Policy uncertainty in Scandinavian countries

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ABSTRACT

We measure policy uncertainty for three small open economies and show how policy uncertainty indices can capture important historical events, both local events such as referendums and certain general elections, as well as global events such as financial crises. By employing the methodology of Baker et al. (2016), we construct indices for the three Scandinavian countries: Norway, Denmark and Sweden. We find that increased policy uncertainty both at home and in the world's largest economy, the US, leads to economic contraction, including a significant decline in stock markets and GDP and a long-lasting reduction in the Scandinavian countries' Purchasing Managers' Index.

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1. Introduction

In light of recent economic policy shocks, a better understanding of policy uncertainty is crucial for decision makers in both the private and public sectors. Brexit, for example, and unclear outcomes from those negotiations have created persistent uncertainty that is exerting a depressing effect on economic growth (Financial Times, 2019). The Bank of England estimates that investments may be between 6% and 14% lower due to Brexit (Bank of England, 2019). The US–China trade war is another example of created pervasive uncertainty that has impaired global growth (Wall Street Journal, 2019). These recent examples emphasize the relevance of policy uncertainty to the willingness to invest and economic growth.

Although a stable policy environment is crucial to inducing economic activity (Friedman, 1968), measuring policy uncertainty is challenging, as it is not directly observable. However, recent contributions from (Baker et al., 2016), among others, attempt to capture policy uncertainty via economic policy uncertainty indices (EPUs)[1] by searching for the frequency of predefined keywords in newspaper articles. This methodology has been extensively employed in a number of empirical applications, e.g., Brogaard and Detzel (2015), Caldara and Iacoviello (2018), Armelius

et al. (2017) and Ghirelli et al. (2019). Other promising alternatives to capture economic uncertainty include (Ozturk and Sheng, 2018), who disentangle idiosyncratic and common uncertainty from professional forecasters, and Jurado et al. (2015), who use common unpredictable uncertainty across many data series to quantify time-varying macroeconomic uncertainty.

However, the work of Baker et al. (2016) focuses on the United States and other major economies. We focus instead on three small economies in the same region to investigate not only global events but also local and regional shocks. We contribute to the existing literature by developing country-specific indices that capture policy uncertainty in each of the Scandinavian countries, thereby geographically extending the work of Baker et al. (2016). We find that Scandinavian countries are not only exposed to local policy uncertainty but are also affected by global events; i.e., they are subject to spill-over effects. Moreover, for Sweden, we do not find support for the claim of a delayed spill-over effect from the United States, as found by Armelius et al. (2017). One reason could be that our time series includes more of Trump's presidency which has introduced immediate and severe policy uncertainty in Scandinavia. Furthermore, our results indicate that a one-standard-deviation shock to our EPU indices causes stock markets to decline for up to two months, negatively affects the Purchasing Manager's Index (PMI) for up to a year, and depresses GDP. These results indicate that policy uncertainty has a profound effect on both the economy in general and investors' perceptions of current and future business conditions in the Scandinavian countries.

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[1] https://www.policyuncertainty.com/

Table 1
Statistics on the data set extracted from Retriever's Atekst database, after duplicate articles were removed. Articles with identical headlines from the same newspaper and with the same date are considered duplicates. The final date is 31.12.2019.

Country	Newspaper	Type	First article	EPU articles
Norway	Aftenposten	Newspaper	30.10.1983	12,610
Norway	Finansavisen	Newspaper	31.01.2011	1,855
Norway	VG	Newspaper	30.10.1983	2,580
Denmark	Ritzau	News agency	27.07.1988	14,924
Sweden	Aftonbladet	Newspaper	01.09.1994	1,782
Sweden	Svenska Dagbladet	Newspaper	01.01.1995	9,865

2. Method

In this paper, we follow the methodology of Baker et al. (2016) to construct a monthly EPU index for Sweden, Denmark and Norway. We translated the search terms used in Baker et al. (2016) to classify articles related to policy uncertainty using academic dictionaries.[2] The full list of search terms is in Appendix A.

Based on the extracted articles, we create an EPU index for each of the Scandinavian countries by combining several news sources. We use the Retriever's Atekst database, which covers the majority of newspapers in Scandinavian countries, and carefully selected a set of high-quality newspapers with national coverage for each country. In Table 1 we show the number of relevant policy uncertainty articles extracted from each source. For Norway and Sweden,[3] the database offers a good selection of reputable newspapers. However, in the case of Denmark, historical articles from the leading newspapers are currently unavailable. We thus include Denmark's leading news agency. Although we would prefer to use Denmark's major newspapers, this news agency offers the advantage of not being affected by the newspapers' political views, which should mitigate the risk of political slant influencing the index.

3. Results

3.1. Cross-country comparisons

The correlations among the different indices indicate that the Scandinavian indices differ substantially from the US EPU index in Baker et al. (2016), with correlations ranging from 0.23 to 0.54, as reported in Appendix B. To further compare the Scandinavian EPUs and the US EPU, we normalize the indices within the same time period, as shown in Fig. 1, where crises that spanned one or more years are marked as shaded grey areas, while the start dates of shorter events are marked by a dotted red line. Note that the four EPU indices react to the same global events. However, there are also distinct local conditions creating different policy uncertainty peaks that amplify global events. Further discussion on the events is provided in Appendix C.

3.2. Bivariate VAR analysis

We are interested in analysing the effect of policy uncertainty on countries' economies and whether these economies respond differently to changes in policy uncertainty. Hence, we first explore the effect of changes in the local EPU indices on

their corresponding economies. Second, we analyse the effect of changes in the US EPU index from (Baker et al., 2016). In line with (Armelius et al., 2017), we use a bivariate vector autoregression (VAR) model, i.e., a model that estimates the relationship between only two variables. We run a regression on the two variables, letting each variable depend on historical values of itself, as well as historical values of the other variable. The VAR models are used to generate impulse response functions using the Cholesky decomposition. For the Cholesky decomposition, the ordering of the variables is important, as it assumes that a variable later in the ordering has no effect on a variable earlier in the ordering in the same period. Since we aim to quantify the effect of changes in the EPU index on the economy, we adopt the approach of Armelius et al. (2017), where we position the local EPU indices first in the ordering. Finally, based on the Akaike information criterion (AIC), we set the number of lags to 4 for all countries.

Effects on the stock market

We analyse the effect of EPU shocks on the stock markets using FTSE All Cap stock indices for Norway, Denmark and Sweden in the local currencies. We conduct our analysis by generating the impulse response function from a VAR model in which the monthly EPU index is regressed on the log-difference of the stock market index.

From the impulse response functions in Fig. 2, we find support for the connection between stocks and policy uncertainty for all three countries. Stock markets react negatively to policy uncertainty by more than a percentage decrease, significant at the 10% level. While instant devaluation seems to be present, there is no significant correction after a couple of months, which indicates that the stock market quickly incorporates new information. Hence, our results are in line with the findings of Brogaard and Detzel (2015) for the US market. Given that Scandinavian countries are likely to impact the US only marginally, our results confirm the importance of the US for small open economies and, in particular, the importance of imported uncertainty. Note that the US EPU index seems to have a similar effect on the Scandinavian stock markets as the local EPU indices in terms of magnitude. However, shocks in the US EPU and the local EPUs might occur at two different points in time, making both indices useful for forecasting.

Effects on the Purchasing Managers' Index

The PMI captures expectations about future business conditions and therefore serves as an important leading indicator. Our hypothesis is that policy uncertainty influences the expectations of firms, and the indices should therefore be deeply intertwined. Each month, the index surveys purchasing managers on changes in their business conditions. The PMI for the US market is calculated by the US Institute for Supply Management, and the independent trade agencies NIMA and DILF calculate the Norwegian and Danish PMIs, respectively, while Swedbank, a major Scandinavian bank, calculates the Swedish index.

We analyse the effect of changes in the monthly EPU indices on the Scandinavian PMI values. The results presented in Fig. 3 show that shocks, both to the local and US EPUs, lower PMI values instantaneously as well as in the following months. Although the US and local indices have similar characteristics, there are distinct differences across countries. Denmark has the most prominent effect, as shown in Fig. 3(b), with an expected -0.6 decrease in the PMI followed by -0.2 the next month and then as much as -0.9 one quarter later. Shocks in Denmark are long lasting, with an expected decrease of 0.7 after 10 months. Another interesting finding is that for both Sweden and Denmark, their respective PMIs react more strongly to a shock in the US EPU index than to shocks to their local indices.

Effects on the Gross Domestic Product

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[2] The dictionaries used are Den Norske Akademisk Ordbok, Den Danske Ordbog, and Svenska Akademiens Ordböcker and these translations were later verified by native speakers.

[3] Armelius et al. (2017)'s index also includes Expressen and Dagens Industri, but these are not available on Retriever. However, the correlation in indexes is relatively high (0.54).
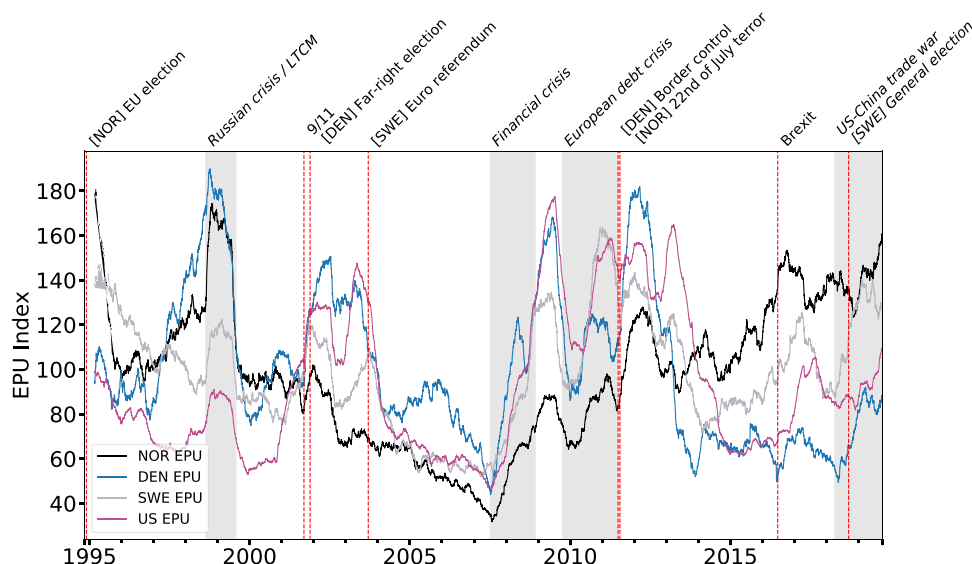
Fig. 1. The Scandinavian EPUs plotted together, with a 300-day backward looking rolling window.

(a) Norwegian EPU on the Norwegian stock index

(b) Danish EPU on the Danish stock index

(c) Swedish EPU on the Swedish stock index

(d) US EPU on the Norwegian stock index

(e) US EPU on the Danish stock index

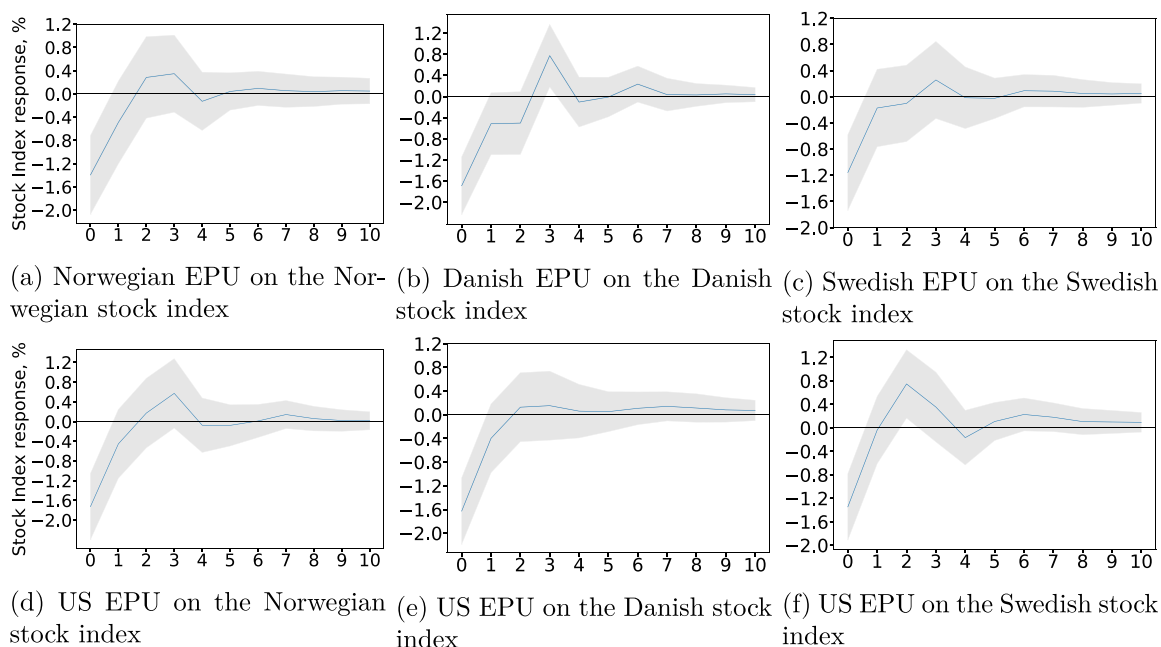(f) US EPU on the Swedish stock index

Fig. 2. The impulse response functions show the effect of a one-standard-deviation shock to the EPU index on the stock market index denoted in the local currency. The graphs show the response in percentage points per month following the shock. The time period analysed is 2003:10–2019:10.

Turning to the gross domestic product (GDP), we analyse the effect of EPU shocks on countries' outputs. As GDP is measured quarterly, we construct a quarterly version of our EPU indices. The VAR model runs a regression of the EPU on the quarterly percentage change in GDP.

Fig. 4 shows the impulse response functions, indicating a decline in GDP following an uncertainty shock for all cases considered. The effects on countries' GDP are significant at the 10% level for 1–2 quarters following the policy uncertainty shock. The Scandinavian countries all have strong states that might soften the effects of international shocks; however, they are also small open economies, and the latter seems to be more pertinent given the significant response of local GDP to the US EPU.

Furthermore, according to real options theory, firms halt irreversible investments when uncertainty increases (Dixit and Pindyck, 1994), thereby leading to a decline in GDP. Intuitively,

this might occur because firms can postpone capital allocation decisions until after a political decision is taken to increase certainty about future profitability. Our findings lend support to this hypothesis of a negative relationship between GDP and policy uncertainty for Scandinavian economies.

Effects on employment

Next, to further investigate the economic impact of policy uncertainty, we have performed a similar analysis using employment instead of GDP. In Fig. 5, we illustrate the impulse response function for employment to a one standard deviation shock to the corresponding EPU. We find a negative impact on Denmark and an insignificant relationship between economic policy uncertainty and employment for Norway and Sweden. However, note that, employment level might not be a good indicator of economic activity, since there is a considerable public sector in the Scandinavian countries which often reacts countercyclical to decreased economic activity (Bergman et al., 2017).
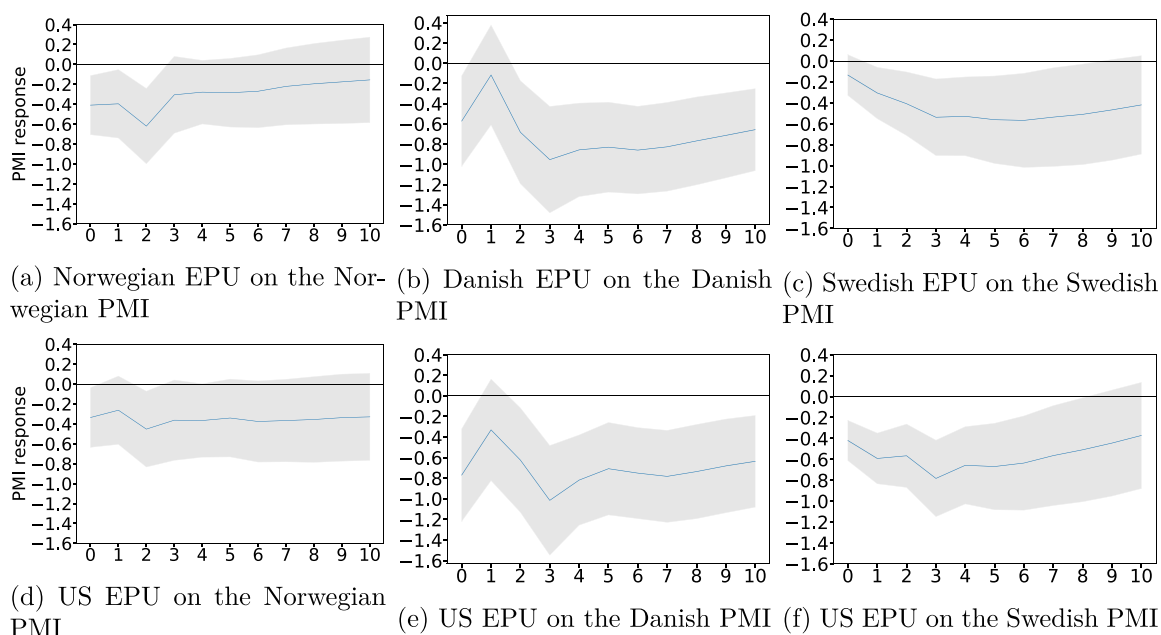
Fig. 3. The impulse response functions show the effect of a one-standard-deviation shock to the EPU index on the countries' PMIs. The graphs show the response in terms of PMI value per month following the shock. The time period analysed is 2004:02–2019:09 for Norway, 1994:01–2019:09 for Denmark, and 1994:11–2019:09 for Sweden.
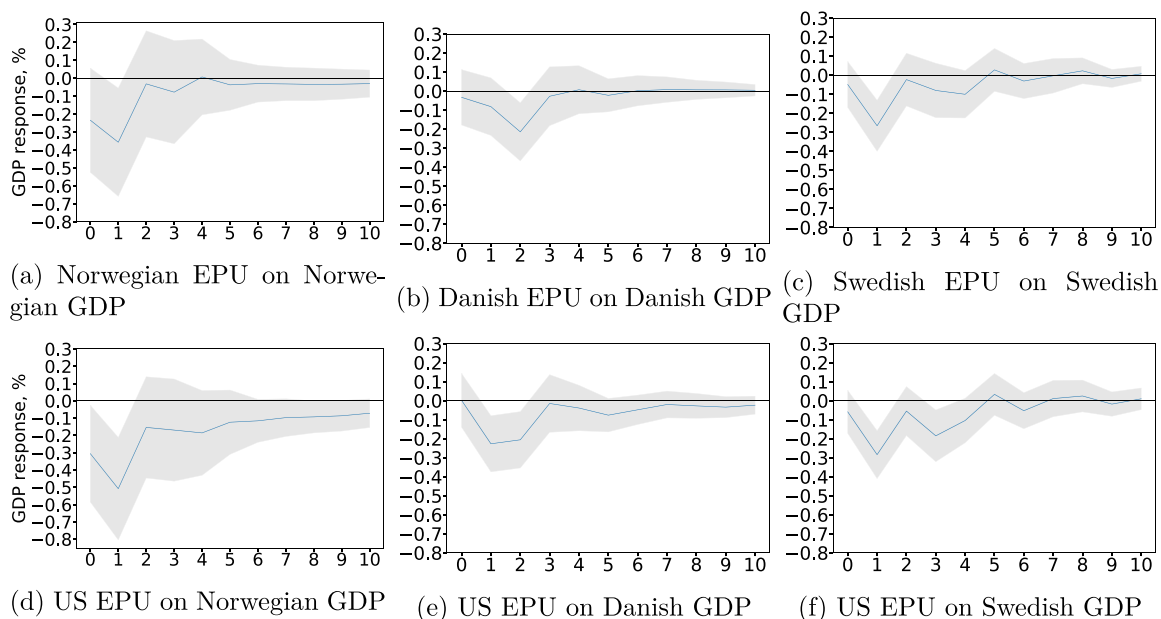

Fig. 4. The impulse response functions show the effect of a one-standard-deviation shock to the EPU index on countries' GDPs. The graphs show the response in percentage points per quarter following the shock. The time period analysed is 1984:Q3–2019:Q2 for Norway, 1991:Q2–2019:Q2 for Denmark and 1994:Q3–2019Q2 for Sweden.

Effects on investments

In order to explore the real options effect, eluded to when discussing the impact on GDP above, we investigate how EPU shocks impact the countries' investment level in fixed prices. Again we contrast the effects stemming from local EPU shocks with a US EPU shock. Fig. 6 shows the impulse response functions, which indicate a decline or no effect on investment following an uncertainty shock for all three countries. Hence, these results do lend some support to the hypothesis of real options theory, that firms halt irreversible investments when uncertainty increases. Nevertheless, the results on GDP, employment and investment are considerable weaker than for the PMIs and stock markets. This

is interesting considering that market participants and managers are often influenced by narratives presented by the media (Shiller, 2020), which could explain the strong connection between the news-driven EPUs and PMIs or stock market indices. In contrast, the connection to the real economy (GDP, Employment and Investment) might take longer to materialize and be less affected by short-term policy uncertainty.

4. Conclusion

We analyse how economic policy uncertainty impacts small open economies by considering the three Scandinavian countries.

Table 2
Norwegian policy uncertainty keywords.
Source: Den Norske Akademis Ordbok.

Word type	Root of keyword	Full list of keywords
Economic	Økonomi	økonomi, økonomien, økonomier, økonomiene
	økonomisk	økonomisk, økonomiske
Policy	Norges Bank	Norges Bank
	Sentralbank	sentralbank, sentralbanken, sentralbanker, sentralbankene
	Regjering	regjering, regjeringen, regjeringer, regjeringene
	Departement	departement, departementet, departementene
	Regulering	regulering, reguleringen, reguleringer, reguleringene
	Minister	minister, ministeren, ministere, ministerene
	Direktiv	direktiv, direktivet, direktivene
	Storting	storting, stortinget, stortingene
Uncertainty	Usikker	usikker, usikkert, usikre
	Usikkerhet	usikkerhet, usikkerheten, usikkerheter, usikkerhetene
	Uro	uro, uroen, uroer

Table 3
Danish policy uncertainty keywords.
Source: Den Danske Ordbog.

Word type	Root of keyword	Full list of keywords
Economic	Økonomi	økonomi, økonomien, økonomier, økonomierne
	økonomisk	økonomisk, økonomiske
Policy	Nationalbank	nationalbank, nationalbanken, nationalbanker, nationalbankerne
	Centralbank	centralbank, centralbanken, centralbanker, centralbankerne
	Regering	regering, regeringen, regeringer, regeringerne
	Departement	departement, departementet, departementerne
	Regulering	regulering, reguleringen, reguleringer, reguleringerne
	Minister	minister, ministeren, ministre, ministrene
	Direktiv	direktiv, direktivet, direktiver, direktiverne
	Folketing	folketing, folketinget, folketingene
Uncertainty	Usikker	usiker, usikkert, usikre, usikrere, usikrest
	Usikkerhed	usikkerhed, usikkerheden, usikkerheder, usikkerhederne
	Uro	uro, uroen, uroer, uroene

(a) Norwegian EPU on the Norwegian log employment

(b) Danish EPU on the Danish log employment

(c) Swedish EPU on the Swedish log employment

(d) US EPU on the Norwegian log employment

(e) US EPU on the Danish log employment
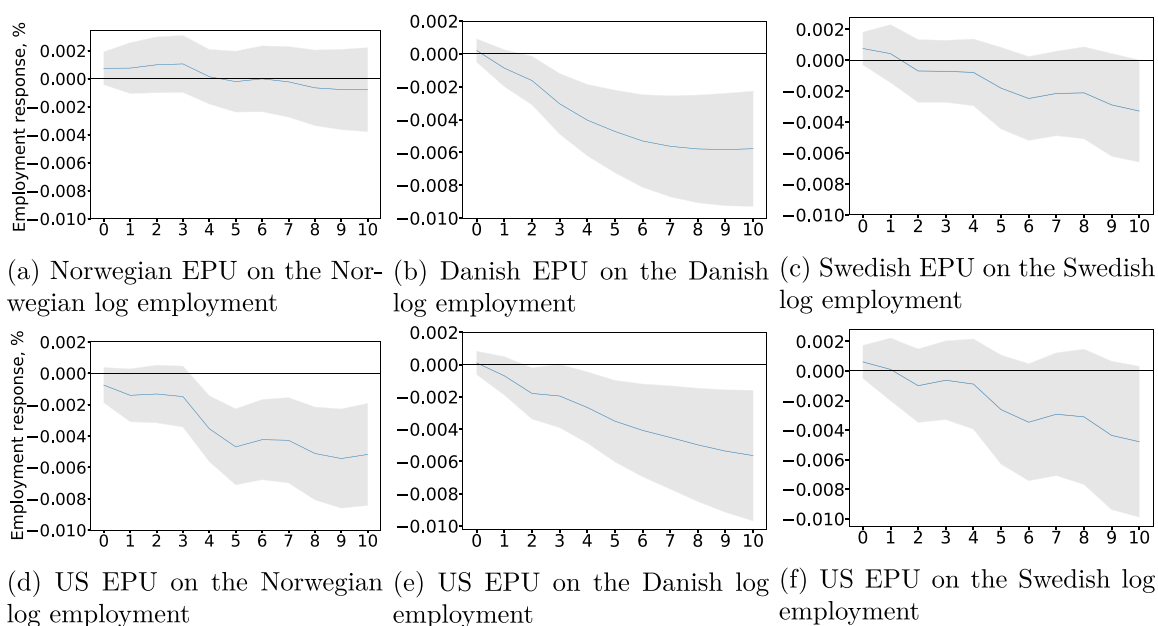
(f) US EPU on the Swedish log employment

Fig. 5. The impulse response functions show the effect of a one-standard-deviation shock to the EPU index on the log of employment. The graphs show the response in percentage points per month following the shock. The time period analysed is 1996:Q1–2019:Q3 for Norway, 1990:Q1–2019:Q3 for Denmark and 1994:Q4–2019Q3 for Sweden.

By analysing daily newspaper articles from 1980 onward, we create country-specific indices for Norway, Denmark and Sweden. Through a visual inspection, we find that our policy uncertainty indices coincide well with important political events believed to have affected these economies. Further, the low correlations between the indices indicates that the local Scandinavian indices differ substantially from the US EPU.
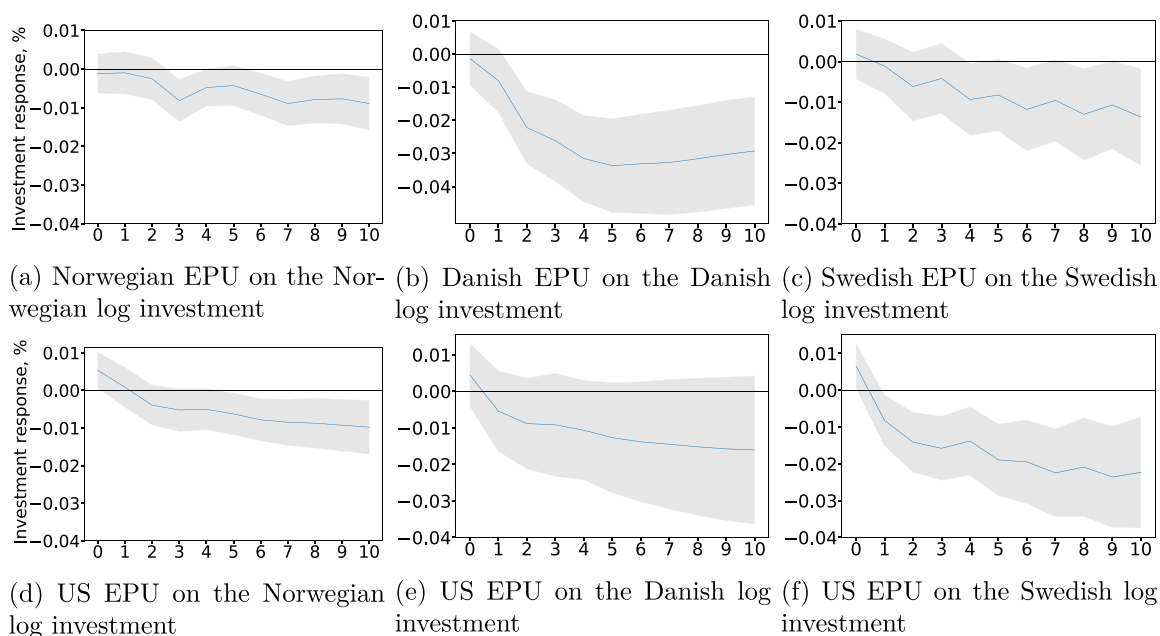
Fig. 6. The impulse response functions show the effect of a one-standard-deviation shock to the EPU index on log of investment level. The graphs show the response in percentage points per month following the shock. The time period analysed is 1983:Q4–2019:Q3 for Norway, 1991:Q1–2019:Q3 for Denmark and 1994:Q4–2019Q3 for Sweden.

Moreover, we analyse the effect of economic policy uncertainty on the countries' key economic indicators using a bivariate VAR model. For all Scandinavian countries, a one-standard-deviation shock to their local EPU index has a negative or insignificant relationship with stock markets, PMI, GDP, employment and investments. Moreover, our results show that the Scandinavian region is impacted by both regional and global shocks. Therefore, these indices should be of interest to anyone aiming to forecast economic movements in the Scandinavian region.

Acknowledgement

Appendix A. Translated search strings

We translate the (Baker et al., 2016) EPU search words to the three Scandinavian languages. We also chose to include country specific names on parliament, government and central banks to further improve the accuracy. Tables 2, 3 & 4 show the key words for each language including their roots.

Appendix B. Correlation

In Table 5, we present the correlation matrix for the EPU indices. As expected, there is a moderate positive correlation between the indices, ranging from 0.28 to 0.54.

Appendix C. Narrative validation

In Fig. 1 we can identify several local events; for example, the Norwegian EPU increased in response to the EU election in 1994, which generated uncertainty regarding Norway's access to the EU's internal market. This spike in the index is not present in the US EPU or the other local indices.

An interesting observation is that the EPU of Norway and Sweden react similarly to the 22nd July terror attack in Norway. This suggests that the resulting debates on national security and

Table 4
Swedish policy uncertainty keywords.
Source: Svenska Akademiens Ordböcker.

Word type	Root of keyword	Full list of keywords
Economic	Ekonomi	ekonomi, ekonomin, ekonomier
	Ekonomisk	ekonomisk, ekonomiskt, ekonomiska
Policy	Riksbank	riksbank, riksbanken, riksbanker
	Centralbank	centralbank, centralbanken, centralbanker
	Regering	regering, regeringen, regeringar
	Departement	departement, departementet, departementen
	Reglering	reglering, regleringen, regleringar
	Minister	minister, ministern, ministrar
	Direktiv	direktiv, direktivet
	Riksdag	riksdag, riksdagen, riksdan, riksdagar
Uncertainty	Osäker	osäker, osäkert
	Osäkerhet	osäkerhet, osäkerheter, osäkerheten
	Oro	oro, oron

Table 5
Correlations between the monthly EPUs of the three Scandinavian countries. The EPUs are standardized and normalized for the period 1994:09–2019:09.

	Norway	Denmark	Sweden	US
Norway	1.00			
Denmark	0.28	1.00		
Sweden	0.45	0.40	1.00	
US	0.33	0.23	0.54	1.00

terror prevention in Norway's neighbouring country had a similar impact on the Swedish index. We find that the Danish EPU is at even higher levels at this time, partially due to the debate on border control occurring at the same time as the 22nd July attacks. Hence, there appears to be significant spill-overs among these interconnected economies.

The aptitude of the indices to capture major global political events is evidenced by the strong reaction of all the indices to the Russian financial crisis in the late 1990s, which caused the downfall of the US hedge fund, Long-Term Capital Management.

In line with (Baker et al., 2016), we see a sharp increase near 9/11 for all the indices. The fact that the far-right parties won the general election in Denmark could explain why the Danish

index continues to rise after the other indices stabilize or decline. Furthermore, the reaction of the Swedish index to the Swedish Euro referendum in 2003 further demonstrates the ability of the indices to capture local events. The Swedish EPU rises prior to the election and drops significantly once the outcome is known.

Although it is difficult to establish a timeline for when the financial crisis stopped and the European debt crisis started, both periods and the interval in between seem to be characterized by elevated policy uncertainty levels. The European debt crisis ended when the EU bailed out several member countries in 2012. However, that rescue put the union's future at risk due to conflict concerning government debt levels. These events seem to have influenced all indices, likely due to the interconnectedness of modern financial systems.

Prior to and following the outcome of the Brexit vote, we find that the US, Norwegian and Swedish EPUs started to increase, while the Danish index fluctuated around its all-time low. The Norwegian reaction can be explained by the fact that the UK is Norway's most important export destination,[4] while it is somewhat unclear why Sweden would react more strongly than Denmark at the time of the vote. Following the Swedish general election of 2018, we see a significant rise in the Swedish as well as the Danish and partially the Norwegian EPU index. This is possibly due to the US–China trade war occurring at the same time.

Concluding our narrative analysis, we find that the EPU indices perform well in capturing not only the major events themselves but are also able to identify local differences. Furthermore, by observing several indices at the same time, we can be more confident that shocks are either regional or global. However, due to several possible explanations for each spike in the indices, the limitations of narrative validation are evident, and more advanced techniques are therefore presented in Section 3.2.

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