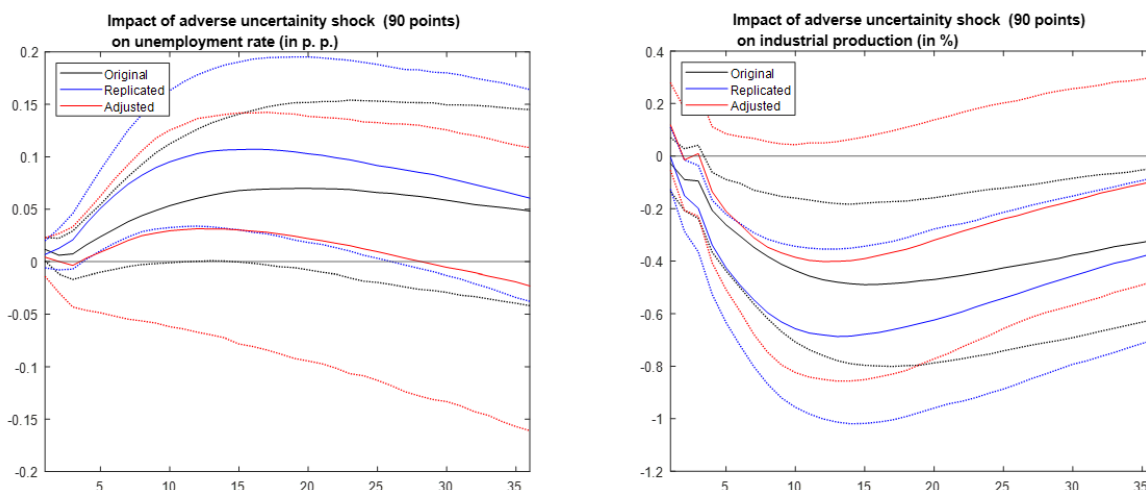
²³Baker et al. (2016) include several VAR specifications in their paper. Their baseline for the United States includes the EPU index, the log of the S&P 500 index, the federal funds rate, log employment, and log industrial production. The panel VAR model for all countries for which the EPU has been developed uses the same specification but with the unemployment rate instead of employment. We added bond yields to track EU financial market conditions with more precision.

²⁴Baker et al. (2016) rely on the pooled estimator as well. However, they use a standard OLS estimator.

restrictions are always debatable. However, our main goal is to compare the impulse responses implied by alternative EPU indices and not causal inference, and for this purpose, this simple identification scheme is sufficient.

The resulting impulse responses to the effects of 90-point increases in alternative EPU indices on the unemployment rate and industrial production are shown in Figure 7.²⁵ Qualitatively, the results are similar: no matter whether the original, replicated or adjusted EPU is used, it is predicted that the unemployment rate will increase and industrial production will decrease. However, the adjusted index leads to weaker implications because, in this case, none of the responses to the uncertainty shock are statistically significant.

Figure 7: Impact of an Uncertainty Shock on Unemployment and Industrial Production for Different EPU Indices



Note: Panel VAR model, Germany, France, Spain, Italy, and the United Kingdom, monthly data 2001M01 - 2019M12. 90% credible intervals obtained from 1,000 bootstrap simulations. Responses correspond to an increase in the EPU index by 90 points. The ‘Difference’ column shows the distribution of the difference between impulse responses under the original and replicated index of uncertainty. A positive value means that the variable in question has a stronger response to an innovation in uncertainty when the original EPU index is considered.

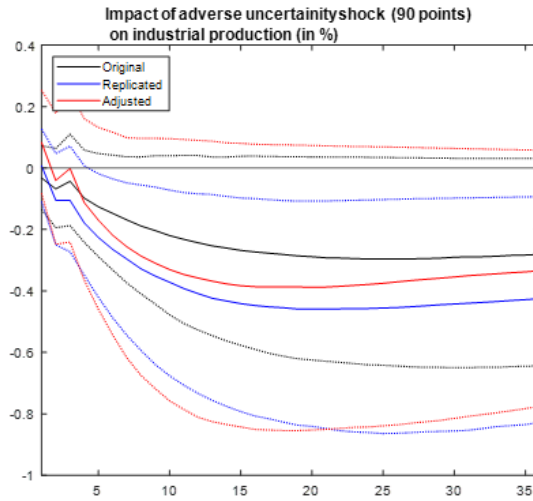
Regarding the impact on the unemployment rate, the predicted effect of uncertainty is lowest with the adjusted EPU, about half of the effect of the original EPU, and one-third of the effect of the replicated EPU. Furthermore, the effects lose their statistical significance and a large part of the 90% credible interval is below zero. The effect on industrial production at the one-year horizon is again lowest with the adjusted index and highest with the replicated EPU, but the difference between the adjusted and the original EPU is not that pronounced. Quantitatively, a 90-point increase in adjusted and original EPU implies a decrease in industrial production of

²⁵The 90-point increase of the EPU follows Baker et al., 2016 for comparability.

about 0.4%; nevertheless, the impact increases to more than 0.6% with the replicated EPU.

As a sensitivity check, we also estimate a bivariate model with industrial production and the EPU index. In this case, the estimated impulse responses of industrial production to alternative EPU indices are very similar, with the original EPU having the quantitatively smallest effect (Figure 8). However, the adjusted EPU again implies lower effects than the replicated EPU, and the responses are statistically insignificant with 90% credible intervals.

Figure 8: Impact of an Uncertainty Shock on Industrial Production for Different EPU Indices: Bivariate Model

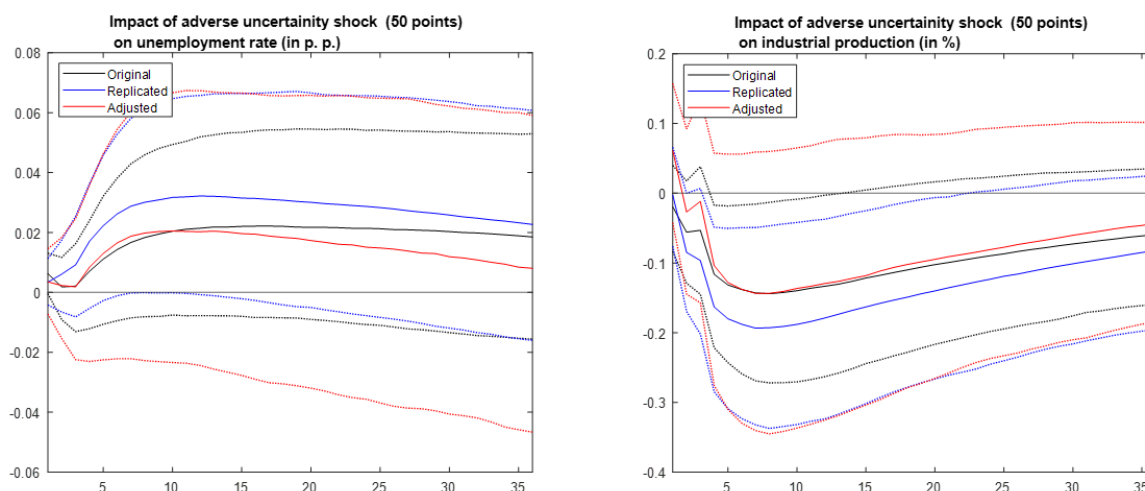


Note: Panel VAR model, Germany, France, Spain, Italy, and the United Kingdom, monthly data 2001M01 - 2019M12. 90% credible intervals obtained from 1,000 bootstrap simulations. Responses correspond to an increase in the EPU index by 90 points.

As we have shown in previous sections, the largest discrepancies between the adjusted EPU and the original or replicated EPU arise in the latter part of the sample and are driven by different trends in the alternative EPU indices, whereas the timing of spikes in EPUs remains similar. To investigate whether differences in trends drive differences in estimated impulse responses, we re-estimated our baseline VAR panel VAR model with EPUs detrended by the Hodrick-Prescott filter, with the smoothing parameter λ set to 10,000. The resulting impulse responses (Figure 9) reveal that the responses of the unemployment rate and industrial production are remarkably similar, implying that the effects of the high-frequency component of all EPU indices are similar.

In general, these exercises confirm the negative effects of uncertainty on economic activity reported by Baker et al. (2016) and many others since then. Therefore, from a policy perspective, the difference in the predicted effects of uncertainty on economic activity is in the assessment of

Figure 9: Impact of an Uncertainty Shock on Unemployment and Industrial Production for Different EPU Indices: Cyclical Components of EPUs.



Note: Panel VAR model, Germany, France, Spain, Italy, and the United Kingdom, monthly data 2001M01 - 2019M12. 90% credible intervals obtained from 1,000 bootstrap simulations. The responses correspond to a 50-point increase in the cyclical component of the EPU obtained using the Hodrick-Prescott filter by 50 points.

the size of the shock implied by the adjusted EPU scaled by economic policy versus the original EPU, and not in the different responses of economic activity to uncertainty.

4.2 Brexit-Related Uncertainty

One of the most prominent European EPU peaks corresponds to the Brexit referendum of June 23, 2016. Uncertainty around future trade relations with the United Kingdom was expected to have a detrimental impact on the British economy. Bloom (2016) had already predicted a negative impact of uncertainty before the referendum. Based on the findings in Baker et al. (2016), Bloom (2016) asserts that a stop in investment and hiring until clarification of the UK's status would amplify economic uncertainty and its negative impact on the economy.²⁶ International Monetary Fund (2016) and HM Treasury (2016) also highlight that the effect of the Brexit referendum was transmitted to the British economy through uncertainty. In these publications, the uncertainty was represented by a common factor of several uncertainty indicators. Therefore, the impact of measurement problems on the EPU was lower compared to the analysis by Bloom (2016).²⁷

In Table 2, we present the evolution of the British EPU around the period of Brexit referen-

²⁶ "In that analysis, we estimated that a 90-point upward innovation in the US EPU Index led to short-term declines of 1.2% in US industrial production, about 0.6% in its gross investment, and about 0.5% in its level of employment. Since the Brexit-related increase in the UK EPU index appears to be even greater, we believe that

Table 2: Brexit-related uncertainty, the United Kingdom

	<i>original EPU</i>	<i>replicated EPU</i>	<i>adjusted EPU</i>
January 2016	249.4	153.0	146.0
February 2016	312.6	208.7	177.7
March 2016	479.3	229.4	177.4
April 2016	434.6	194.1	159.8
May 2016	428.5	296.6	226.1
June 2016	799.9	384.2	321.9
July 2016	1141.8	480.8	409.4
August 2016	458.7	336.9	273.2
September 2016	379.0	266.3	225.7
October 2016	545.1	344.0	285.5
November 2016	816.2	494.4	337.3
December 2016	468.0	321.7	252.0

Note: The United Kingdom European Union membership referendum took place on June 23, 2016. The original EPU is taken from <https://www.policyuncertainty.com/>. The replicated EPU is based on the count of uncertainty-related words scaled by all articles. The adjusted EPU is the EPU index with alternative normalization, that is, the counts of articles related to uncertainty scaled by articles related to economic policy.

dum. Our replicated and adjusted EPU indices reveal a markedly lower increase in uncertainty. Although the original EPU in July is 4.5 times higher than the January level, our replicated indices are about three times higher than their January levels. Therefore, the increase in uncertainty is corroborated by our replication, but its magnitude is lower. Our results have quantitative implications for the predictions of the short-term impact of the Brexit referendum. According to Bloom’s assessment of the Baker et al. (2016) US model, every 90-point upward innovation in the EPU implies a 0.5% decrease in employment. Therefore, an increase in the EPU of 890 points between January and July 2016 decreases employment by 5%. On the other hand, the replicated and adjusted EPUs imply a moderate decrease in employment of 1.4 to 1.8%. Thus, a relatively arbitrary change in the composition of newspapers, along with a change in the database used for scraping the newspaper articles, lead to a significantly lower predicted impact of the Brexit referendum on employment. A similar exercise for industrial production leads to a prediction of a 12% decline in industrial production with the original

Brexit-related uncertainty has a material negative effect on UK economic performance” (Bloom, 2016).

²⁷The HM Treasury constructed the uncertainty factor by averaging the following normalized measures: the EPU; FTSE 100 implied volatility; sterling implied volatility; CBI Industrial Trends uncertainty measure; European Commission consumer uncertainty measure, and GfK unemployment expectations. All series were normalized by subtracting their means and dividing by the respective standard deviations in 2000-2015. The IMF used the average standard deviation of the current and future years of the consensus forecast, the EPU, the survey-based indicator of the uncertainty effect on industrial demand, GfK unemployment expectations, and the volatility of the stock market and the exchange rate.

EPU. In comparison, the replicated EPU again suggests a more moderate 4% decline.²⁸

4.3 COVID-Related Uncertainty

The uncertainty indices spiked again with the start of the COVID-19 pandemic. Altig et al. (2020) compare the evolution of a wide range of indicators that map uncertainty in the United States. The authors found that while all indices imply huge jumps in uncertainty in reaction to the pandemic, their amplitudes and time paths differ greatly. We document similar variations solely among the original, replicated, and adjusted EPU indices in the case of European countries. Table 3 presents the European EPU indices and shows that the original and replicated EPU peaked at values greater than 80% above the January 2020 levels, while the adjusted EPU peak was only 25% higher.

Again, a substantially larger variation appears in the country-level data. We observe the largest increases in the EPU indices in Germany, where the original EPU almost quadrupled and the adjusted index doubled. Large discrepancies between the original and adjusted EPU indices appear in all other countries, but the sizes of the differences between the peaks and the values in January 2020 are smaller. Still, the EPU index scaled by all articles leads to roughly twice as large an uncertainty increase as the adjusted EPU normalized by economic policy articles in all countries. In addition, the timings of the peaks are different in France, Spain, and the United Kingdom.

To conclude, we confirm that the COVID-19 pandemic caused unprecedented jumps in the uncertainty index of Europe, but the timing of the peaks and the implied changes in uncertainty differ markedly across EPU indices.

5 Conclusion

In this paper, we explore the properties of the EPU indices of the major European economies (Germany, France, Italy, Spain, and the United Kingdom) and their sensitivity to minor modifications to estimation procedures.

First, we discuss the long-term increasing trends in the EPU indices in the United Kingdom, Germany, France, and the aggregate European EPU index, and the lack thereof in Italy and

²⁸Note that following the result of the Brexit referendum, the Bank of England cut the policy rate, launched quantitative easing, and allowed the pound to depreciate. All these measures contributed to mitigating the short-term impact of the referendum on economic performance, and industrial production accelerated after those monetary policy interventions. Employment also continued to rise.

Spain, despite the turmoil during the EU debt crisis and the subsequent political instability in both countries. Moreover, the trends in the EPU are inconsistent with the financial instability measured by implied volatility and with the World Uncertainty Index. These uncertainty indices tend to be mean-reverting and do not contain any clear upward-sloping trends observed in the EPU.

Next, we replicate the text mining and construction of the EPU indices to reveal the nature of the trends and their sensitivity to minor changes in their construction. We found that our replicated EPU indices differed from the original indices, despite using the closest possible text mining specification. The differences appear mainly in the long-run behavior of the indices of Germany, France, and, to some extent, the United Kingdom as well. These differences arise not only from the utilization of alternative databases and/or newspapers (France, United Kingdom), but also appear in countries where our text-mining exercise matches the one conducted by Baker et al. (2016), the authors of the original EPU.

Finally, we show that some dynamics of the original EPU indices are driven by non-trivial movements in the count of all articles used for the normalization of the raw count of uncertainty-related articles rather than by the frequency of articles related to economic policy uncertainty that are supposed to provide signals about genuine uncertainty. To eliminate the impact of changing newspaper composition on the EPU, we normalize the counts of uncertainty-related articles by the counts of articles related to economic policy, instead of all articles. We found that this normalization leads to less pronounced trends in the EPU, more consistent results using different newspapers and/or databases, and that it possibly increases the reproducibility and reliability of the EPU index, as seen in our experiments with French and German newspapers.

Our findings have several implications for empirical research on the effects of uncertainty shocks. Most importantly, the EPU index could have overestimated the uncertainty in European countries during recent uncertainty episodes by 20 - 50%. Furthermore, our panel VAR experiments revealed that the impulse responses of industrial production and the unemployment rate to the shock of uncertainty are relatively similar across alternative EPU indices, so the negative effects of uncertainty shocks on economic activity are also confirmed when articles related to economic policy are used instead of all articles for the normalization of the EPU. Therefore, the differences in the sizes of alternative EPUs lead to a quantitatively different assessment of the importance of uncertainty shocks, which is particularly relevant for policymakers aiming to offset their negative effects through policy interventions. Our results also imply that policymakers

must consider the limited reliability of uncertainty indicators to track uncertainty. Finally, alternative scaling factors for the count of uncertainty-related articles should be considered when developing new uncertainty indicators based on the methodology of the EPU index.

Table 3: Economic Policy Uncertainty during COVID-19

	Peak value	Increase in the peak since January (%)	Peak date
<i>Europe</i>			
original EPU	361.4	81.4	March
replicated EPU	358.5	83.0	May
adjusted EPU	202.1	24.5	March
<i>Germany</i>			
original EPU	498.1	278.7	March
replicated EPU	907.0	221.2	March
adjusted EPU	267.0	117.1	March
<i>France</i>			
original EPU	432.7	70.2	September
replicated EPU	298.5	65.2	August
adjusted EPU	189.2	38.9	November
<i>Italy</i>			
original EPU	279.4	118.5	November
replicated EPU	209.1	49.0	November
adjusted EPU	212.9	46.8	November
<i>Spain</i>			
original EPU	246.8	158.9	March
replicated EPU	289.7	91.0	December
adjusted EPU	240.4	68.0	August
<i>United Kingdom*</i>			
original EPU	386.6	62.4	March
replicated EPU	322.0	36.7	May
adjusted EPU	289.0	29.2	May

Note: Our sample ends in December 2020. The original EPU is taken from <https://www.policyuncertainty.com/>. The replicated EPU is based on the count of uncertainty-related words scaled by all articles. The adjusted EPU is the EPU index with the alternative normalization, i.e., the counts of uncertainty-related articles scaled by articles related to economic policy. *In the case of the United Kingdom, the COVID-related peak is compared to the EPU levels in February. In January, the EPU indices were determined by the final phase of negotiation of the Withdrawal Agreement Bill that was finally passed through the House of Commons on 22 January, and the United Kingdom officially left the EU on 31 January 2020. The original EPU peaks in January 2020, before the spread of the COVID-19 epidemic in Europe.

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Appendix for “Uncertain Trends in Economic Policy Uncertainty”

Appendix A: Additional Tables

Table A1: Stationarity tests

I. Index by Baker, Bloom, and Davis (2016)						
	ADF		ADF-GLS		KPSS	
	tau	p-value	tau	p-value	t-stat	p-value
Europe	-2.403	0.141	-0.577	0.527	2.724	<0.01
Germany	-5.409	0.000	-0.859	0.392	2.058	<0.01
France	-2.453	0.127	-0.502	0.559	3.141	<0.01
Italy	-3.704	0.004	-1.023	0.314	0.494	0.045
Spain	-3.609	0.006	-1.999	0.045	0.435	0.062
UK	-0.803	0.818	0.192	0.795	3.141	<0.01

II. Replicated EPU indices						
	ADF		ADF-GLS		KPSS	
	tau	p-value	tau	p-value	t-stat	p-value
Europe	-2.051	0.265	-0.667	0.487	2.719	<.01
Germany	-2.024	0.277	0.048	0.753	3.029	<.01
France	-2.624	0.088	-2.308	0.020	1.476	<.01
Italy	-4.279	0.001	-1.899	0.058	1.488	<.01
Spain	-3.414	0.011	-0.639	0.501	1.805	<.01
UK	-1.404	0.582	-0.718	0.461	2.701	<.01

Note: Augmented Dickey-Fuller test with lag length based on AIC, test down from 12 lags. ADF-GLS test, demeaned and detrended data, lag length based on AIC, test down from 12 lags. ADF and ADF-GLS null hypothesis: unit root. KPSS test, automatic window size, null hypothesis: stationarity. Sample: 2001:1 - 2019:10.

Table A2: Summary Statistics

Variable	Since	N	Mean	Std. Dev.	Min	Pctl. 25	Pctl. 75	Max	AR(1)
<i>Original EPU Index</i>									
Europe	1990-01	372	139	67	45	89	179	433	0.8277
Germany	1993-01	336	132	73	28	81	167	498	0.7095
Italy	1997-01	288	112	41	32	81	135	279	0.6049
UK	1997-01	288	194	156	25	75	274	1142	0.8712
France	1990-01	372	155	98	11	81	218	575	0.8190
Spain	2001-01	240	117	58	23	75	146	407	0.6051
<i>Replicated EPU Index</i>									
Europe	2001-01	240	147	68	45	96	183	372	0.8632
Germany	1993-01	336	180	145	28	81	251	907	0.8469
Italy	1997-01	288	119	43	33	87	143	285	0.5863
UK	1990-01	372	130	77	38	73	153	494	0.8810
France	2001-01	240	131	64	43	83	159	396	0.7249
Spain	2001-01	240	139	68	22	88	181	388	0.6828
<i>Adjusted EPU Index</i>									
Europe	2001-01	240	121	43	51	91	143	272	0.8386
Germany	1993-01	336	120	53	33	83	148	372	0.6665
Italy	1997-01	288	110	34	35	85	128	223	0.5461
UK	1990-01	372	125	60	51	86	145	409	0.8623
France	2001-01	240	105	43	37	73	126	267	0.6866
Spain	2001-01	240	117	55	30	78	147	326	0.6787

Table A3: Uncertainty indicators: Correlation coefficients

Europe							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	VSTOXX		
EPU_{Orig}	1	0.938	0.851	0.696	0.154		
EPU_{Rep}		1	0.917	0.665	0.16		
EPU_{Adj}			1	0.627	0.189		
WUI				1	-0.105		
VSTOXX					1		
Germany							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	Forecast	Macro	VDAXX
EPU_{Orig}	1	0.946	0.850	0.374	0.325	-0.003	0.281
EPU_{Rep}		1	0.794	0.471	0.394	-0.110	0.226
EPU_{Adj}			1	0.321	0.117	0.033	0.302
WUI				1	0.318	-0.131	-0.053
Forecast					1	0.239	0.224
Macro						1	0.446
VDAX							1
France							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	Forecast	Macro	VCAC
EPU_{Orig}	1	0.665	0.387	0.312	0.252	-0.035	0.035
EPU_{Rep}		1	0.864	0.199	0.005	0.128	0.175
EPU_{Adj}			1	0.220	0.001	0.178	0.277
WUI				1	0.238	-0.085	0.217
Forecast					1	0.168	0.231
Macro						1	0.618
VCAC							1
Italy							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	Forecast	Macro	
EPU_{Orig}	1	0.777	0.730	0.263	-0.004	0.021	
EPU_{Rep}		1	0.865	0.339	-0.128	-0.009	
EPU_{Adj}			1	0.275	0.046	0.067	
WUI				1	-0.223	-0.274	
Forecast					1	0.371	
Macro						1	
Spain							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	Forecast	Macro	
EPU_{Orig}	1	0.801	0.800	0.498	0.022	0.162	
EPU_{Rep}		1	0.875	0.507	0.179	0.356	
EPU_{Adj}			1	0.500	0.109	0.192	
WUI				1	-0.024	0.200	
Forecast					1	0.335	
Macro						1	
United Kingdom							
	EPU_{Orig}	EPU_{Rep}	EPU_{Adj}	WUI	VFTSE		
EPU_{Orig}	1	0.907	0.867	0.748	-0.124		
EPU_{Rep}		1	0.951	0.695	-0.136		
EPU_{Adj}			1	0.766	-0.112		
WUI				1	-0.057		
VFTSE					1		

Note: The correlations between the original EPU by Baker et al. (2016), the replicated EPU and the adjusted EPU scaled by economic policy articles and other uncertainty indicators. Those include (i) the respective world uncertainty indices (Ahir et al. (2018)), (ii) the implied volatility of the stock market, (iii) the uncertainty indices derived from the forecast dispersion and (iv) macroeconomic uncertainty. The last two indicators were calculated by Meinen and Röhe (2017)). Because the WUI is available on a quarterly basis, its correlations are based on quarterly data.

Appendix B: Replication of the EPU - Search Queries

Germany

Q1 (Wirtschaft OR wirtschaftlich) AND (steuer OR wirtschaftspolitik OR regulierung OR regulierungs OR ausgaben OR bundesbank OR EZB OR zentralbank OR haushalt OR defizit OR haushaltsdefizit) AND (unsicher OR Unsicherheit)

Q2 (Wirtschaft OR wirtschaftlich) AND (steuer OR wirtschaftspolitik OR regulierung OR regulierungs OR ausgaben OR bundesbank OR EZB OR zentralbank OR haushalt OR defizit OR haushaltsdefizit)

Q3 (empty)

Sources: Own archives of Frankfurter Allgemeine Zeitung and Handelsblatt available at <https://fazarchiv.faz.net/?dosearch=new> and <https://archiv.handelsblatt.com/>

France

Q1 (economie OR economique OR economiques) AND (taxe OR taxes OR impot OR impots OR politique OR politiques OR regulation OR regulations OR reglementation OR loi OR “lois reglementations” OR depense OR depenses OR deficit OR deficits OR “banque centrale” OR “BCE” OR “Reserve Federale” OR budget OR budgetaire) AND (incertitude OR incertain OR incertitudes OR incertains)

Q2 (economie OR economique OR economiques) AND (taxe OR taxes OR impot OR impots OR politique OR politiques OR regulation OR regulations OR reglementation OR loi OR “lois reglementations” OR depense OR depenses OR deficit OR deficits OR “banque centrale” OR “BCE” OR “Reserve Federale” OR budget OR budgetaire)

Q3 aujourd’hui

Source: Factiva. Searched for Le Figaro (France, French Language) and Les Echos (France, French Language)

Search specifications:

Language: French

Exclude: Republished news; Recurring pricing and market data; Obituaries, sports, calendars, etc.

Starting date: January 2001

Note - Original sources: Figaro - Factiva, Le Monde - Lexis Nexis

Italy

Q1 (economia OR economico OR economica OR economici OR economiche) AND (tassa OR tasse OR politica OR regolamento OR regolamenti OR spesa OR spese OR spesa OR deficit OR “Banca Centrale” OR “Banca d’Italia” OR budget OR bilancio) AND (incerto OR incerta OR incerti OR incerte OR incertezza)

Q2 (economia OR economico OR economica OR economici OR economiche) AND (tassa OR tasse OR politica OR regolamento OR regolamenti OR spesa OR spese OR spesa OR deficit OR “Banca Centrale” OR “Banca d’Italia” OR budget OR bilancio)

Q3 oggi

Source: Factiva. Newspapers: Corriere della Sera (Italy, Italian Language) and La Stampa (Italy, Italian Language)

Search specifications:

Language: Italian

Exclude: Starting date: January 1997

Republished news; Recurring pricing and market data; Obituaries, sports, calendars. . .

Spain

Q1 (económica OR economía) AND (impuesto OR tarifa OR regulacion OR politica OR gastar OR gasta OR gasto OR presupuesto OR deficit OR “banco central”) AND (incierto OR incertidumbre)

Q2 (económica OR economica) AND (impuesto OR tarifa OR regulacion OR politica OR gastar OR gasta OR gasto OR presupuesto OR deficit OR “banco central”)

Q3 hoy

Source: Factiva. Newspapers: El Mundo (Spain, Spanish Language) El País - Nacional (Spain, Spanish Language)

Search specifications:

Language: Spanish

Exclude: Republished news; Recurring pricing and market data; Obituaries, sports, calendars, etc.

Starting date: January 2001 (limited by El País).

United Kingdom

Q1 (economic OR economy OR business OR industry OR commerce OR commercial) AND (spending OR policy OR deficit OR budget OR tax OR regulation OR “Bank of England” OR war OR tariff) AND (uncertain OR uncertainty)

Q2 (economic OR economy OR business OR industry OR commerce OR commercial) AND (spending OR policy OR deficit OR budget OR tax OR regulation OR “Bank of England” OR war OR tariff)

Q3 today

Source: Factiva. Newspapers: The Times (UK), The Guardian (UK).

Search specifications:

Language: English

Exclude: Republished news; Recurring pricing and market data; Obituaries, sports, calendars, etc.

Starting date: January 1990 (limited by The Guardian).

The original EPU was retrieved from https://www.policyuncertainty.com/europe_monthly.html, April 13, 2021 Factiva searches were performed in March 2021.

Appendix C: Additional Results for Germany

This appendix tests the robustness of the differences between the original EPU index by Baker et al. (2016) and our replicated EPU. We have considered the following alterations to the baseline text mining exercise.

First, we manually retrieved the underlying EPU data at a quarterly frequency from the Frankfurter Allgemeine Zeitung archive. The results matched our monthly data.

Second, we reran the text mining in March 2023, two years after our data collection, with and without additional restrictions.

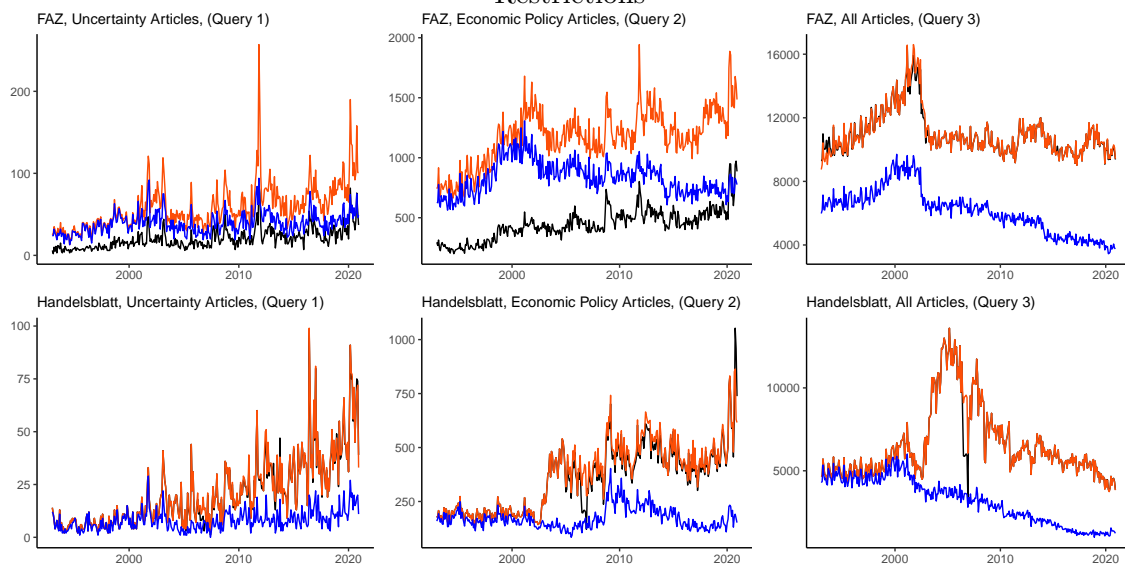
- Handelsblatt online archive: Only Handelsblatt print edition was used (previously, all resources (*Alle Quellen*) were used).

- Frankfurter Allgemeine Zeitung: Instead of *Alle Quellen*, all resources, only “Frankfurter Allgemeine Zeitung” was used.

Differences from these experiments are depicted in Figures C1 and C2.

Most strikingly, even with the restrictions, the counts of uncertainty and economic policy articles in the Frankfurter Allgemeine Zeitung are *higher* than in our original text mining exercise in 2021, although their short-run pattern remains very similar. The count of all articles obtained from our search differs relatively little. On the other hand, we do not observe such large discrepancies in the case of Handelsblatt, where the data from the 2023 data collection matched those collected in 2021 (Figure C1). This result shows that the collection of data from the FAZ online archive does not produce consistent results over time.

Figure C1: Raw Counts for Germany Retrieved in 2021 and 2023, With and Without Restrictions

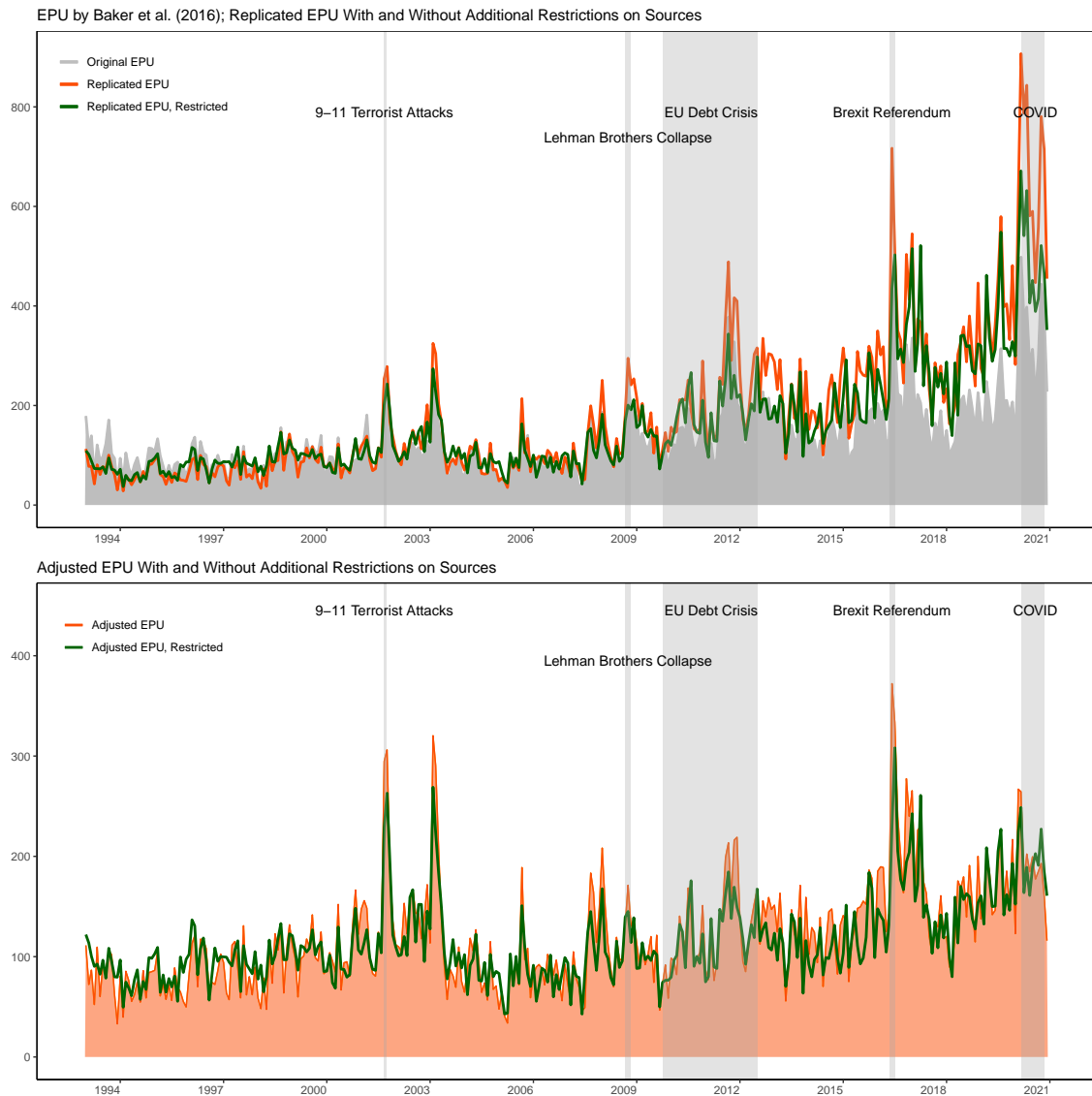


Note: Search in 2021 (baseline) - black, Search in 2023 - red, Search in 2023 with restrictions (Handelsblatt, print edition, Frankfurter Allgemeine Zeitung - articles appearing only in FAZ and not in other resources included in the archive) - blue. Query 1: economic + policy + uncertainty-related articles. Query 2: economic + policy articles. Query 3: All articles.

Despite these differences in FAZ counts, the replicated EPU index did not change with the data collected in 2023. This was due to the normalization of the overall index to the pre-2009 means and standard deviations. The restrictions (the print edition of Handelsblatt and articles published in the Frankfurter Allgemeine Zeitung) leads to an index that resembles the original EPU by Baker et al. (2016) more than our replication without those additional restrictions (Figure C2). However, the replicated index has remained higher in recent years than the index by Baker et al. (2016). On the other hand, the dynamics of the adjusted EPU index normalized

by economic-policy articles is relatively robust to additional restrictions on resources (Figure C2, lower panel).

Figure C2: Germany - EPU Indices, Sensitivity Analysis



Note: A comparison of the EPU by Baker et al. (2016) (gray) with the replicated EPU (orange) and replicated EPU with additional restrictions (Handelsblatt, print edition, Frankfurter Allgemeine Zeitung - articles appearing only in FAZ and not in other resources included in the archive; green). The bottom plot shows a comparison of the adjusted EPU (orange) and the adjusted EPU with these restrictions (green).

Overall, this experiment confirms that the adjusted EPU is more robust to various changes in search specifications than the baseline EPU.

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