Ca' Foscari University of Venice

Department of Economics

Working Paper

Michael Donadelli
Luca Gerotto
Marcella Lucchetta
Daniela Arzu

Migration fear, Uncertainty, and Macroeconomic Dynamics

ISSN: 1827-3580
No. 29/WP/2018

Working Papers
Department of Economics
Ca' Foscari University of Venice
No. 29/WP/2018
ISSN 1827-3580

Migration Fear, Uncertainty, and Macroeconomic Dynamics

Michael Donadelli
Faculty of Economics and Business Administration and Research Center SAFE, Goethe University Frankfurt; Ca' Foscari University of Venice

Luca Gerotto
Ca' Foscari University of Venice

Marcella Lucchetta
Ca' Foscari University of Venice

Daniela Arzu
Ca' Foscari University of Venice

Abstract: This paper examines the effects of changes in immigration-related uncertainty and fear on the real economic activity in four advanced economies (i.e., US, UK, Germany and France). Immigration uncertainty/fear is first captured by two news-based indicators developed by Baker et al. (2015), namely the Migration Policy Uncertainty Index (MPUI) and the Migration Fear Index (MFI), and then by a novel Google Trend Migration Uncertainty Index based on the frequency of internet searches for "immigration" (GTMU). VAR investigations suggest that the macroeconomic implications of rising immigration uncertainty/fear depend on the country under examination as well as on the way in which immigration uncertainty/fear is measured. In the US and UK, MPUI, MFI and GTMU shocks induce positive long-run effects on the real economic activity. Differently, in Germany, MPUI and MFI shocks lead to expansionary reactions whereas GTMU shocks generate significant adverse effects on the economy. This suggests that increasing media attention and rising population's interest in immigration-related issues affect people's mood in a different way. In France, MPUI, MFI and GTMU shocks induce negative macroeconomic effects in the long-run. A battery of robustness tests confirms our main findings.

Keywords: Immigration, Uncertainty, Fear, Google Trends, Business Cycle
JEL Codes: C32, E32, G41

Address for correspondence:
Michael Donadelli
Faculty of Economics and Business Administration
Research Center SAFE, Goethe University
Frankfurt, Germany
E-mail: michael.donadelli@gmail.com

The Working Paper Series
is available only on line
(http://www.unive.it/pag/16882/)
For editorial correspondence, please contact:
wp.dse@unive.it

Department of Economics
Ca' Foscari University of Venice
Cannaregio 873, Fondamenta San Giobbe
30121 Venice Italy
Fax: ++39 041 2349210

Migration Fear, Uncertainty, and Macroeconomic Dynamics

This version: Sep2018

M. DONADELLI, L. GEROTTO, M. LUCCHETTA, D. ARZU *

Abstract

This paper examines the effects of changes in immigration-related uncertainty and fear on the real economic activity in four advanced economies (i.e., US, UK, Germany and France). Immigration uncertainty/fear is first captured by two news-based indicators developed by Baker et al. (2015), namely the Migration Policy Uncertainty Index ($MPUI$) and the Migration Fear Index (MFI), and then by a novel Google Trend Migration Uncertainty Index based on the frequency of internet searches for "immigration" ($GTMU$). VAR investigations suggest that the macroeconomic implications of rising immigration uncertainty/fear depend on the country under examination as well as on the way in which immigration uncertainty/fear is measured. In the US and UK, $MPUI$, MFI and $GTMU$ shocks induce positive long-run effects on the real economic activity. Differently, in Germany, $MPUI$ and MFI shocks lead to expansionary reactions whereas $GTMU$ shocks generate significant adverse effects on the economy. This suggests that increasing media attention and rising population's interest in immigration-related issues affect people's mood in a different way. In France, $MPUI$, MFI and $GTMU$ shocks induce negative macroeconomic effects in the long-run. A battery of robustness tests confirms our main findings.

JEL classification: C32, E32, G41

Keywords: Immigration, Uncertainty, Fear, Google Trends, Business Cycle

*Michael Donadelli (e-mail: michael.donadelli@gmail.com, phone: +49 69 798 33882) is affiliated with the Faculty of Economics and Business Administration and Research Center SAFE, Goethe University Frankfurt and the Department of Economics of Ca' Foscari University of Venice. Luca Gerotto, Marcella Lucchetta and Daniela Arzu are at the Department of Economics of Ca' Foscari University of Venice (e-mails: luca.gerotto@unive.it, lucchett@unive.it, daniela.arzu@unive.it). We thank Gianluca Bortoletto for helpful comments and suggestions. This work has been supported (in terms of both research and financial support) by the Research Center SAFE, funded by the State of Hessen initiative for research LOEWE. All remaining errors are our own.

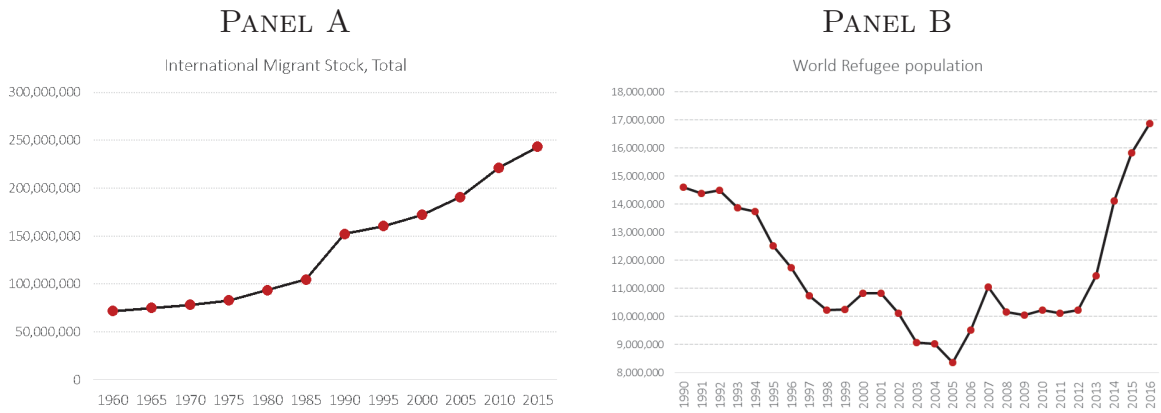
1 Introduction

It is widely accepted that the movement of people across the world's borders boosts global productivity. Those countries that prioritise integration are more likely to improve outcomes for their own economies and societies as well as for immigrants themselves. In its 2016 Global Report, McKinsey (2016) shows the following statistics about the economic impact of migrants: (*i*) 40–80% of labor force growth in top destinations between 2000 and 2014 was contributed by migrants; (*ii*) migrants' contribution to global GDP is around 9.5%. Moreover, it is observed that migrants of all skill levels contribute to the productivity effect in top destinations and do not harm the long-run employment or wages of native workers. Needless to mention, the international movement of workers leads to comparative advantage. Undoubtedly, the increasing degree of goods and financial markets integration across continents/countries has contributed most to the steep increase observed in the stock of migrants around the world. Remarkably, the average rate of growth of the World migrant stock over the last 50 years is above 10%. As illustrated in Figure 1 (Panel A), the number of migrants jumps from 71,9 million in 1960 to 243,2 million in 2015. Updated estimates provided by McKinsey (2016) for the 2016 show that 247 million people live outside their motherland.

However, the increasing number of migrants has raised significant concerns about its economic and social implications, especially among western developed economies. The series of terrorist attacks and civil wars in the Middle East (ME) and Africa have strengthened these concerns. More importantly, conflicts in the ME and Africa have led to a rapid rise in the number of refugees. World's refugees jump from 10 million in 2008 to almost 17 million in 2016 (Fig. 1, Panel B). Notably, refugees and asylum seekers account today for 10% of the world's total cross-border migrants. Such numbers have contributed to rising fear among natives, in particular among the EU population. As argued by Williams and Baláz (2012), migration tend to be a generator of risk/uncertainty, especially in popular, political, and policy discussions. A recent work by Alesina et al. (2018) has analyzed the perceptions of the natives towards the number and characteristics of immigrants in several countries, finding that these perceptions are significantly biased. In particular,

they observe that natives "greatly overestimate the total number of immigrants, think immigrants are culturally and religiously more distant from them, and are economically weaker". Needless to mention, in many countries politicians did not loose the chance to stoke fear among the population. Not surprisingly, major advanced economies are today full of fear. Of course, the BREXIT, the US elections outcome as well as the increasing power of far-right parties in several EU countries are also responsible for the tangible rise in migration fear.

Figure 1: International Migrant and Refugee Stock



Notes: This figure shows the evolution of World total migrant and refugee stock. *Source*: World Bank, United Nations Population Division.

In this respect, there are studies showing that large immigration inflows produce uncertain effects on labor markets housing markets, schooling, social services and government spending (Borjas, 2003; Card, 2005; Boeri et al., 2015, see, among others,). Moreover, Halla et al. (2017) observe that waves of refugees from Africa and ME to EU have generated further anxiety, which might certainly influence the political, social and economic outcome of any society. In light of these developments and empirical evidence media attention to immigration-related issues has largely increased over the last 5 years (see Fig. 2), as observed by Baker et al. (2015).[1] Increasing media attention to immigration-related phenomena has motivated researchers to further examine the implications of immigration for macroeconomic quantities and prices, especially employment and wages (D'Amuri and Peri, 2014; Kerr et al., 2015; Ruhs and Vargas-Silva, 2016). A

[1]An example of increasing media coverage on immigration-related issues is given by the ongoing debate – within the EU – about rescuing people in the Mediterranean.

large and growing literature focuses thus on the effects of immigration on the domestic labor market conditions. No study, however, examines the effects of immigration-related sentiment, namely (perceived) uncertainty and fear, on the real economic activity. With this paper we aim to fill this gap.

Immigration-related sentiment in our paper is first captured by the Baker et al. (2015)'s Migration Policy Uncertainty Index ($MPUI$) and Migration Fear Index (MFI). As for the standard Economic Policy Uncertainty (EPU) index, both indexes are built by relying on the number of news in newspaper articles reporting specific immigration-related terms. One can classify these two measures as News-Based Immigration-Related Sentiment Indexes. In other words, they reflect journalists' feeling/interest towards immigration. The $MPUI$ and the MFI are available at quarterly frequency from 1990:Q1 for the following countries: US, UK, Germany and France. Following the very recent literature aimed at capturing directly users' uncertainty by means of internet search volume for specific topics (Dzielinski, 2011; Donadelli, 2015; Bontempi et al., 2016; Castelnuovo and Tran, 2017), we build a novel indicator of immigration-related uncertainty based on the frequency of Google searches for the term "immigration". Google trends on a specific topic and for a specific country can be retrieved at a monthly frequency from 2004. Our Google Trend Migration Uncertainty ($GTMU$) index for the US, UK, Germany and France covers thus the period 2004:M1-2017:M12.

A preliminary analysis suggests that, in almost all countries, the news-based immigration sentiment measures (i.e., $MPUI$ and MFI) and the EPU are positively correlated. Differently, there is evidence of a negative co-movement between our $GTMU$ index and the existing EPU. One can argue that the $GTMU$ accounts for different dimensions of immigration-related uncertainty. By means of VAR investigations, we observe that a $MPUI$ shock has a negative effect on the real economic activity only in the US and in France. In the US, we observe a short run (and statistically significant) drop in the industrial production and rise in the unemployment rate. However, from eight quarters after the shock production starts to increase significantly; a long-run increase in the price level is also observed. Differently, in France, there are no short-run effects, while industrial production (unemployment) starts to fall (rise) from three (eight) quarters after the

shock. By contrast, $MPUI$ shocks in the UK and Germany lead to (i) an increase in the production level; (ii) a drop in the unemployment rate and (iii) a short-run decrease in price levels. When using the MFI as measure of immigration-related sentiment similar conclusions can be drawn.

When immigration-related uncertainty is instead captured by the frequency of internet searches, different implications for the macroeconomy are found. For instance, in Germany, $GTMU$ shocks – as opposed to $MPUI$ and MFI shocks – undermine the real economic activity. An unanticipated rise in the frequency of internet searches for "immigration" produces a short-run drop in the industrial production. Noteworthy, $GTMU$ shocks are also significant drivers of unemployment in Germany: increasing Google-search-based immigration-related uncertainty produces a long-lasting increase in the unemployment rate. Not surprisingly, at two- or three-year-horizon, a $GTMU$ shock explains 6% of the variation in the German unemployment rate. France shares with Germany similar labor market implications following a $GTMU$ shock. In contrast, in the US, a $GTMU$ shock generates expansionary reactions. In particular, we observe a long-lasting drop in the unemployment rate. A similar effect is found for the UK.

Taken together, our empirical analysis suggests that rising immigration-related uncertainty/fear has significant macroeconomic implications. More importantly, such implications are not homogenous across countries. In some countries, rising interest towards immigration induces sizeable adverse effects on the real economic activity whereas in others it generates expansionary reactions. Therefore, deteriorating immigration-related sentiment – usually associated to relevant political and social tensions – does not necessarily harm the real economic activity. Moreover, our findings have pointed out that the observed macroeconomic outcomes depend on the way in which immigration-related uncertainty/fear is measured. As opposed to Donadelli (2015), Bontempi et al. (2016) and Castelnuovo and Tran (2017) who show that news-based EPU shocks and Google search-based macroeconomic-policy-uncertainty shocks produce similar impulse responses of main macroeconomic aggregates, our analysis points out that the macroeconomic implications of a shock to the $MPUI$ and MFI (i.e., news-based immigration-related sentiment shock) of Baker et al. (2015) are different from those generated by a shock to

our newly developed $GTMU$ index (i.e., Google search-based immigration-related uncertainty shock). It turns out that – when referring to "immigration phenomena" – increasing media coverage (i.e., number of articles on immigration issues) and Google searches (i.e., frequency of internet search for " immigration") have different implications on economic agents' behavior. Put differently, journalists' view and interest in immigration-related phenomena do not map (directly) into the actual behavior/mood of internet users, which represent a significant portion of the overall population.

The rest of the paper is organized as follows. Section 2 describes data. Section 3 briefly explain our empirical strategy and discusses the empirical findings. Section 4 concludes.

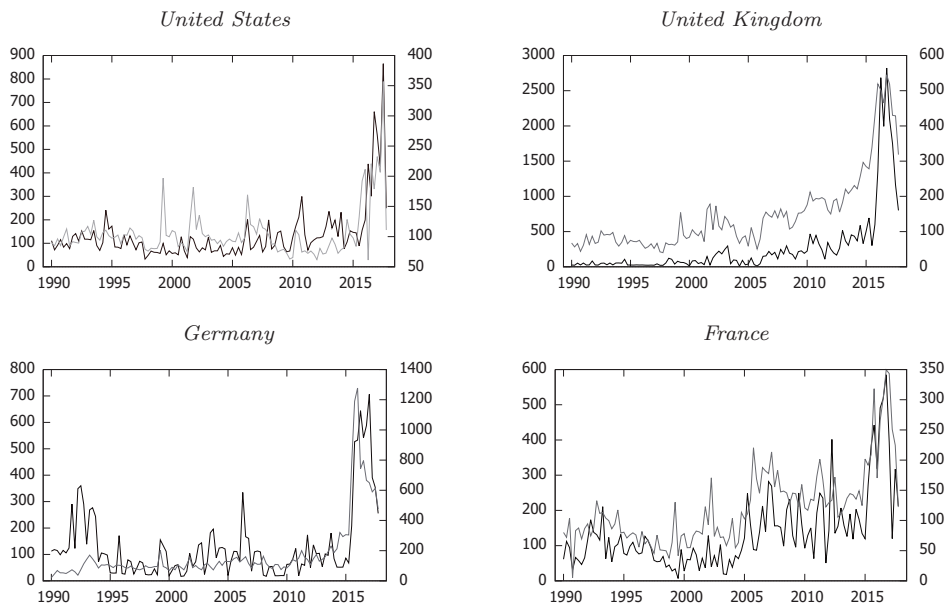
2 Data Description

News-Based Immigration-Related Sentiment Indicators. As indicators of uncertainty/fear related to immigration phenomena, we use the following two news-based immigration-related sentiment indexes: (i) Migration Policy Uncertainty Index ($MPUI$); (ii) Migration Fear Index (MFI).[2] The $MPUI$ and the MFI have been recently developed by Baker et al. (2015) and are available at quarterly frequency from 1990:Q1 for the following countries: France, Germany, UK and United States (see http://www.policyuncertainty.com/immigration_fear.html). The construction of the $MPUI$ and MFI relies on the following five sets of words: (i) Migration (`M`): "border control", "Schengen", "open borders", "migrant", "migration", "asylum", "refugee", "immigrant", "immigration", "assimilation", "human trafficking"; (ii) Fear (`F`): "anxiety", "panic", "bomb", "fear", "crime", "terror", "worry", "concern", "violent"; (iii) Economy (`E`): "economic", "economy"; (iv) Policy (`P`): "regulation", "deficit", "white house", "legislation", "congress","federal reserve"; (v) Uncertainty (`U`): "uncertainty", "uncertain".

As described by Baker et al. (2015), the MFI is built by counting the number of articles with at least one word from each of the `M` and `F` word sets. Similarly, the $MPUI$ is based on the number of articles containing at least one word from each of `M`, `F`, `E`, `P` and

[2] In this respect, we differ from Czudaj (2018) who focus his analysis only on the MFI.

Figure 2: News-Based Immigration-Related Sentiment Indicators



Notes: This figure reports the dynamics of the $MPUI$ (black line, left axes) and MFI (grey line, right axes) for the US, UK, Germany and France. The $MPUI$ and MFI have been retrieved from http://www.policyuncertainty.com/immigration_fear.html and run from 1990:Q1 to 2017:Q4.

U term sets.[3] Figure 2 shows the evolution of the $MPUI$ and MFI for each country. As discussed in http://www.policyuncertainty.com/immigration_fear.html, the most relevant spikes are associated with episodes related to major immigration issues (e.g., Kosovo war refugees, EU refugees crisis, Paris attacks, UKIP election in the UK)

Table 1 shows the correlation between the EPU and the two indicators of immigration-related sentiment. The presence of the term sets E, P and U in the construction of the $MPUI$ makes it positively co-moving with the EPU. The correlation ranges from a minimum of 0.2 in the US to a maximum of 0.87 in the UK. Similar conclusions can be drawn by looking at the correlation between the EPU and the MFI. Fear-related terms are most likely to appear with economic policy-related terms. An exception is the US, where the EPU and the MFI are negatively correlated, while the EPU and the $MPUI$ are weakly (althogh significantly) positively correlated.

[3]Articles counts are from the following newspapers: all US newspapers indexed by the Access World News Newsbank (US), *Le Monde* (France), *Frankfurter Allgemeine Zeitung* and *Handelsblatt* (Germany), and the *Financial Times* and the *Times of London* (UK).

Table 1: Correlation: EPU vs. News-Based Immigration-Related Sentiment Indicators

United States	***MPUI***	***MFI***
EPU	0.195	-0.159
	[2.08]	[-1.69]
United Kingdom	***MPUI***	***MFI***
EPU	0.865	0.833
	[15.06]	[13.64]
Germany	***MPUI***	***MFI***
EPU	0.506	0.537
	[5.81]	[6.30]
France	***MPUI***	***MFI***
EPU	0.650	0.643
	[8.98]	[8.81]

Notes: This table reports the correlation coefficient (for each country) between the Baker et al. (2016) EPU index and the $MPUI$ andMFI. *t-statistics* are reported in square brackets. Data are quarterly and run from 1990:Q1 to 2017Q4.

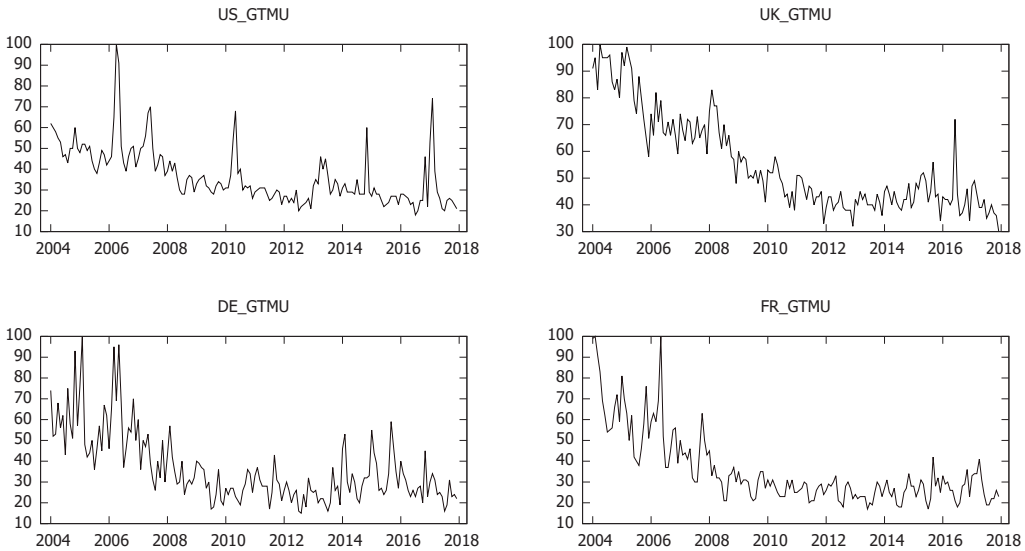
Google Search-Based Immigration-Related Uncertainty Indicators. Recent studies show that uncertainty about the future can be captured by the frequency of internet searches. The idea is that search frequency on Internet intensifies when the level of uncertainty for a specific topic is high.[4] We thus construct an immigration-related uncertainty index that relies on Google searches for the term "immigration". Given that news in different countries are written in their respective languages, we search for the term "immigration" in the US, UK and France and for the term "Einwanderung" in Germany.[5] Our newly developed Google Trend Migration Uncertainty ($GTMU$) Indexes are plotted in Figure 3. As in news-based immigration-related sentiment indexes, the major spikes in each country are associated with relevant immigration-related events (see Table 2).

Differently from the news-based immigration-related sentiment indicators proposed by Baker et al. (2015), our country-level $GTMU$ indexes are negatively correlated with the corresponding country EPU index. The correlation between the EPU and the $GTMU$ ranges from a minimum of -0.40 (Germany) to a maximum of -0.55 (UK). Similar results are obtained comparing the quarterly averages of $GTMU$ with the two news-based indexes specific to migration, that is $MPUI$ and MFI. This suggests that economic agents' internet searches on a specific topic and news released on that topic are not necessarily

[4]As highlighted in Bontempi et al. (2016), uncertainty is more relevant than idiosyncratic interest in driving searches. Moreover, Bontempi et al. (2016) conduct an interesting study to understand if media coverage leads or lags the general interest in different topics.

[5]In the spirit of Dzielinski (2011), we search for a term that might be able to capture several dimensions of uncertainty related to immigration issues.

Figure 3: Google Search-Based Immigration Uncertainty



Notes: This figure shows the evolution of the Google Trends Migration Uncertainty ($GTMU$) Indicator for the United States, United Kingdom, Germany and France. Sample: Sample: January 2004 - December 2017.

simultaneous. In other words, economic agents keep searching even if media attention to a specific topic slows down (or viceversa). On the other hand, a negative correlation suggests that the actual behavior of the population in searching for information about immigration issues differs (substantially) from media coverage dynamics associated to macro-, policy-, and immigration-related news.

Table 2: Immigration-Related Events

Country	Period	Event
United States	March - April 2006	Comprehensive Immigration Reform Act of 2006
	May 2007	Secure Borders, Economic Opportunity and Immigration Reform Act of 2007
	April 2010	Arizona Law
	January 2017	Trump Election
United Kingdom	November 2004 - May 2006	Restriction of the free movement of workers from Eastern Europe
	June 2016	BREXIT Referendum
Germany	November 2004 - May 2006	Restriction of the free movement of workers from Eastern Europe
	January 2005	First German Immigration Law Takes Effect
	October 2015	transformation of the fundamental right of asylum
France	November 2004 - May 2006	Restriction of the free movement of workers from Eastern Europe
	March 2007	Sarkozy paying immigrants to leave the country

Macro e Financial Variables. Quarterly data for the period 1990:Q1–2017:Q4 on Share Price Indexes (SPI), Long-Term Rates, Unemployment Rate (UR) and Consumer Price Index (CPI) are from the OECD. Country Industrial Production Indexes (IP) have been retrieved from the Federal Reserve Bank of St. Louis. In order to match the frequency and time span of Google search data, we have also retrieved SPI, LTR, IP,

and CPI from the OECD database for the period 2004:M1–2017:M12. Monthly data on UR is then from the Federal Reserve Bank of St. Louis. Annual data on the migrant stock and migrant flow in each country have been retrieved from the OECD International Migration Outlook.

Table 3: Correlation: News-Based Indexes vs. $GTMU$

	$GTMU_{US}$	$GTMU_{UK}$	$GTMU_{GE}$	$GTMU_{FR}$
EPU_i	-0.419	-0.553	-0.400	-0.510
	[-5.953]	[-8.554]	[-5.631]	[-7.636]
MFI_i	0.026	-0.604	-0.196	-0.251
	[0.189]	[-5.570]	[-1.468]	[-1.920]
$MPUI_i$	-0.208	-0.414	-0.098	-0.361
	[-1.559]	[-3.344]	[-0.722]	[-2.845]

Notes: This table shows the correlation between the $GTMU$ and the Baker et al. (2016) EPU index and the Baker et al. (2015) MFI and MPUI indexes ($i = US, UK, GE, FR$). *t-statistics* are reported in square brackets. Sample: January 2004 - December 2017. For MFI and MPUI, the analysis is based on quarterly data (quarterly observations are obtained as averages of monthly figures).

3 Empirical Analysis

3.1 Empirical Methodology

The macroeconomic effects of immigration-related uncertainty/fear shocks are identified by modelling the aforementioned macroeconomic series with country-specific VAR models. Formally, our baseline model reads as follows:

$$\mathbb{Y}_t = \mathbb{C}(L)\mathbb{Y}_{t-l} + \mathbb{V}_t$$

where $\mathbb{Y}_t$ is the set of endogenous variables, $\mathbb{C}(L)$ is the VAR coefficients matrix driving the system, and $\mathbb{V}_t$ is the vector of reduced-form residuals having zero-mean and variance-covariance matrix Λ, i.e. $\mathbb{V}_t \sim (0, \Lambda)$. To make sure that shocks to immigration-related sentiment indexes are orthogonal to the other embedded stochastic elements, the impulse vector responsible of the on-impact response of the variables in the vector $\mathbb{Y}_t$ is modelled by employing a Cholesky decomposition of the reduced-form variance-covariance matrix Λ. For each country j, we have the following data vectors: $\mathbb{Y}_t = [MPUI_t^j, IP_t^j, UR_t^j, CPI_t^j]$, $\mathbb{Y}_t = [MFI_t^j, IP_t^j, UR_t^j, CPI_t^j]$ and $\mathbb{Y}_t = [GTMU_t^j, IP_t^j, UR_t^j, CPI_t^j]$ where j = US, UK, Germany and France. The ordering in $\mathbb{Y}_t$ assumes (implicitly) that a

migration sentiment shock contemporaneously affects production, then labor market and finally prices. Each VAR is estimated via OLS. All variables are in log-levels, except for the migration-related sentiment indexes, which are in levels. The AIC, BIC and HQC are (jointly) used to select the optimal number of lags.

3.2 Empirical Evidence: News-Based Immigration-Related Sentiment

Fig. 4 depicts the impulse responses of industrial production, unemployment rate and prices (for each country) to a one-standard deviation shock to the $MPUI$ (Panel A) and MFI (Panel B). To capture the relevance of migration-related sentiment shocks on long-run fluctuations in main macroeconomic variables, we perform the 4-year (16 quarters) ahead forecast error variance decomposition analysis focusing on the contribution of the $MPUI$ and MFI shocks. In Table 4, for each country, we highlight the contribution of the $MPUI$ (Panel A) and MFI (Panel B) shocks in explaining the long-run fluctuations in countries' macroeconomic aggregates. Country-by-country key findings are discussed in what follows.

United States. An unanticipated increase in immigration-related uncertainty induces counterposed short-run and long-run effects on the US economy. Specifically, in the short run there are adverse effects, which are overturned in the long run. In particular, within the first two quarters after the shock we observe a drop in production ($IP \downarrow$) and a statistically significant rise in the unemployment rate. Conversely, from eight quarters after the shock production (unemployment) starts to increase (decrease), inducing thus long-run economic benefits. A $MPUI$ shock produces also a long-lasting increase in the price level.

By contrast, a MFI shock generates only long-lasting positive effects on the US economy (Fig. 4, Panel B, "*United States*"). While within the first two quarters there are no statistically significant effects, from three quarters after the shock we observe a sizeable increase (decrease) in production (unemployment). As $MPUI$ shocks, also a rise in migration fear (i.e., $MFI \uparrow$) boosts inflation in the long-run. Not surprisingly, at four year horizon, both $MPUI$ and MFI shocks account for 9% of the variation in the

US inflation (see Table 4).

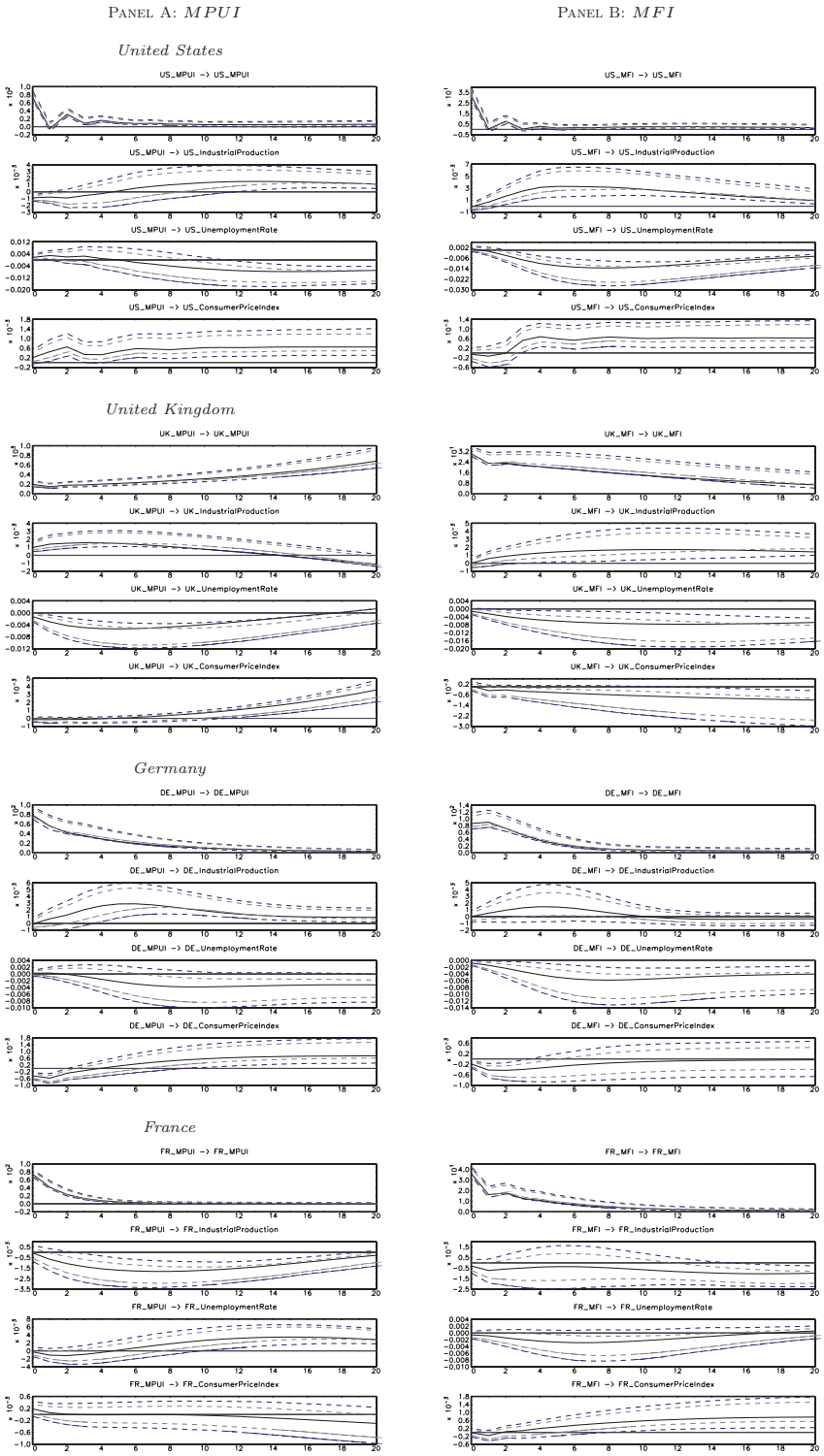
United Kingdom. In the UK, increasing immigration uncertainty/fear induces long-lasting positive macroeconomic effects. Notably, both $MPUI$ and MFI shocks produce a rise in industrial production and a drop in unemployment (Fig. 4, Panels A and B, "*United Kingdom*"). Both effects are highly significant and last for several quarters. Thus, migration uncertainty and fear represent significant drivers of the UK real economic activity, with a non-negligible contribution. At four year horizon (see Table 4), the MFI shock accounts for 7% (8%) of fluctuations in the UK industrial production (unemployment rate).

Germany. As in the UK, $MPUI$ and MFI shocks in Germany give rise to macroeconomic benefits in the long-run. In particular, they generate a sizeable persistent drop in the unemployment rate (Fig. 4, Panels A and B, "*Germany*"). MPUI shocks are also responsible for a statistically significant increase in industrial production (from four quarters onwards). Moreover, these shocks generate a temporary but significant deflationary reaction (i.e., CPI drops significantly up to three quarters after the shock).

France. In France, rising immigration-related uncertainty/fear generates a significant and long-lasting recessionary reaction. When considering the $MPUI$, production drops significantly from two quarters after the shock (Fig. 4, Panel A, "*France*"). Differently, when only (news-based) migration fear is accounted for, the drop in production levels starts later (i.e., three years after the shock). $MPUI$ shocks also initially generate a decrease in unemployment followed, from 12 quarters after the shock, by an increase in the unemployment rate. Conversely, MFI shocks have no significant effects on the unemployment rate. In general, there is no evidence of a significant effect on the price level due to increasing immigration uncertainty and fear (i.e., no inflationary or deflationary reactions).

Overall, our findings suggest that the macroeconomic implications of immigration sentiment (i.e.,uncertainty or fear) shocks differ across countries. In particular, news-based

Figure 4: Impulse Responses to News-Based Immigration-Related Uncertainty/Fear Shocks



Notes: This figure reports orthogonalized impulse responses of IP, UR and CPU to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. VAR estimated with a constant. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

Table 4: VAR Forecast Error Variance Decomposition: Baseline Model

PANEL A: Migration Policy Uncertainty Index					PANEL B: Migration Fear Index				
United States					*United States*				
shock/variable	$MPUI_t$	IP_t	UR_t	CPI_t	shock/variable	MFI_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.54	0.02	0.02	0.09	ϵ_{MFI_t}	0.55	0.11	0.11	0.09
United Kingdom					*United Kingdom*				
shock/variable	$MPUI_t$	IP_t	UR_t	CPI_t	shock/variable	MFI_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.89	0.04	0.03	0.07	ϵ_{MFI_t}	0.79	0.07	0.08	0.03
Germany					*Germany*				
shock/variable	$MPUI_t$	IP_t	UR_t	CPI_t	shock/variable	MFI_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.91	0.11	0.03	0.07	ϵ_{MFI_t}	0.90	0.02	0.09	0.02
France					*France*				
shock/variable	$MPUI_t$	IP_t	UR_t	CPI_t	shock/variable	MFI_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.98	0.11	0.04	0.00	ϵ_{MFI_t}	0.98	0.02	0.03	0.07

Notes: This table reports the proportions of forecast error (at 4-year horizon) in IP_t, UR_t and CPI_t accounted for by Migration Policy Uncertainty Index ($MPUI_t$, Panel A) and Migration Fear Index (MFI_t, Panel B). All entries refer to the point estimates of the baseline VAR model. Sample: 1990:Q1-2017:Q4 (112 obs).

immigration sentiment shocks are found to induce significant long-run recessionary reactions only in France, while in the other three countries there are long-lasting expansionary reactions upon the realisation of $MPUI$ or MFI shocks.[6] Loosely speaking, our findings suggest that the way in which agents living in different countries process news-based uncertainty and fear about immigration phenomena is not homogenous.

3.2.1 A Battery of Robustness Checks

In this section we consider various robustness checks regarding the effects of news-based immigration-related sentiment shocks (i.e., $MPUI$ and MFI shocks) on main macroeconomic (and financial) quantities and prices.

Adding trend. In this first additional empirical exercise we check whether the inclusion of a linear trend in the VAR alters significantly the impulse response functions obtained in our baseline VAR analysis (see Fig. 4). Impulse responses from VARs with a constant and a linear trend are showed in Fig. A.1.1. Results are hardly distinguishable (i.e., impulse responses exhibit almost identical patterns).

Different lag-order. In our baseline VAR lags are optimally selected via the (joint) use of the AIC, BIC and HQC selection criteria. We find that the optimal number of lags ranges from a minimum of one to a maximum of three. In this second robustness test, we

[6] Note that in the US such shocks also lead to a short run drop in production and rise in unemployment. However, the long-run macroeconomic effects turn out to be significantly positive (see Fig. 4, Panels A and B, "*United States*").

estimate all VARs using two lags. Impulse response functions from this alternative test are reported in Fig. A.1.2. Once again, our main findings are virtually indistinguishable.

Different variables ordering. Following recent studies focusing on the impact of economic policy uncertainty on macroeconomic quantities and prices (Bloom, 2009; Colombo, 2013; Donadelli, 2015; Castelnuovo and Tran, 2017), in our benchmark VAR analysis we also assume immigration-related uncertainty (or fear) to affect contemporaneously industrial production, unemployment rate and consumer price index (i.e., immigration-related uncertainty/fear is ordered first in a Cholesky decomposition). Here we investigate whether results obtained by ordering news-based immigration uncertainty/fear shocks first would be altered if we order them last (i.e., $\mathbb{Y}_t = [IP_t^j, UR_t^j, CPI_t^j, MPUI_t^j]$, $\mathbb{Y}_t = [IP_t^j, UR_t^j, CPI_t^j, MFI_t^j]$). This test enables us to control for the possible role played by contemporaneous variables in the VAR in affecting immigration-related sentiment. VARs where $MPUI$ and MFI are ordered last generate very similar impulse responses (see Fig. A.1.3).[7]

Post 9/11. From the moment the first plane hit one of the Twin Towers in Manhattan, the immigration system as well as citizens' attitude towards immigration in the US (and other advanced economies) was destined to change. The 9/11 terrorist attacks did certainly start a global immigration debate. It is thus likely that the macroeconomic implications of deteriorating immigration-related sentiment amplified in the aftermath of the 9/11. We thus replicate our baseline VAR analysis by using only post-9/11 data (i.e. 2002:Q1-2017:Q4). Impulse responses from this sub-sample analysis are depicted in Fig. A.1.4.

Not surprisingly, in the US, with respect to the full-sample analysis there are stronger and more persistent adverse effects and weaker (or no) positive effects. A $MPUI$ shock is found to induce a stronger and more long-lasting adverse effect on the industrial production, and the short-run rise in the unemployment rate is also stronger and more statistically significant than in the full period. Differently from the full sample analysis

[7] Generalized impulse responses (GIRFs) have also been estimated. GIRFs yield very similar results. For brevity's sake results are not reported but available upon request.

where a MFI shock generates long-lasting positive effects on the real economic activity, here a rise in migration fear generates a short-run significant drop (increase) in the US industrial production (unemployment rate). Moreover, the long-run positive effects disappear.

Different results in the post-9/11 and full-sample analysis are observed also for the UK (see Fig. 4 vs. Fig. A.1.4). In fact, using post-9/11 data, $MPUI$ and MFI shocks lead to long-lasting adverse effects on the UK real economic activity. In particular, (i) the industrial production increases significantly up to four quarters after the shock and starts to fall significantly from six quarters after the shock and (ii) the unemployment rate starts to increase significantly from 5/6 quarters after the shock. These empirical findings confirm that the citizens' attitude and perceptions towards immigration changed deeply not only in the US but also in the UK following the 9/11 terrorist attacks. For Germany and France, we instead observe very similar impulse responses.

General uncertainty. The correlation coefficients reported in Table 1 provide evidence of a similarity between the baseline (Baker et al., 2016) EPU index and the two news-based immigration sentiment indicators. As previously discussed, this is due to the way in which all these sentiment indexes are constructed. Do $MPUI$ and MFI really differ from the EPU? More importantly, do they provide the same, if any, macroeconomic implications once general uncertainty is accounted for? We address this issue by controlling for uncertainty in each specific country (proxied by the EPU index developed by Baker et al. (2016)). In each country VAR, the EPU index is added to the baseline vector and ordered first (i.e., $\mathbb{Y}_t = [EPU_t^j, MPUI_t^j, IP_t^j, UR_t^j, CPI_t^j]$ and $\mathbb{Y}_t = [EPU_t^j, MFI_t^j, IP_t^j, UR_t^j, CPI_t^j]$). Empirical impulse responses to EPU shocks and $MPUI/MFI$ shocks are reported in Fig. A.1.5. Once again, for all countries, impulse responses of industrial production, unemployment rate and consumer price index to $MPUI$ and MFI shocks are almost identical to those generated by our baseline VAR analysis (Fig. 4 vs. Fig. A.1.5). Results from this robustness test confirm existing findings showing that EPU shocks undermine the US real economic activity (Donadelli, 2015; Baker et al., 2016; Castelnuovo and Tran, 2017). In addition, our analysis points out

that macroeconomic policy uncertainty and immigration-related sentiment influence economic agents' behavior differently. Finally, our additional empirical test provides novel evidence suggesting that not only US EPU shocks (Colombo, 2013), but also country-specific macroeconomic policy-related uncertainty shocks undermine the real economic activity in the EU.

Financial market dynamics. In this robustness test, we attempt to control for financial market dynamics. Precisely, we investigate whether the effects of news-based immigration-related sentiment shocks are robust to the inclusion of financial variables. In order to control for variations in financial markets, we add to our baseline vectors the share price index (SPI) and long-term rate (LTR). Both controls are ordered before macroeconomic quantities and prices (i.e., $\mathbb{Y}_t = [MPUI_t^j, SPI_t^j, LTR_t^j, IP_t^j, UR_t^j, CPI_t^j]$, $\mathbb{Y}_t = [MFI_t^j, SPI_t^j, LTR_t^j, IP_t^j, UR_t^j, CPI_t^j]$). The ordering in $\mathbb{Y}_t$ is based on the assumptions that immigration-related uncertainty/fear shocks instantaneously influence asset prices, then production and labor, and finally price levels. Impulse responses from this augmented-VAR for the US, UK, Germany and France are depicted in Fig. A.1.6. For all countries, impulse responses of industrial production, unemployment rate and consumer prices index remain mostly unaffected. What are the effects of $MPUI$ and MFI shocks on financial variables? And, how important are these shocks? In the US, a $MPUI$ shock generates only a significant long-lasting drop in long-term rates; conversely, a rise in MFI produces an increase in stock prices from four quarters after the shock. In the UK, there is no significant effect on long-term rates, while we observed a significant drop in the share prices index from (around) ten quarters after a $MPUI$ or MFI shock. In Germany, both share prices and long-term rates drop in the short run upon the realisation of news-based immigration-related uncertainty/fear shocks. Share prices decrease significantly also in France. A couple of additional findings are noteworthy. First, as suggested by entries in Table A.1.1, a $MPUI$ shock explains 5% of the variation in the French share price index. Second, MFI shocks explain a non-negligible fraction of fluctuations in stock market prices in the US, UK and France (i.e., 7%, 5% and 11%, respectively).

Dynamic impulse responses. Motivated by the interesting result related to the post-9/11 sample, we inspect whether the macroeconomic effects of immigration-related sentiment shocks change over time. To do so, we rely on dynamic impulse responses of industrial production, unemployment rate and CPI. Intuitively, these are computed by estimating our VAR using a rolling window of 40 quarters (i.e., 10 years). Impulse responses – yearly aggregated for the period 2006-onwards – are plotted in Figs. A.1.7 (for the US and UK) and A.1.8 (for France and Germany).

As anticipated by the post-9/11 results, the macroeconomic effects of immigration-related sentiment shocks tend to change over time. For instance, in the US, we observe short-run recessionary (expansionary) reactions in 2009 (2017). The negative (positive) macro-effects vanish in the long-run (Fig A.1.7, "*United States*", blue line vs. dotted blue line). Time-varying effects are observed also in other countries. In Germany, for example, the industrial production rises in the short-run and drops in the long-run in the following years: 2006 (black line), 2007 (red line) and 2008 (green line). These effects, however, start to disappear from 2009 onwards.

For the sake of completeness, we then check whether the time-varying macroeconomic effects of rising immigration-related uncertainty/fear are related to actual immigration phenomena (i.e., immigration stock and flow). The evolution of the migrant stock and migrant flow are depicted in Fig. A.1.9. The correlation between the dynamic responses (at different horizons) to $MPUI$ and MFI shocks and (detrended) stock and flow of immigrants are reported in Table A.1.2.

Overall, our simple analysis suggest the presence of a statistically significant link between the strength of the reactions to immigration-related sentiment shocks and the observed variations in the immigration phenomena. Making reference to Germany, UK and the US, Table A.1.2 presents several significant correlations between responses to macroeconomic aggregates and both the stock and the flow of immigrants. In particular, the migrant flow appears to be the most relevant of the two drivers for US, while the migrant stock is relatively more important for Germany and for UK. Let us remark that in this specific exercise one would expect that a rise in immigration stock/flow leads to an amplification of the effects of immigration-related sentiment shocks. In other words, we

should have a negative correlation for the industrial production and the consumer price index and a positive correlation for the unemployment rate. However, we find mixed signs on the correlation coefficients, meaning that in some circumstances the way in which people react (both in the short- and long-run) to rising immigration uncertainty/fear is not necessary consistent with actual countries' immigration dynamics. Our evidence, somehow, reconcile with Alesina et al. (2018)' findings concerning the misalignment between the natives' perception and the real migration phenomena.

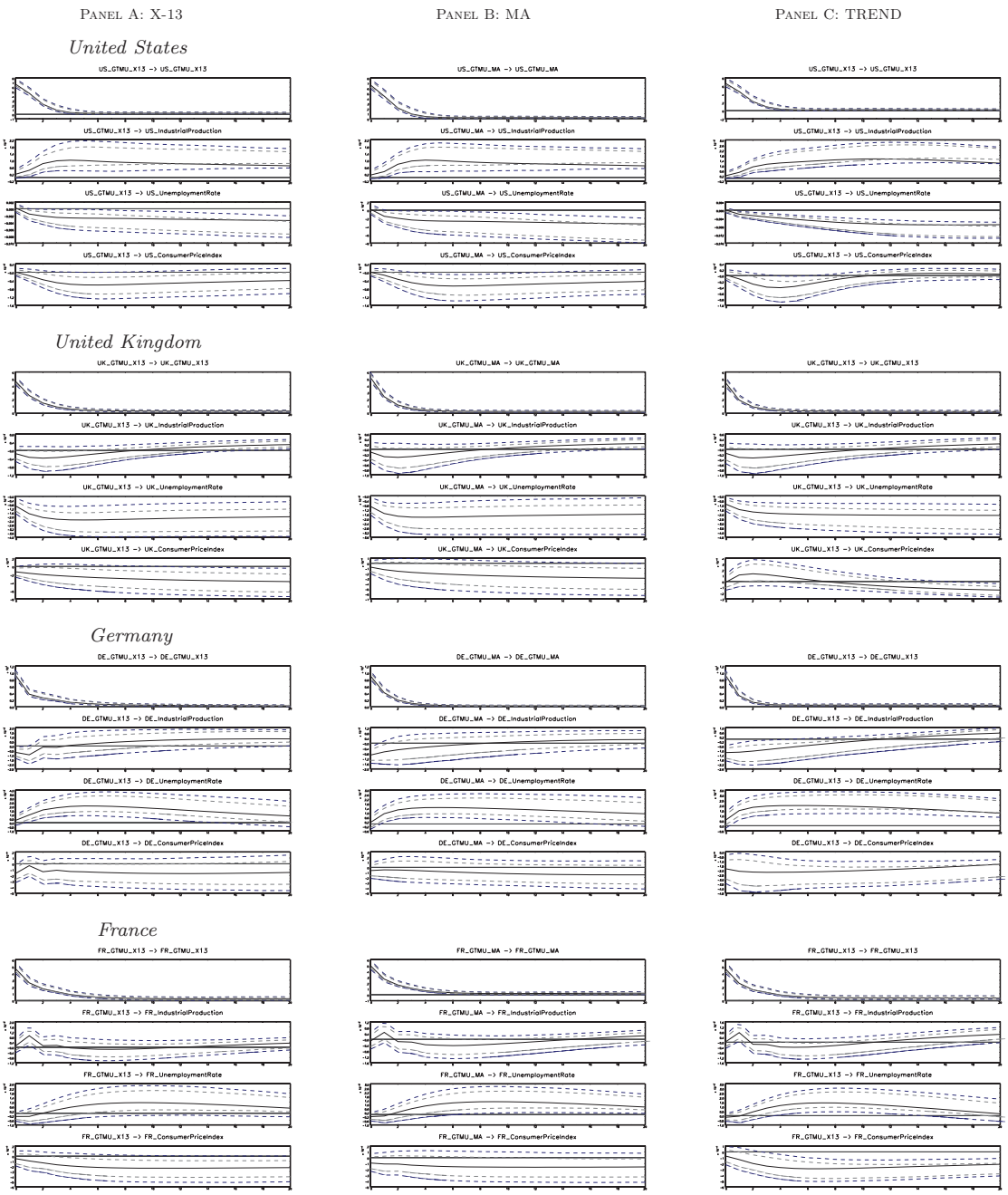
3.3 Empirical Evidence: Google Search-Based Immigration-Related Uncertainty

Figure 5 depicts the impulse response functions to a one-standard deviation shock to the $GTMU$ index for the US, UK, Germany and France. In Panel A, we report impulse responses from our benchmark VAR where the $GTMU$ index is seasonally-adjusted via the `X-13ARIMA-SEATS` Seasonal Adjustment Program of the U.S. Census Bureau.[8] In Panel B, the $GTMU$ index is seasonally-adjusted by means of standard moving average (MA) methods. Finally, impulse responses in Panel C are estimated from a VAR with a constant and a linear trend. Let us anticipate that impulse response functions of industrial production, unemployment rate and prices do not differ across the different VAR specifications. The percentage of variance in business cycle fluctuations of macroeconomic quantities and prices explained by $GTMU$ shocks is reported in Table 5.

It is interesting to compare the effects of the $GTMU$ shocks to the ones of $MPUI$ and MFI shocks; in particular, we will compare the results both with the full sample used for news-based analysis (1990 to 2017) and the post-9/11 subsample, which mainly overlaps with the one of $GTMU$ data (2004-2017). For example, in the US, $GTMU$ shocks induce both short-run and long-lasting positive effects on the real economy, differently from $MPUI$ and MFI shocks. In particular, a rise in the frequency of internet searches for immigration, generates a significant increase (decrease) in the US industrial production (unemployment rate). These results are strikingly different from the ones obtained for the post-9/11 analysis for news-based indexes, according to which there are strong and

[8] In this respect, we follow Castelnuovo and Tran (2017). For the sake of robustness we have also performed the analysis using the approach of Dzielinski (2011). Results are very similar and available upon request.

Figure 5: Impulse Responses to Google Search-Based Migration-Related Uncertainty Shocks



Notes: This figure reports orthogonalized impulse responses of IP, UR and CPU to a $GTMU$ shock for the US, UK, Germany and France. The $GTMU$ is based on Google searches for the term "immigration. Panel A (baseline model): the $GTMU$ index is seasonally adjusted via the X-13ARIMA-SEATS Seasonal Adjustment Program; Panel B: the $GTMU$ index is seasonally adjusted using standard MA methods; Panel C: VAR estimated with a constant and a linear trend. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. Sample: 2004:M1-2017:M12 (168 obs).

persistent adverse effects. Counterfactually, price levels drop significantly. Importantly, at two and three years horizon, $GTMU$ shocks account for a non-negligible percentage of variations in production and price levels (almost 15% and 20%, respectively). Quantitatively, Google search-based population's uncertainty related to immigration issues seems to capture a larger percentage of macroeconomic fluctuations than news-based immigration-related sentiment indicators.

By contrast, in the UK, the unemployment rate and consumer price index drop significantly in the long-run: the contribution of $GTMU$ shocks to variations in the unemployment rate is as high as 5%. Like for US, results are strickly different from the post-9/11 effects of news-based indexes, meaning long-lasting adverse effects on the UK real economic activity.

General price levels decrease also in Germany and France. Moreover, in these two countries $GTMU$ shocks give rise to a persistent and significant increase in the unemployment rate. However, industrial production drops significantly only in Germany.[9] We argue that such deflationary phase can be the result of the observed decline in industrial production. On the one hand, these results are in line with the recessionary reaction of the French economy to a news-based shock; on the other hand, we observe positive effects of a news-based shock in Germany, while a $GTMU$ shock seems to have adverse effects.

Taken together, these findings suggest that rising population's concerns about immigration dynamics tends to affect mainly economies exhibiting a relatively rigid labor market (i.e., continental Europe economies: France and Germany).

3.3.1 Additional Tests

As in Section 3.2.1, in what follows we provide several robustness tests in order to corroborate our main findings on the macroeconomic implications of $GTMU$ shocks. Are the main findings reported in Fig. 5 robust to (i) modelling different VAR lags; (ii) ordering $GTMU$ last in the vectors; (iii) controlling for general uncertainty and financial variables

[9] $GTMU$ shocks undermine production levels also in the UK and France but the effects are not statistically significant.

Table 5: Forecast error variance decomposition

United States				
shock/variable	$GTMU_t$	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.62	0.12	0.05	0.17
$\epsilon^{36}_{GTMU_t}$	0.53	0.14	0.06	0.19
United Kingdom				
shock/variable	$GTMU_t$	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.82	0.02	0.07	0.04
$\epsilon^{36}_{GTMU_t}$	0.75	0.03	0.05	0.05
Germany				
shock/variable	$GTMU_t$	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.85	0.02	0.06	0.02
$\epsilon^{36}_{GTMU_t}$	0.81	0.02	0.04	0.01
France				
shock/variable	$GTMU_t$	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.59	0.01	0.01	0.03
$\epsilon^{36}_{GTMU_t}$	0.49	0.01	0.01	0.03

Notes: This table reports the proportions of forecast error at 2 and 3 years horizon in IP_t, UR_t and CPI_t accounted for by $GTMU_t$. All entries refer to the point estimates of the baseline VAR model. In the baseline VAR, the $GTMU$ index (in each country) is seasonally adjusted via the X-13ARIMA-SEATS Seasonal Adjustment Program. Sample: 2004:M1-2017:M12 (168 obs).

and (*iv*) using an alternative $GTMU$?

Different lag-order and variables ordering. Figures A.2.1 and A.2.2 depict the impulse responses obtained by using four lags and ordering $GTMU$ last in the VARs, respectively. Impulse responses are almost identical to those obtained in the baseline VAR (Fig. 5, Panel A).

General uncertainty. Does general macroeconomic policy uncertainty offset the macroeconomic implications of a $GTMU$ shock? To address this issue, we re-estimate our baseline VARs by adding and ordering first the Baker et al. (2016)'s EPU index (i.e., $\mathbb{Y}_t = [EPU_j, GTMUI^j_t, IP^j_t, UR^j_t, CPI^j_t]$). Let us remark that by using this ordering we purge the Google search-based immigration uncertainty indicator from the contemporaneous movement of general macroeconomic policy uncertainty, therefore sharpening the identification of $GTMU$ shocks. Impulse responses to EPU and $GTMU$ shocks are depicted in Fig. A.2.3. This additional test confirms our baseline results about the macroeconomic reactions of $GTMU$ shocks as well as existing evidence on the adverse effects of EPU shocks.

Aggregate $GTMU$. An issue in our analysis could be whether the Google trends search for the single term "immigration" accounts for all dimensions of anxiety/fear/uncertainty about immigration-related phenomena. For instance, in order to capture macroeconomic policy uncertainty by means of Google trends, Castelnuovo and Tran (2017) follow the Baker et al. (2016)'s approach and build an aggregate Google trends economic policy-related index, which relies on a large and broad set of key words (e.g., "bankruptcy", "stock market", "economic reforms", "debt stabilization", "White House", "debt ceiling").[10] We embrace this approach and, for the sake of robustness, build an aggregate Google search-based immigration-related uncertainty index. For each country, this is based on the frequency of internet searches for a set of immigration-related terms:[11]

- United States: "immigrant", "immigration", "migrant", "migration", "refugee";
- United Kingdom: 'immigrant", "immigration", "migrant", "migration", "refugee";
- Germany: 'einwanderung", "einwanderer", "wandertier", "abwanderung", "flüchtling";
- France: "immigrant", "immigration", "migrant", "migration", "réfugié".

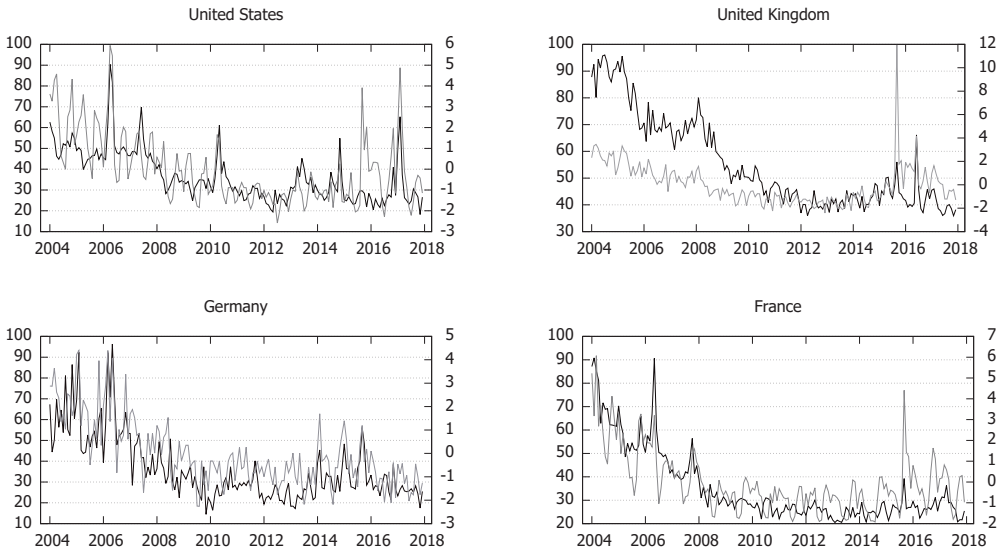
Our aggregate $GTMU$ shock is then represented by the first principal component extracted from the dataset composed by the different Google trends indexes based on different immigration-related terms (hereinafter $GTMU_{PC}$). The newly developed aggregate $GTMU_{PC}$ index and the baseline $GTMU$ index based on searches for the single word "immigration" are plotted (for each country) in Fig. 6. Needless to mention, the two Google search-based indicators of uncertainty exhibit very similar patterns. In fact, the correlation between the $GTMU_{PC}$ and the $GTMU$ ranges from a minimum of 0.608 (UK) to a maximum of 0.784 (France).

The impulse response functions of macroeconomic quantities and prices from this robustness test are reported in Fig. A.2.4. Results remain basically unaffected. We still observe a significant drop (rise) in unemployment (production) in the US and the UK and

[10] Baker et al. (2016) identify articles containing "uncertain/uncertainty", "economic/economy", "congress", "deficit", "federal reserve", "legislation", "regulation", "White House", "FED", "regulatory".

[11] Note that all these terms are used by (Baker et al., 2015) to build the $MPUI$ and MFI (see term set `M`).

Figure 6: Google Search-Based Immigration Uncertainty



Notes: This figure shows the evolution of the baseline $GTMU$ (black line) and the $GTMU_{PC}$ (grey line) indicators for the United States, United Kingdom, Germany and France. Correlation between $GTMU$ and $GTMU_{PC}$: US → 0.724 [13.51]; UK → 0.608 [9.88]; Germany → 0.774 [15.73]; France → 0.784 [16.30]. *T-statistics* are reported in square brackets. Sample: Sample: January 2004 - December 2017.

a long-lasting increase in the unemployment rate in Germany. Loosely speaking, Google search-based immigration-related uncertainty does not harm the US and UK economies. However, it generates persistent adverse effects on the EU labor market.

Financial market dynamics. As in Section 3.2.1, in this robustness test we check whether the macroeconomic implications of $GTMU$ shocks remain unchanged in the presence of financial market dynamics. We therefore add to our VAR analysis share price indexes and long-term rates. Impulse responses on industrial production, unemployment and prices are very similar. In particular, a $GTMU$ shock generates a decrease (increase) in unemployment in the US and UK (France and Germany). Increasing Google search-based immigration uncertainty produces also (i) a significant short run drop in share price levels in Germany and France and (ii) a long-lasting decrease in the French long-term rates (see Fig. A.2.5). $GTMU$ shocks produce instead non-significant effects on stock market prices and rates in the US and UK.

Dynamic impulse responses. In what follow we replicate the analysis carried out in our previous sections aimed at capturing the time-varying nature of the macroeconomic

effects induced by rising immigration fear/uncertainty. By computing dynamic responses of industrial production, unemployment rate and prices to a $GMTU$, we thus check whether the macroeconomic implication of rises in the frequency of internet searches for immigration change over time. Dynamic responses to $GMTU$ shocks are computed using a rolling window of 36-moths. Yearly (aggregated) responses are reported in Fig. A.2.6. For example, in the UK a $GTMU$ shocks generates a short-term recessionary (i.e., a drop in industrial production) until 2012, while since 2013 we observe short-term expansionary effects. $GTMU$ shocks induce time-varying macro-effects also in France. On the one hand, we have a short-term recessionary effect on the industrial production for the years 2012 (violet line) , 2013 (yellow line) and 2014 (grey line). On the other hand, for the post-2014 period, we observe short-term expansionary effects.

Then, we check whether the intensity of the implications of a $GMTU$ shock on macroeconomic quantities and prices is related to actual immigration phenomena dynamics (i.e., stock and flow of migrants). To do so, we compute the correlation between the stock and flow of immigrants (in each country) and the dynamic responses (at 1, 5, 10 and 20 months horizon) on selected macro variables for the period 2006-2017.[12] Similarly to our previous robustness test where news-based immigration sentiment indexes are used, we observe a significant comovement between the strength of the immigration phenomena and the strength of the effects of $GMTU$ shocks on the economy. In particular, when looking at immigrants flow, we find a statistically significant link in the US, UK and France. Such comovement is weaker in the case of Germany. Also in this analysis, we observe counterintuitive signs on the correlation coefficients, meaning that in some circumstances the real immigration phenomena tend to be counterintuitively related to the macroeconomic effect of rising people attention to immigration-related issues.

4 Concluding Remarks

By using two recently developed news-based indicators of immigration-related uncertainty and fear and a novel Google trends migration uncertainty index based on the

[12] Outlier estimates are excluded from the analysis.

frequency of internet searches for "immigration", this study has examined the macroeconomic implications of a deterioration in immigration sentiment. VAR investigations suggest that the effects of a rise in immigration uncertainty/fear on macroeconomic quantities and prices are not homogenous across countries. In the US and UK, news-based uncertainty ($MPUI$), news-based fear (MFI) and Google-based uncertainty ($GTMU$) shocks are all found to generate expansionary reactions. In particular, they induce a long-lasting decrease in the unemployment rate. An exception is the post-9/11 sample. In fact, since the Twin towers terrorist attack, both news-based uncertainty and news-based fear shocks are found to have adverse effects on the economy of the above-mentioned countries. Differently, in Germany, news-based uncertainty and news-based fear (Google-based uncertainty) shocks generate significant long lasting positive (negative) effects on the German economy by reducing (increasing) unemployment. In France, news-based uncertainty, news-based fear and Google-based uncertainty shocks generate recessionary reactions. Especially, a significant increase in the unemployment rate in the long run is observed. Overall, our results suggest that the macroeconomic implications of immigration-related uncertainty/fear depend on countries' specific attitude toward the immigration phenomenon as well as on the way in which immigration sentiment is measured.

Based on our novel empirical findings we believe that migration-related uncertainty/fear will continue to have significant macroeconomic implications, in particular if a vicious cycle of (*dis*)information keeps rising (Alesina et al., 2018). Remarkably, due to the evidence related to particular distressed periods (i.e.: post 9/11), following a futher sentiment deterioration we would likely face long lasting negative effects on the real economic activity, in particular by rising economies' unemployment rate. Examining the effects of immigration-related uncertainty/fear represents thus an interesting avenue for future research. In particular, future research should make use of extensive media coverage and Google trends data to build measures of immigration-related sentiment for different countries/regions. Particular attention should be then given to measuring the economic effects of deteriorating immigration sentiment in those countries where immigration is still at the center of the policy debate and fuels social tensions (e.g., Italy, Hungary,

Libia etc....). Last, but not least, additional analyses should focus on the international spillover macroeconomic effects of rising migration uncertainty.

References

Alesina, A., Miano, A., Stantcheva, S., 2018. Immigration and redistribution. Working Paper 24733, National Bureau of Economic Research.

Baker, S., Bloom, N., Davis, S. J., 2015. Immigration fears and policy uncertainty. VoxEU.org, 15 December .

Baker, S., Bloom, N., Davis, S. J., 2016. Measuring economic policy uncertainty. Quarterly Journal of Economics 131, 1539–1631.

Bloom, N., 2009. The impact of uncertainty shocks. Econometrica 77, 623–685.

Boeri, T., Philippis, M. D., Patacchini, E., Pellizzari, M., 2015. Immigration, housing discrimination and employment. The Economic Journal 125, F82–F114.

Bontempi, M. E., Golinelli, R., Squadrani, M., 2016. A new index of uncertainty based on internet searches: A friend or foe of other indicators? DSE Working Paper .

Borjas, G., 2003. The labor demand curve is downward sloping. Quarterly Journal of Economics 118, 1335–1374.

Card, D., 2005. Is the new immigration really so bad? The Economic Journal 115, F300–F323.

Castelnuovo, E., Tran, T. D., 2017. Google it up! a google trends-based uncertainty index for the united states and australia. Economics Letters 161, 149–153.

Colombo, V., 2013. Economic policy uncertainty in the us: Does it matter for the euro area? Economics Letters 121, 39–42.

Czudaj, R. L., 2018. In equity market volatility driven by migration fear? Finance Research Letters, Forthcoming .

D'Amuri, F., Peri, G., 2014. Skilled immigration and the employment structures of us firms. Journal of the European Economic Association 12, 432–464.

Donadelli, M., 2015. Google-search based metrics, policy-related uncertainty and macroeconomic conditions. Applied Economics Letters 22, 801–807.

Dzielinski, M., 2011. Measuring economic uncertainty and its impact on the stock market. Finance Research Letters 9, 167–175.

Halla, M., Wagner, A., Zweimüller, J., 2017. Immigration and voting for the far-right. Journal of the European Economic Association 6, 1341–1385.

Kerr, S. P., Kerr, W. R., Lincoln, W. F., 2015. Skilled immigration and the employment structures of us firms. Journal of Labor Economics 33, S147–S186.

McKinsey, 2016. People on the move: Global migrations impact and opportunity. McKinsey Global Institute, Executive Summary .

Ruhs, M., Vargas-Silva, C., 2016. The labour market effects of immigration. The Migration Observatory, Oxford University .

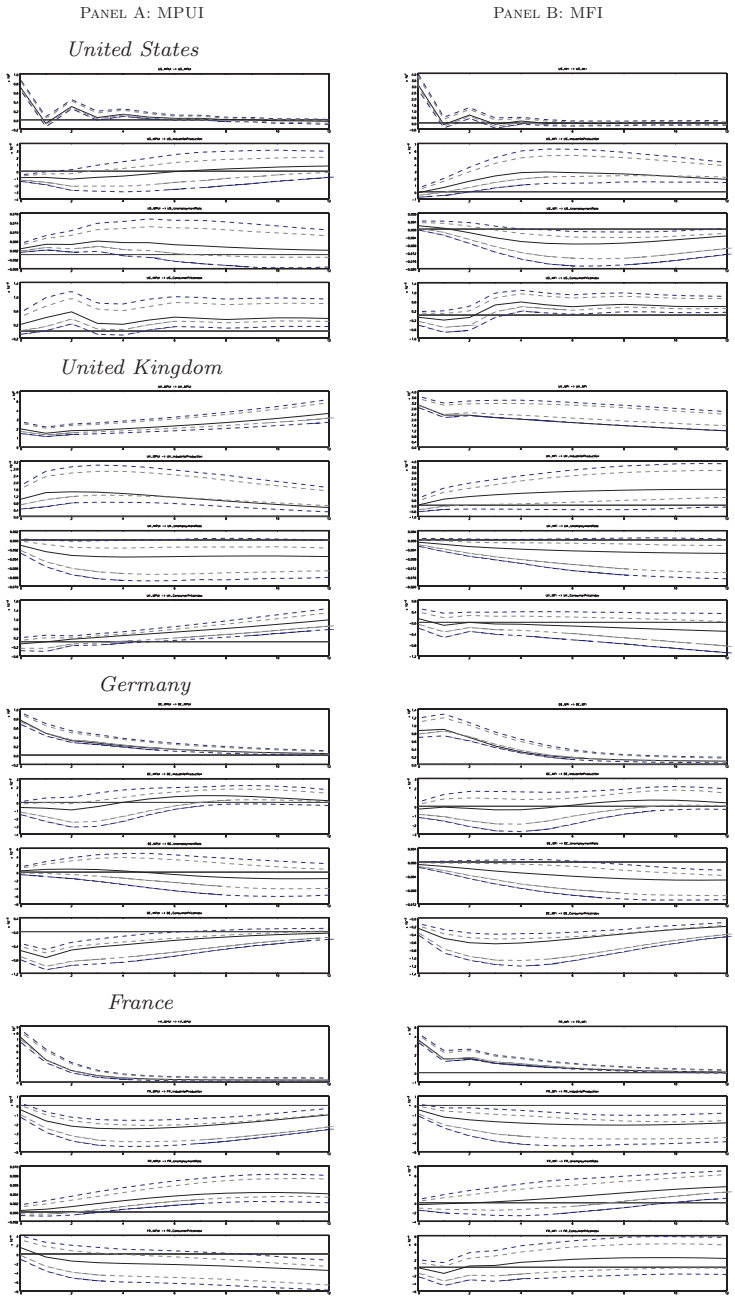
Williams, A. M., Baláz, V., 2012. Migration, risk, and uncertainty: Theoretical perspectives. Population, Space and Place 18, 167–180.

A Additional Empirical Tests

A.1 News-Based Immigration Uncertainty

Adding trend.

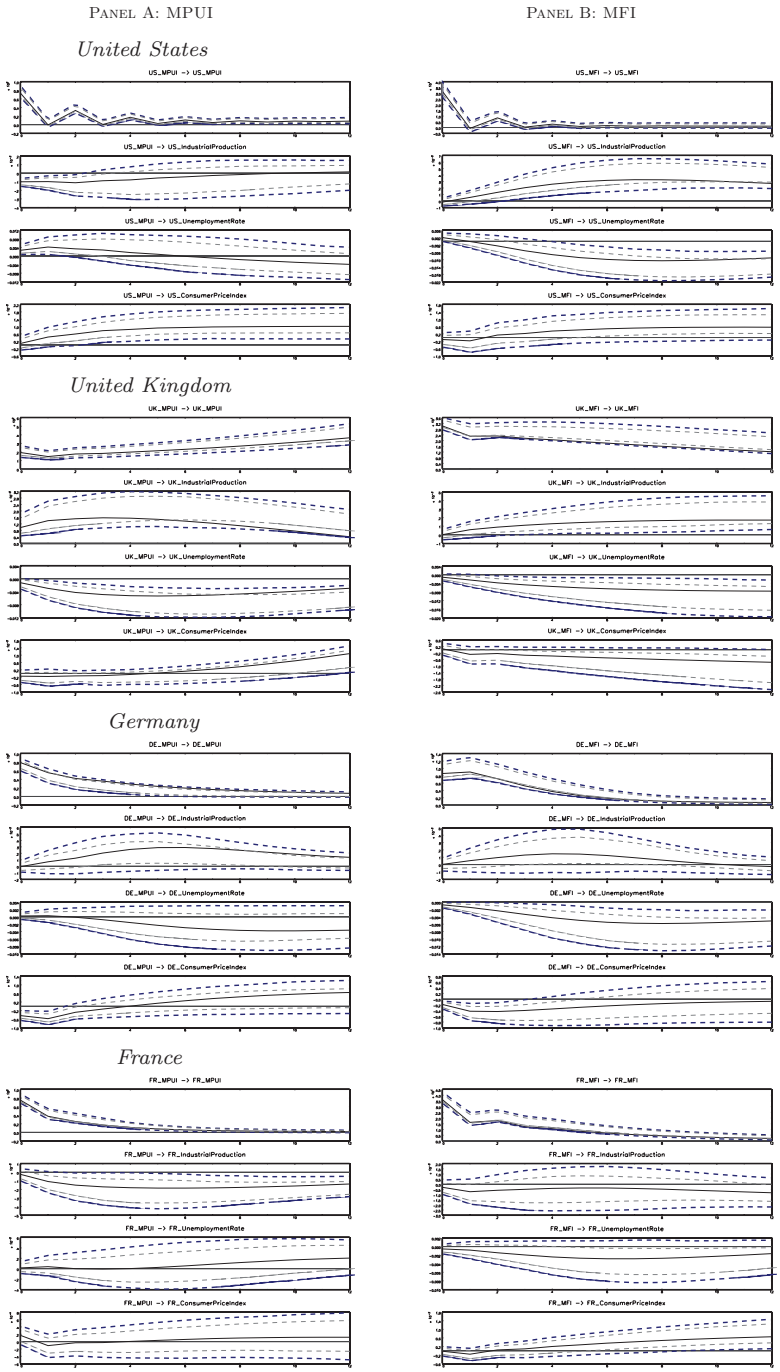
Figure A.1.1: Impulse Responses to Migration-Related Uncertainty/Fear Shocks (with TREND)



Notes: This figure reports orthogonalized impulse responses to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. VARs estimated with a constant and a linear trend. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

Different lag-order.

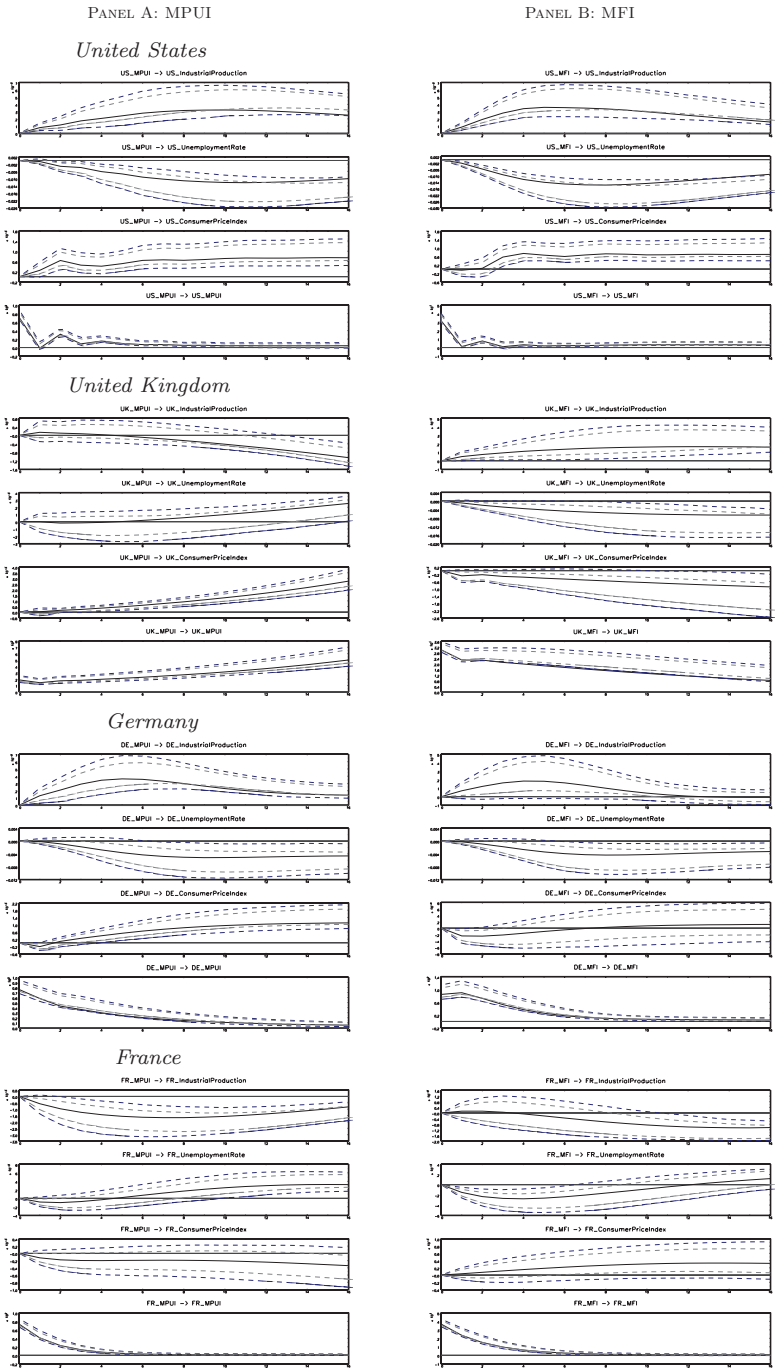
Figure A.1.2: Impulse Responses to Immigration-Related Uncertainty/Fear Shocks (LAG2)



Notes: This figure reports orthogonalized impulse responses to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. All VARs feature a constant and are estimated with two lags. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

Different variables ordering.

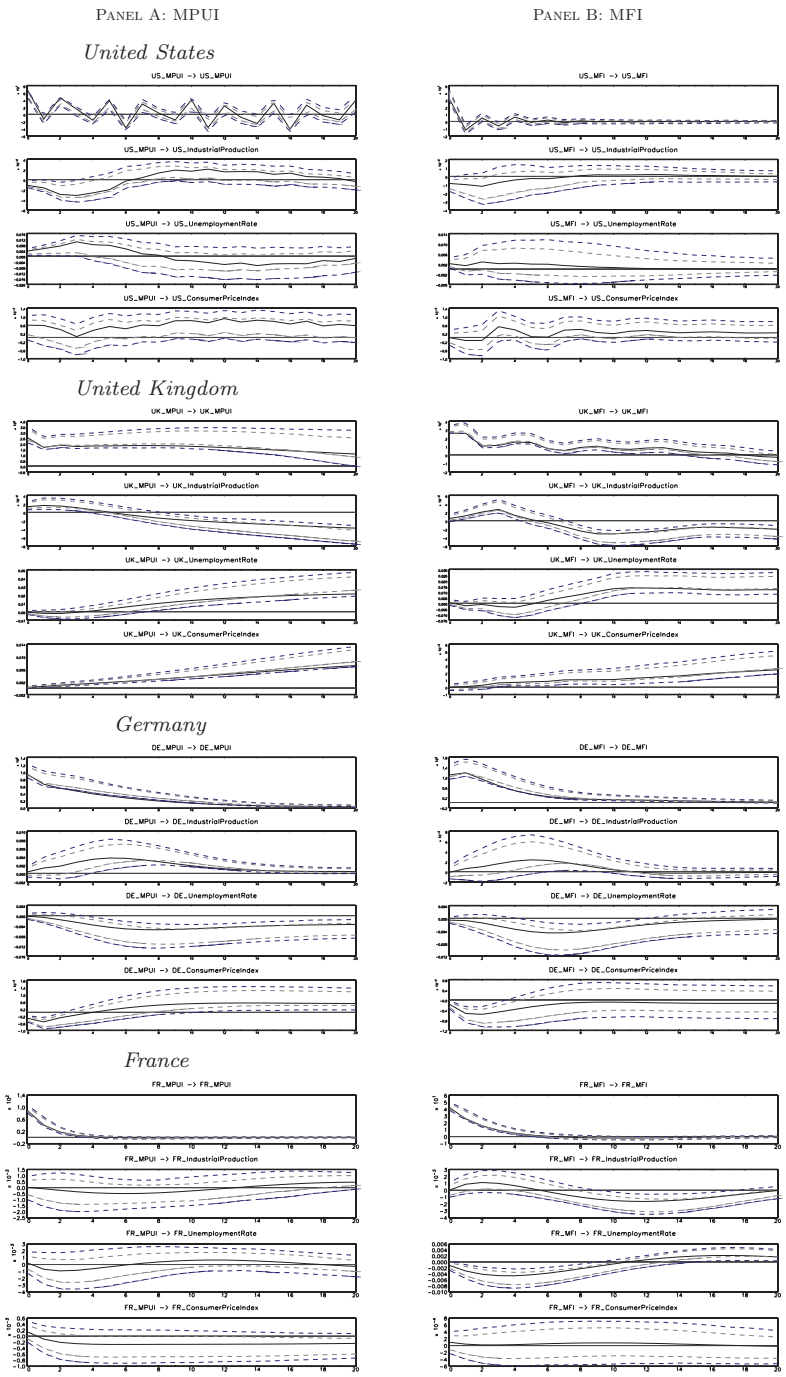
Figure A.1.3: Impulse Responses to Immigration-Related Uncertainty/Fear Shocks (LAST)



Notes: This figure reports orthogonalized impulse responses to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands.The news-based migration uncertainty index is ordered last in a Cholesky decomposition. VARs estimated with a constant. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

Post 9/11.

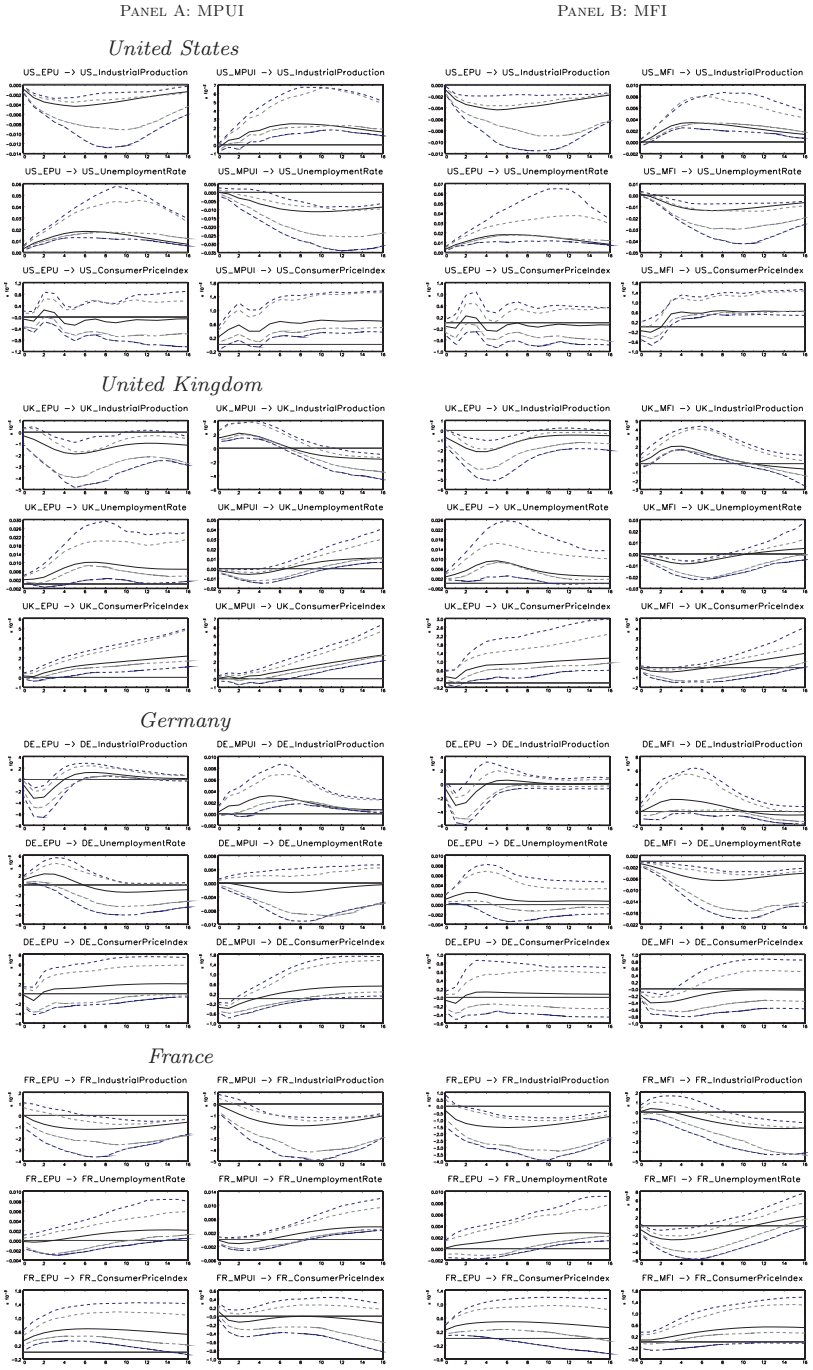
Figure A.1.4: Impulse Responses to Immigration-Related Uncertainty/Fear Shocks (post-9/11)



Notes: This figure reports orthogonalized impulse responses of to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. The horizontal axis identifies quarters. VARs estimated with a constant. Sample: 2002:Q1-2017Q4 (64 obs).

General uncertainty.

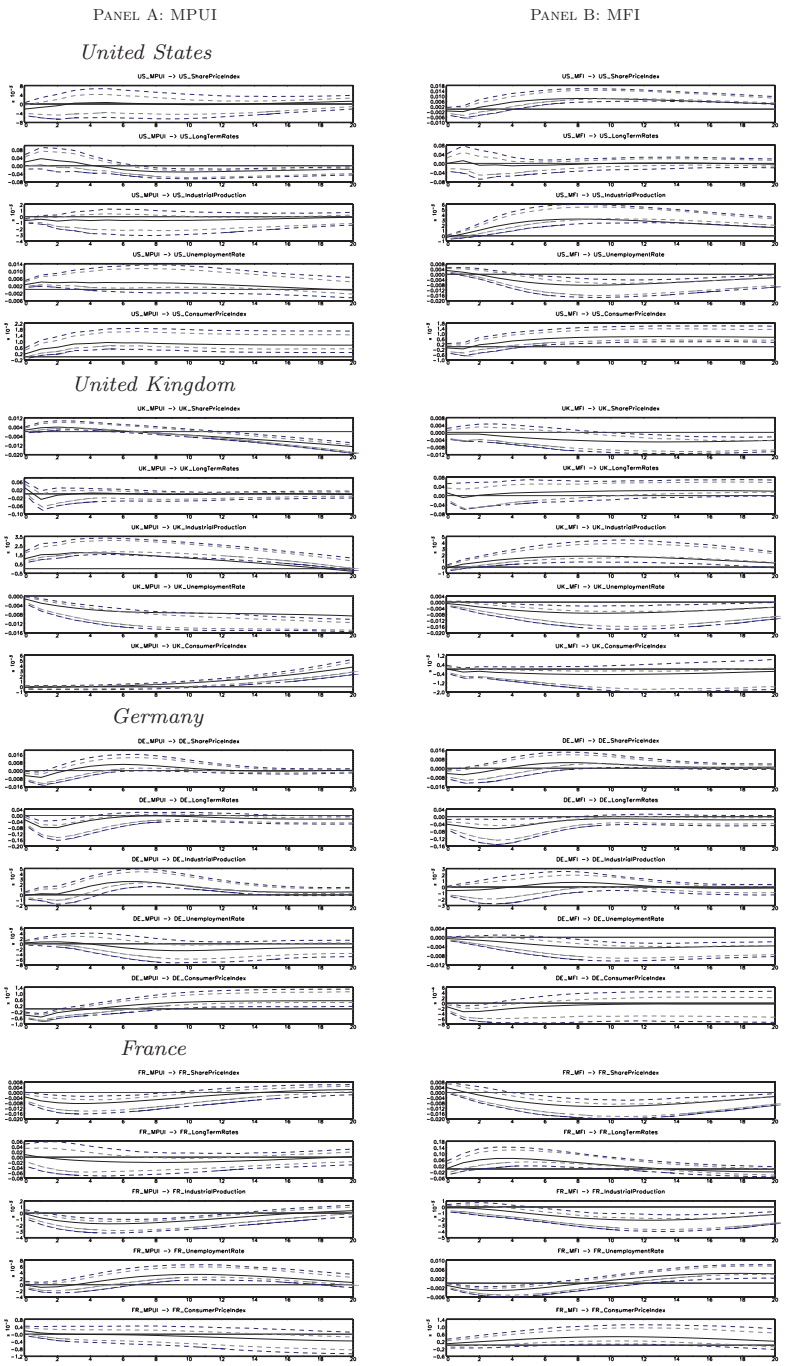
Figure A.1.5: Impulse Responses to Immigration-Related Uncertainty/Fear and EPU Shocks



Notes: This figure reports orthogonalized impulse responses to an EPU shock and to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. For each country, the (Baker et al., 2016) EPU is added to the original baseline vector and ordered first in a Cholesky decomposition (Panel A: $\mathbb{Y}_t = [EPU_t^j, MPUI_t^j, IP_t^j, UR_t^j, CPI_t^j]$; Panel B: $\mathbb{Y}_t = [EPU_t^j, MFI_t^j, IP_t^j, UR_t^j, CPI_t^j]$). VARs are stimated with a constant. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

Financial market dynamics.

Figure A.1.6: Impulse Responses to Immigration-Related Uncertainty/Fear Shocks (FIN)



Notes: This figure reports orthogonalized impulse responses of SPI, LTR, IP, UR and CPU to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. VARs estimated with a constant. The horizontal axis identifies quarters. Sample: 1990:Q1-2017Q4 (112 obs).

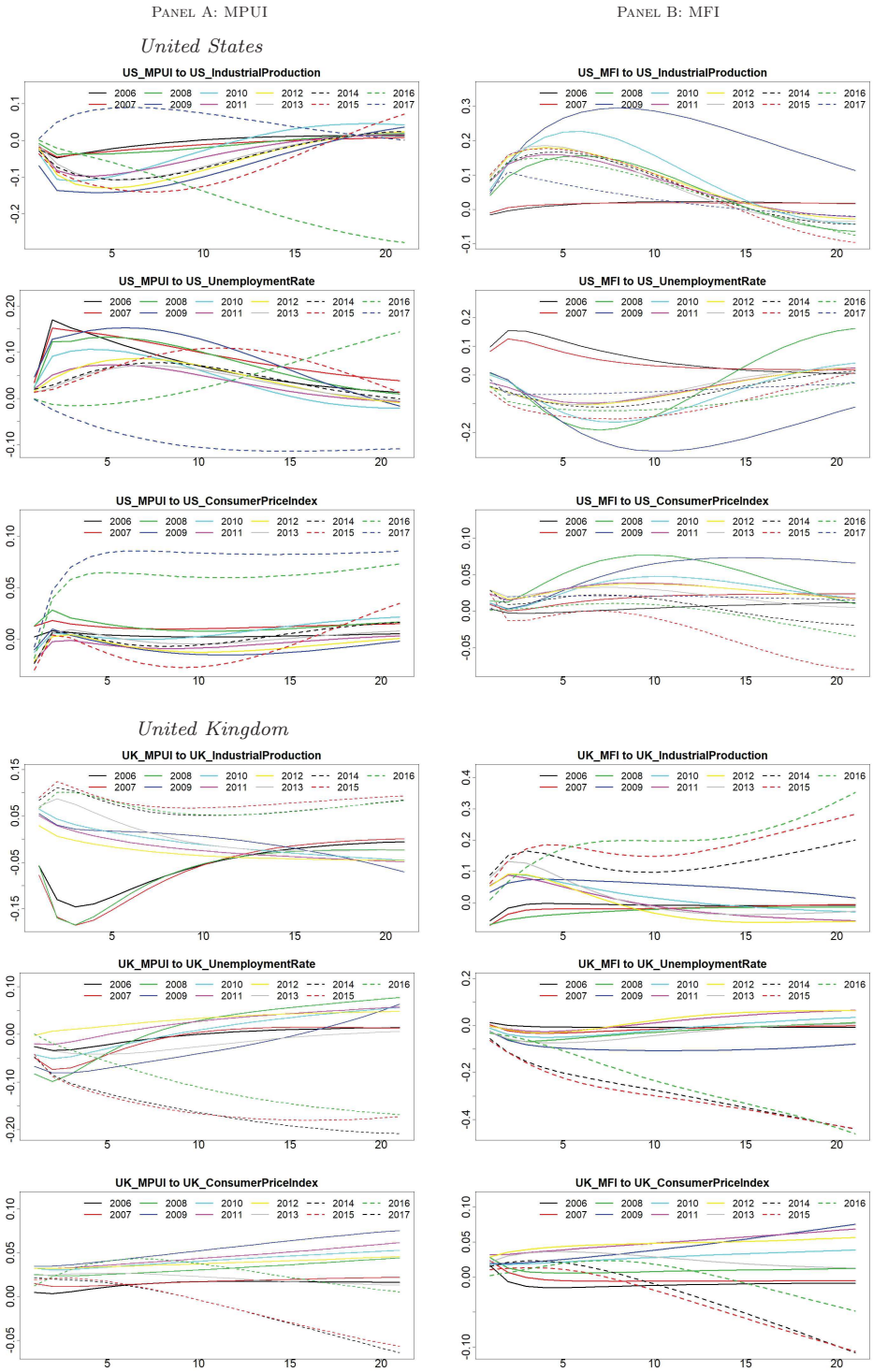
Table A.1.1: VAR Forecast Error Variance Decomposition: Model with Financial Market

PANEL A: Migration Policy Uncertainty Index							PANEL B: Migration Fear Index						
United States							*United States*						
shock/variable	$MPUI_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t	shock/variable	MFI_t	SPI_t	LTR_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.46	0.00	0.03	0.01	0.01	0.09	ϵ_{MFI_t}	0.51	0.07	0.00	0.11	0.04	0.05
United Kingdom							*United Kingdom*						
shock/variable	$MPUI_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t	shock/variable	MFI_t	SPI_t	LTR_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.90	0.05	0.00	0.08	0.10	0.07	ϵ_{MFI_t}	0.71	0.05	0.01	0.09	0.08	0.01
Germany							*Germany*						
shock/variable	$MPUI_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t	shock/variable	MFI_t	SPI_t	LTR_t	IP_t	UR_t	CPI_t
ϵ_{MFI_t}	0.76	0.03	0.05	0.08	0.02	0.05	ϵ_{MFI_t}	0.79	0.02	0.06	0.01	0.06	0.01
France							*France*						
shock/variable	$MPUI_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t	shock/variable	MFI_t	SPI_t	LTR_t	IP_t	UR_t	CPI_t
ϵ_{MPUI_t}	0.98	0.05	0.01	0.08	0.07	0.01	ϵ_{MFI_t}	0.98	0.11	0.04	0.13	0.07	0.04

Notes: This table reports the proportions of forecast error (at 4-year horizon) in share prices (SPI_t), long-term rates (LTR_t), industrial production (IP_t), unemployment rate (UR_t) and price level (CPI_t) accounted for by Migration Policy Uncertainty Index ($MPUI_t$, Panel A) and Migration Fear Index (MFI_t, Panel B). All figures reported in the Table refer to the model where the financial variables (i) share price index and (ii) long-term rates are added to the baseline vector and ordered before macro-aggregates. Sample: 1990:Q1-2017Q4

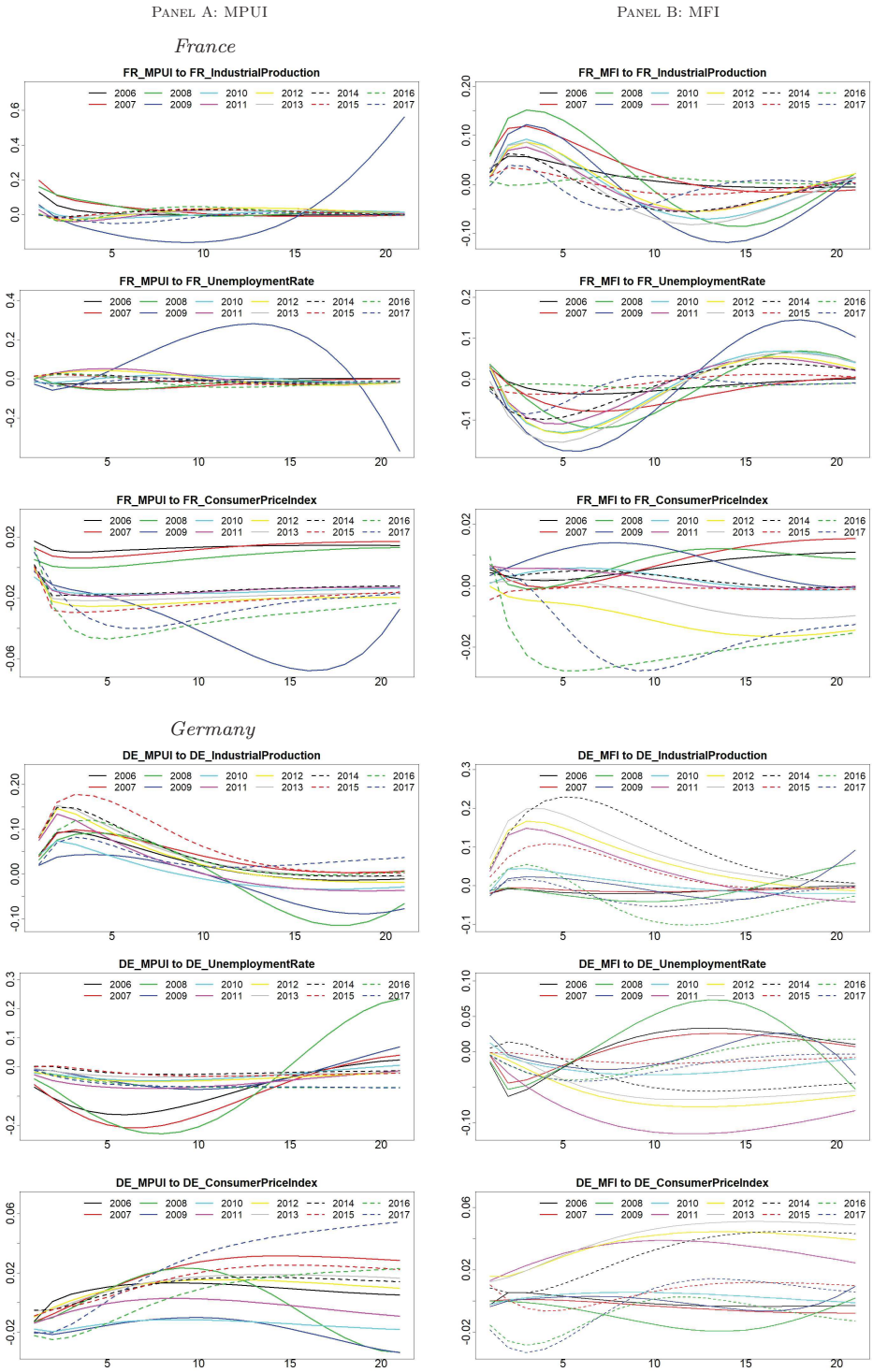
Dynamic impulse responses.

Figure A.1.7: Dynamic Impulse Responses to Immigration-Related Uncertainty/Fear Shocks



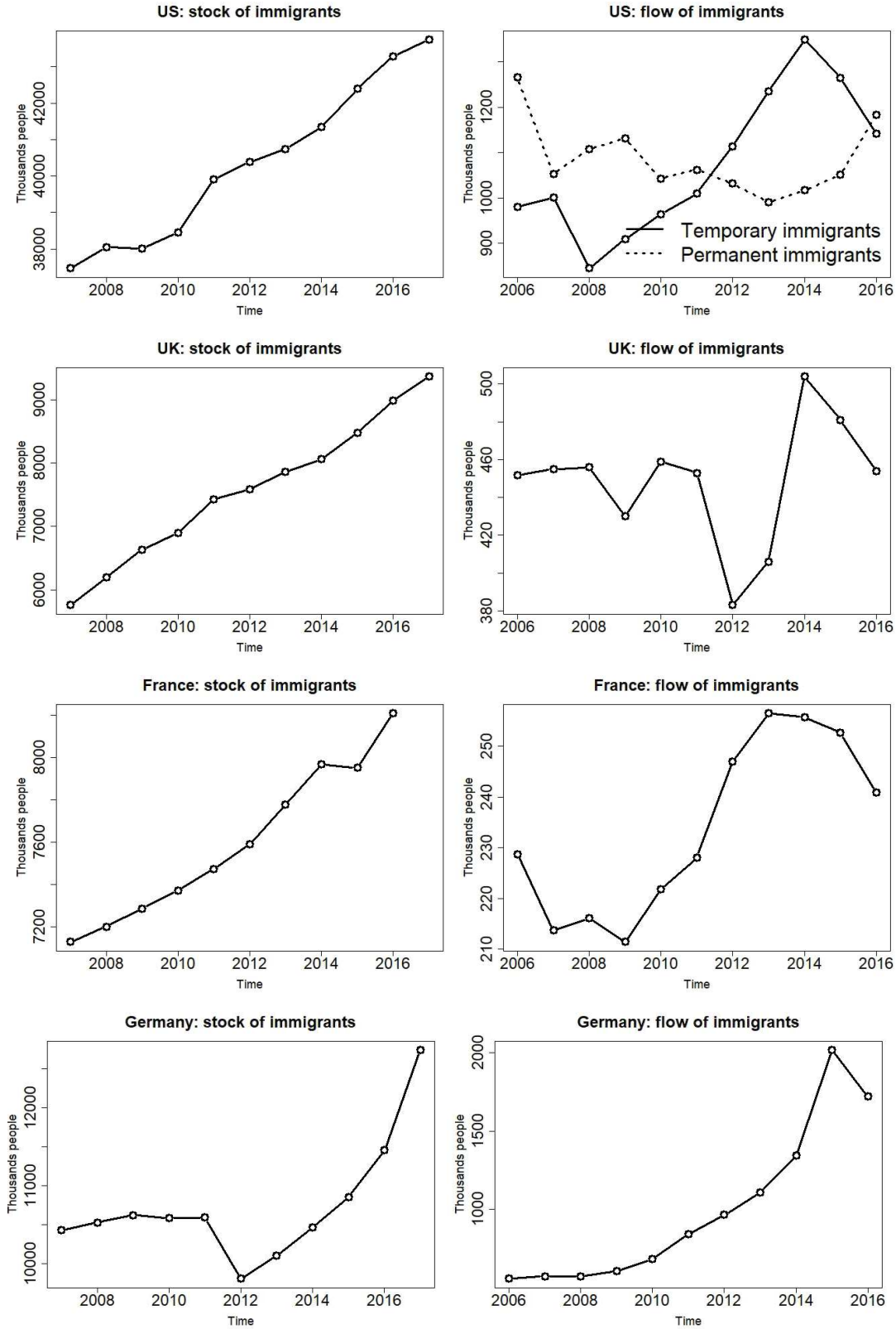
Notes: This figure reports dynamic orthogonalized impulse responses of IP, UR and CPI to a $MPUI$ (Panel A) and MFI (Panel B) shock for the US and UK. Impulse responses are computed using a rolling window of 40 quarters. Yearly responses – computed as averages of quarterly figures – for the period 2006-2017 are reported. All VARs are estimated with a constant. The horizontal axis identifies quarters.

Figure A.1.8: Dynamic Impulse Responses to Immigration-Related Uncertainty/Fear Shocks



Notes: This figure reports dynamic orthogonalized impulse responses of IP, UR and CPI to a $MPUI$ (Panel A) and MFI (Panel B) shock for France and Germany. Impulse responses are computed using a rolling window of 40 quarters. Yearly responses – computed as averages of quarterly figures – for the period 2006-2017 are reported. All VARs are estimated with a constant. The horizontal axis identifies quarters.

Figure A.1.9: Stock and flow of immigrants



Notes: This figure shows the evolution of the stock and flow of immigrants in the US, UK, France and Germany. *Source*: OECD Migration Outlook 2018.

Table A.1.2: Correlation: Dynamic Responses to news-based sentiment shocks vs. immigration stock/flow

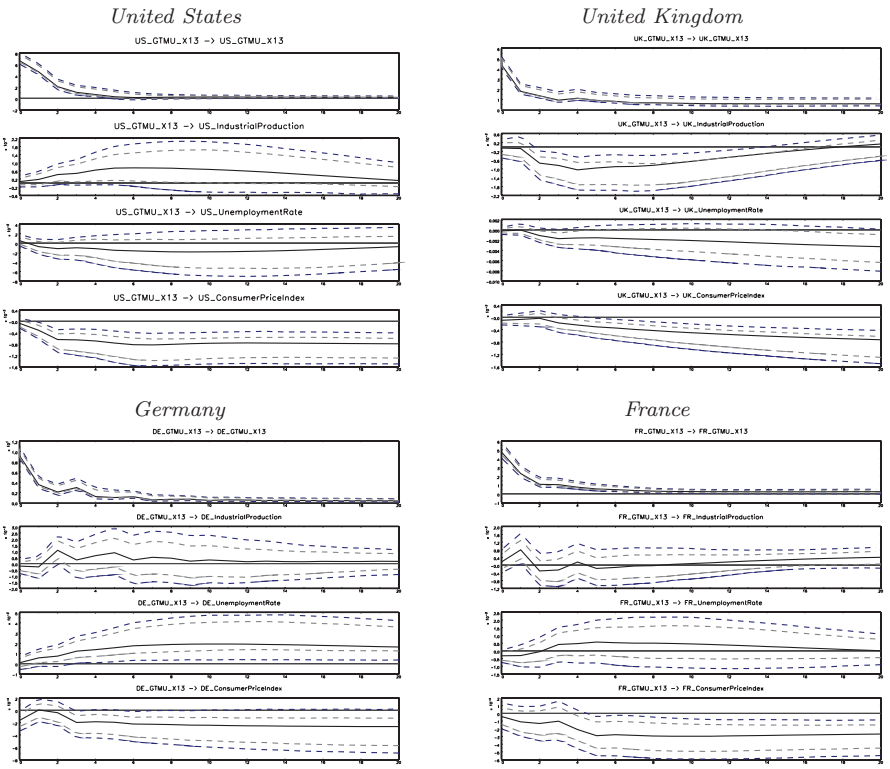
	Panel A: MPUI - Stock			Panel B: MPUI - Flow						Panel C: MFI - Stock			Panel D: MFI - Flow					
US																		
				Permanent Immigrants			Temporary Immigrants						Permanent Immigrants			Temporary Immigrants		
	IP	UR	CPI	IP	UR	CPI	IP	UR	CPI	IP	UR	CPI	IP	UR	CPI	IP	UR	CPI
1	0.602	-0.293	0.394	0.119	-0.088	0.109	0.003	0.078	-0.122	-0.272	0.217	-0.291	-0.262	0.248	-0.707	-0.114	0.167	0.403
	[2.263]	[-0.919]	[1.286]	[0.361]	[-0.266]	[0.328]	[0.008]	[0.234]	[-0.368]	[-0.847]	[0.667]	[-0.911]	[-0.815]	[0.767]	[-2.998]	[-0.343]	[0.508]	[1.319]
5	0.462	-0.201	0.376	0.364	-0.235	0.563	0.02	0.05	-0.403	-0.717	0.407	-0.11	-0.27	0.209	-0.459	-0.444	0.542	-0.435
	[1.563]	[-0.615]	[1.218]	[1.171]	[-0.725]	[2.046]	[0.061]	[0.15]	[-1.32]	[-3.083]	[1.337]	[-0.331]	[-0.842]	[0.64]	[-1.548]	[-1.487]	[1.934]	[-1.449]
10	0.117	-0.15	0.349	-0.2	-0.267	0.527	0.195	0.082	-0.365	-0.608	0.484	-0.202	-0.075	0.034	-0.307	-0.497	0.59	-0.574
	[0.353]	[-0.454]	[1.118]	[-0.612]	[-0.832]	[1.859]	[0.595]	[0.246]	[-1.175]	[-2.298]	[1.659]	[-0.62]	[-0.227]	[0.101]	[-0.968]	[-1.716]	[2.192]	[-2.105]
20	-0.402	0.351	0.316	-0.624	0.614	0.475	0.384	-0.226	-0.295	-0.265	0.292	-0.222	0.085	-0.306	-0.168	-0.05	-0.006	-0.257
	[-1.316]	[1.125]	[0.999]	[-2.394]	[2.335]	[1.621]	[1.249]	[-0.696]	[-0.928]	[-0.824]	[0.917]	[-0.683]	[0.256]	[-0.966]	[-0.511]	[-0.149]	[-0.018]	[-0.798]
UK																		
	IP	UR	CPI	IP	UR	CPI				IP	UR	CPI	IP	UR	CPI			
1	0.053	0.265	0.532	-0.016	-0.418	-0.354				-0.005	0.522	0.32	-0.138	-0.408	-0.349			
	[0.151]	[0.778]	[1.778]	[-0.048]	[-1.379]	[-1.134]				[-0.013]	[1.729]	[0.955]	[-0.419]	[-1.341]	[-1.116]			
5	-0.026	0.645	0.848	0.027	-0.646	-0.486				-0.183	0.59	0.504	0.177	-0.496	-0.551			
	[-0.075]	[2.385]	[4.531]	[0.082]	[-2.537]	[-1.666]				[-0.527]	[2.064]	[1.65]	[0.54]	[-1.712]	[-1.979]			
10	-0.283	0.541	0.874	0.353	-0.521	-0.547				-0.178	0.488	0.826	0.416	-0.534	-0.704			
	[-0.834]	[1.821]	[5.088]	[1.132]	[-1.83]	[-1.961]				[-0.513]	[1.581]	[4.143]	[1.373]	[-1.895]	[-2.977]			
20	-0.596	0.554	0.788	0.575	-0.51	-0.537				-0.354	0.456	0.764	0.472	-0.529	-0.641			
	[-2.098]	[1.881]	[3.616]	[2.108]	[-1.777]	[-1.909]				[-1.07]	[1.451]	[3.352]	[1.605]	[-1.87]	[-2.504]			
France																		
	IP	UR	CPI	IP	UR	CPI				IP	UR	CPI	IP	UR	CPI			
1	0.347	0.222	0.768	-0.129	0.345	0.168				0.412	-0.377	0.681	0.095	-0.158	-0.365			
	[1.047]	[0.643]	[3.388]	[-0.392]	[1.102]	[0.513]				[1.281]	[-1.151]	[2.63]	[0.287]	[-0.479]	[-1.175]			
5	0.438	-0.525	0.147	0.266	0.087	0.263				0.037	0.367	-0.366	-0.312	0.005	0.192			
	[1.379]	[-1.746]	[0.42]	[0.828]	[0.263]	[0.819]				[0.106]	[1.116]	[-1.112]	[-0.985]	[0.015]	[0.588]			
10	0.013	-0.42	0.258	0.275	-0.25	0.269				0.479	-0.146	-0.1	-0.402	0.417	-0.083			
	[0.037]	[-1.31]	[0.756]	[0.86]	[-0.773]	[0.839]				[1.545]	[-0.419]	[-0.285]	[-1.317]	[1.378]	[-0.25]			
20	-0.278	0.267	0.363	-0.384	0.474	0.155				-0.5	-0.281	0.223	0.447	-0.385	0.04			
	[-0.817]	[0.784]	[1.104]	[-1.248]	[1.614]	[0.472]				[-1.635]	[-0.827]	[0.646]	[1.499]	[-1.251]	[0.119]			
Germany																		
	IP	UR	CPI	IP	UR	CPI				IP	UR	CPI	IP	UR	CPI			
1	-0.859	-0.322	-0.754	-0.023	-0.244	0.099				-0.817	-0.075	-0.836	-0.29	-0.402	-0.142			
	[-5.033]	[-1.022]	[-3.44]	[-0.068]	[-0.755]	[0.299]				[-4.253]	[-0.225]	[-4.562]	[-0.908]	[-1.316]	[-0.431]			
5	-0.448	-0.398	-0.301	0.61	-0.239	0.293				-0.816	0.016	-0.749	-0.305	0.514	-0.555			
	[-1.504]	[-1.3]	[-0.947]	[2.308]	[-0.737]	[0.919]				[-4.237]	[0.047]	[-3.388]	[-0.962]	[1.796]	[-2.002]			
10	-0.238	-0.45	0.161	0.733	-0.185	0.469				-0.757	0.466	-0.684	-0.248	0.532	-0.497			
	[-0.734]	[-1.513]	[0.488]	[3.234]	[-0.566]	[1.594]				[-3.472]	[1.58]	[-2.812]	[-0.767]	[1.883]	[-1.718]			
20	0.049	0.098	0.139	0.364	-0.011	0.425				0.087	0.586	-0.726	-0.039	0.574	-0.428			
	[0.148]	[0.295]	[0.422]	[1.172]	[-0.034]	[1.409]				[0.261]	[2.172]	[-3.164]	[-0.117]	[2.105]	[-1.422]			

Notes: This table shows the correlation between the stock, or the flow, of immigrants in the country and the dynamic responses (at 1, 5, 10 and 20 quarters horizon) on selected macro variables to MPUI or MFI shocks. *t-statistics* are reported in square brackets. Sample: 2007-2017 for MPUI - Stock and MFI - Stock, except for France for which the period is 2007-2016; 2006-2016 for MPUI - Flow and MFI - Flow

A.2 Google Search-Based Immigration Uncertainty

Different lag-order.

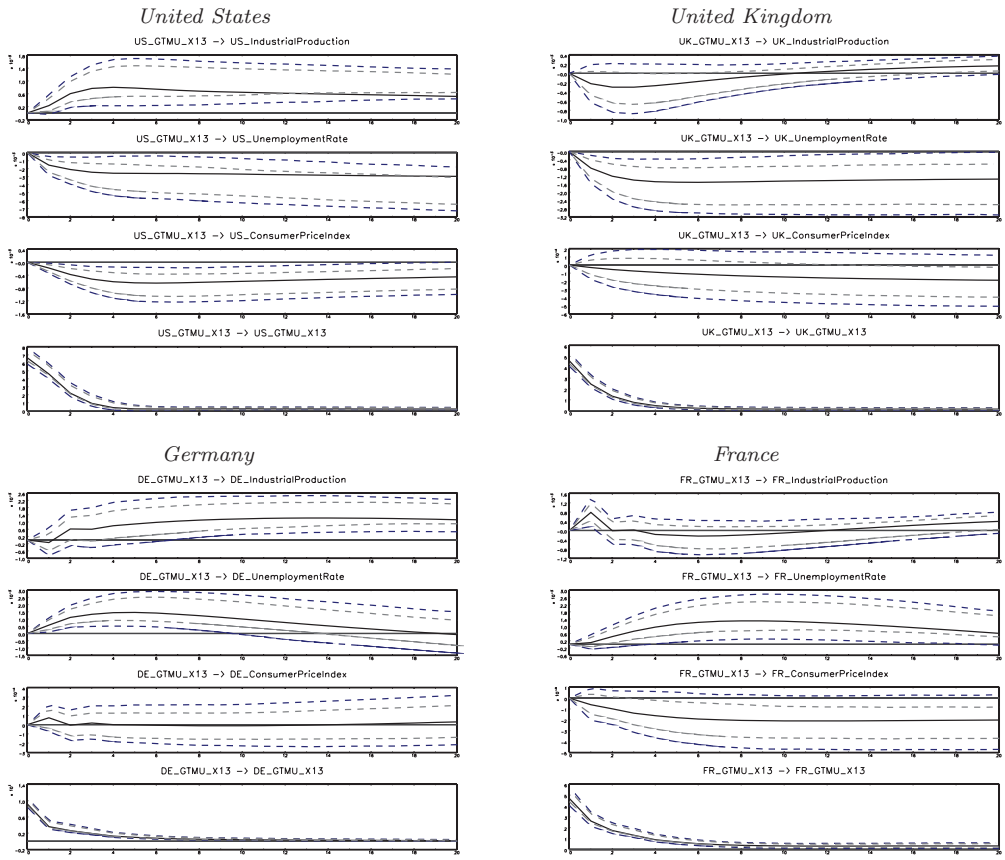
Figure A.2.1: Impulse Responses to "Google Search-Based Migration" Uncertainty Shocks (LAG4)



Notes: This figure reports orthogonalized impulse responses of SPI, LTR, IP, UR and CPU to a $GTMU$ shock for the US, UK, Germany and France. The $GTMU$ is based on Google searches for the term "immigration. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. All VARs feature a constant and are estimated with four lags. The horizontal axis identifies months. Sample: 2004:M1-2017:M12 (168 obs).

Different variables ordering.

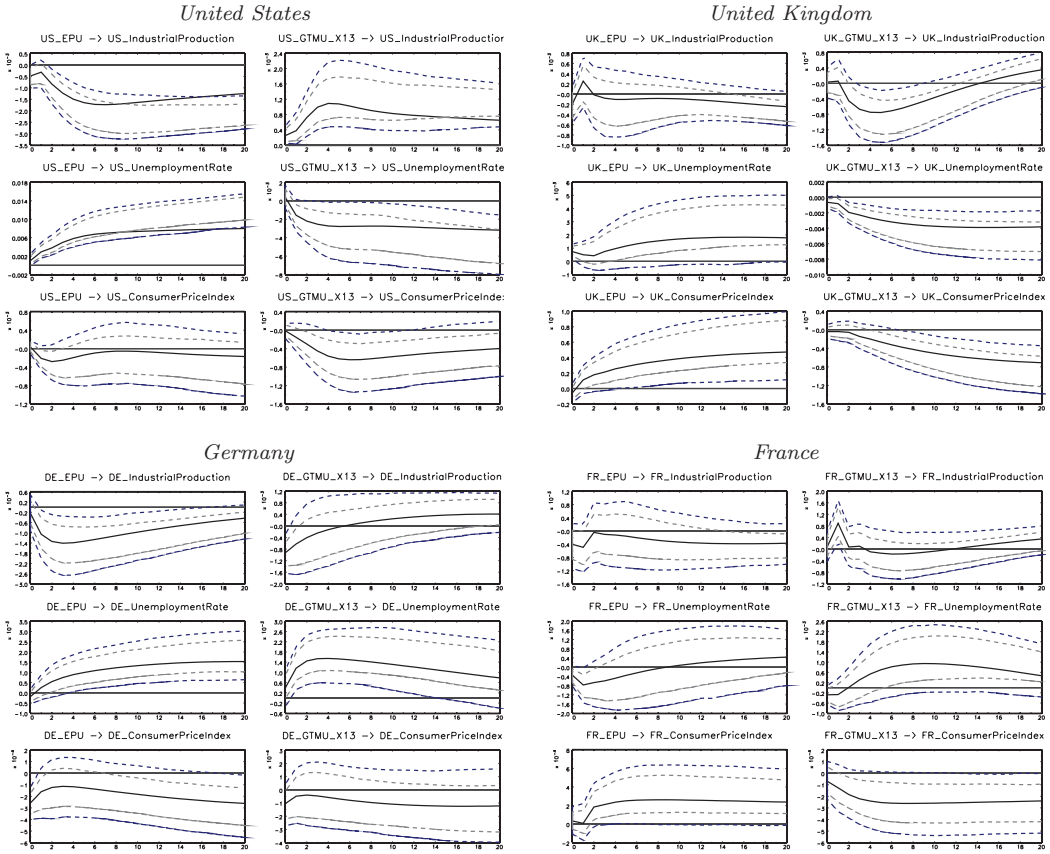
Figure A.2.2: Impulse Responses to "Google Search-Based Migration" Uncertainty Shocks (LAST)



Notes: This figure reports orthogonalized impulse responses of IP, UR and CPU to a $GTMU$ shock for the US, UK, Germany and France. The $GTMU$ is based on Google searches for the term "immigration. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. The $GTMU$ index – seasonally adjusted via the X-13ARIMA-SEATS Seasonal Adjustment Program – is ordered last in the VAR (i.e., $\mathbb{Y}_t = [IP_t^j, UR_t^j, CPI_t^j, GTMU_t^j]$). VARs estimated with a constant. The horizontal axis identifies months. Sample: 2004:M1-2017:M12 (168 obs).

General uncertainty.

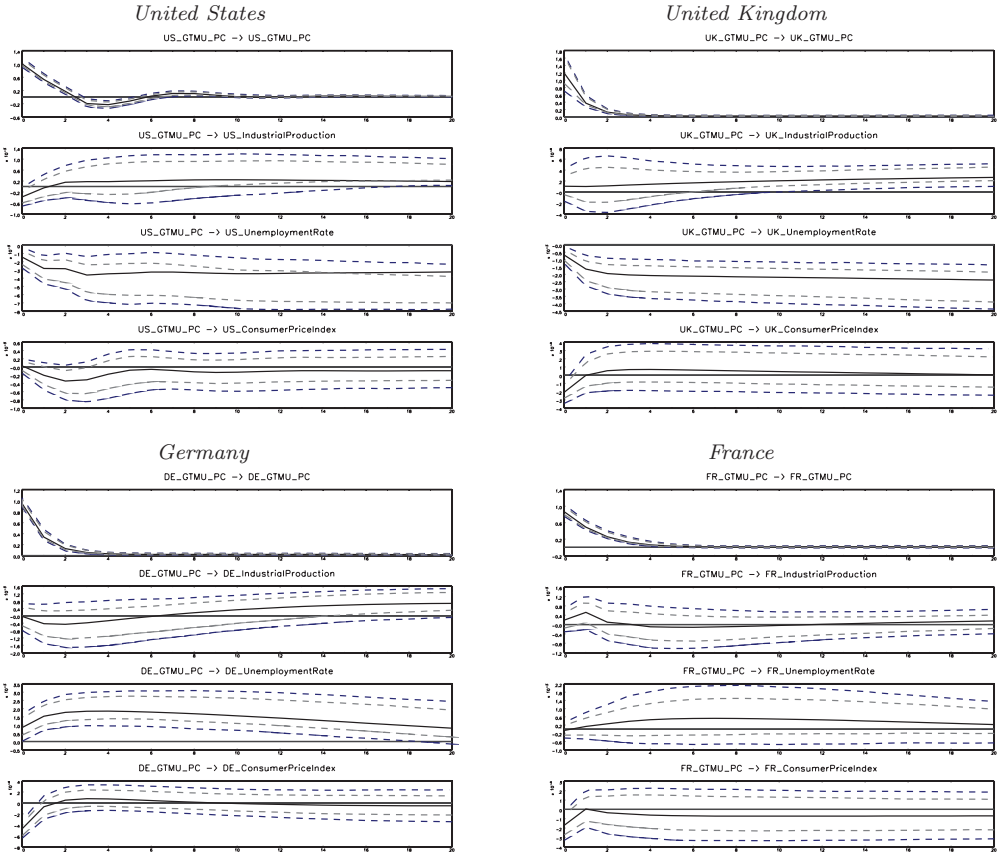
Figure A.2.3: Impulse Responses to "EPU" Shocks and "Google Search-Based Migration"



Notes: This figure reports orthogonalized impulse responses to an EPU and a $GTMU$ shock for the US, UK, Germany and France. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. For each country, the Baker et al. (2016) EPU is added to the original baseline vector and ordered first in a Cholesky decomposition (i.e., : $\mathbb{Y}_t = [EPU_j, GTMUI_t^j, IP_t^j, UR_t^j, CPI_t^j]$). VARs are estimated with a constant. The horizontal axis identifies months. Sample: 2004:M1-2017M12.

Aggregate GTMU.

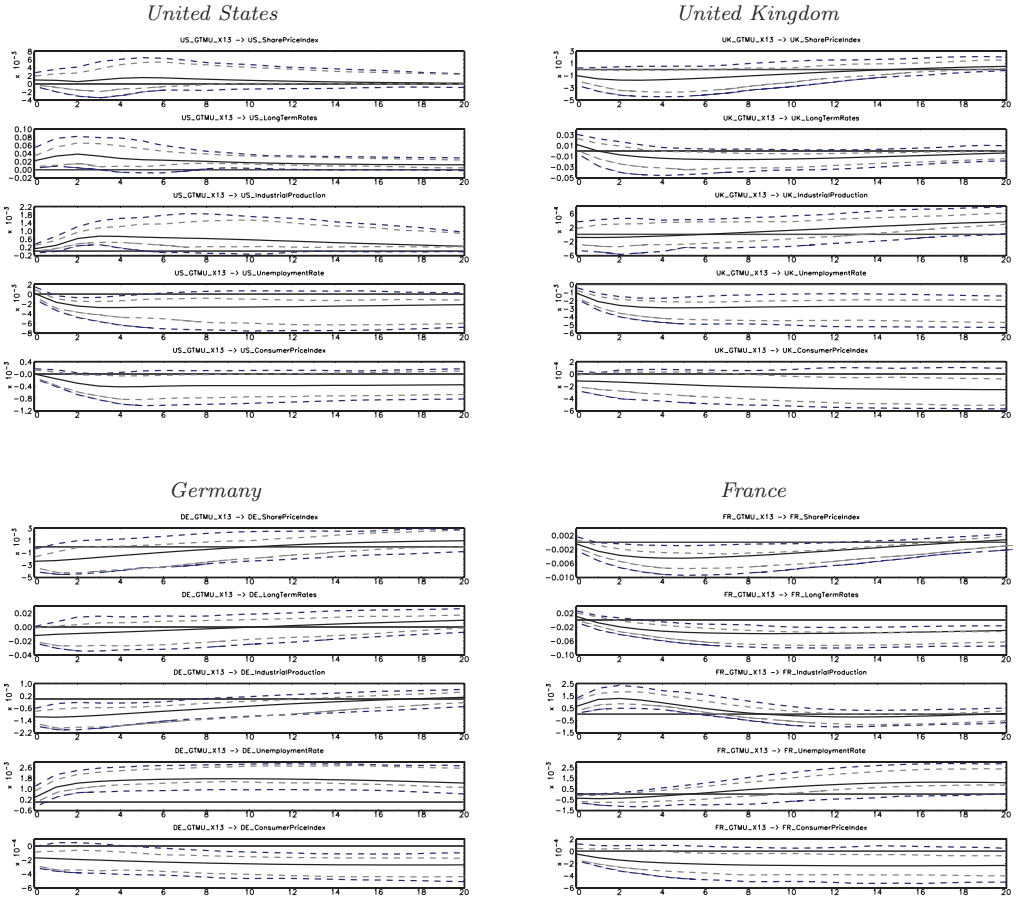
Figure A.2.4: Impulse Responses to a "Google Search-Based Migration" Uncertainty Shocks (PC)



Notes: This figure reports orthogonalized impulse responses of to a "$GTMU$ Aggregate Index" shock for the US, UK, Germany and France. "$GTMU$ Aggregate Index" (for each country) is represented by the first principal component extracted from four different migration-related Google trends. Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. The horizontal axis identifies months. VARs are stimated with a constant. Sample: 2004:M1-2017M12.

Financial market dynamics.

Figure A.2.5: Impulse Responses to Google Search-Based Immigration-Related Uncertainty Shocks (FIN)



Notes: This figure reports orthogonalized impulse responses of SPI, LTR, IP, UR and CPU to a $GTMU$ shock for the US, UK, Germany and France. The $GTMU$ is based on Google searches for the term "immigration. SPI_t and LTR_t are added to the baseline vector and ordered before macroeconomic quantities and prices (i.e., $\mathbb{Y}_t = [GTMU_t^j, SPI_t^j, LTR_t^j, IP_t^j, UR_t^j, CPI_t^j]$). Solid "black lines: estimated impulse responses. Dashed "blue lines: 90% bootstrapped confidence bands. Dashed "grey lines: 68% bootstrapped confidence bands. VARs are stimated with a constant. The horizontal axis identifies months. Sample: 2004:M1-2017:M12 (168 obs).

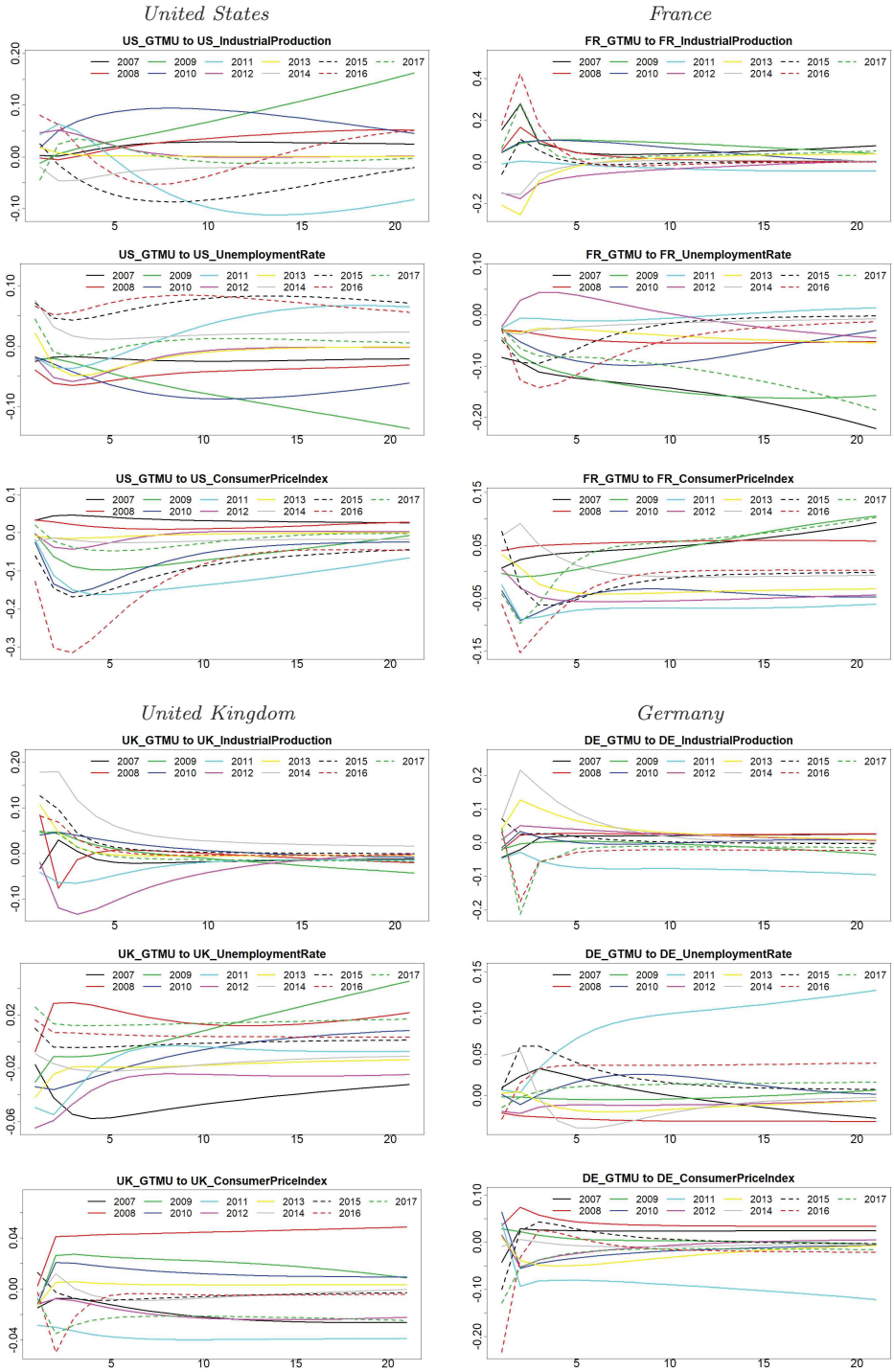
Table A.2.1: Forecast error variance decomposition

United States						
shock/variable	$GTMU_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.60	0.10	0.09	0.11	0.02	0.09
$\epsilon^{36}_{GTMU_t}$	0.53	0.10	0.09	0.11	0.02	0.09
United Kingdom						
shock/variable	$GTMU_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.77	0.01	0.01	0.01	0.08	0.02
$\epsilon^{36}_{GTMU_t}$	0.68	0.01	0.01	0.03	0.08	0.03
Germany						
shock/variable	$GTMU_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.74	0.01	0.00	0.02	0.07	0.05
$\epsilon^{36}_{GTMU_t}$	0.66	0.01	0.01	0.02	0.06	0.05
France						
shock/variable	$GTMU_t$	SPI_t	LTR_t	IP_t	UR_t	CPI_t
$\epsilon^{24}_{GTMU_t}$	0.65	0.05	0.07	0.03	0.03	0.03
$\epsilon^{36}_{GTMU_t}$	0.59	0.06	0.06	0.04	0.02	0.03

Notes: This table reports the proportions of forecast error (at 2Y and 3Y horizon) in share prices (SPI_t), long-term rates (LTR_t), industrial production (IP_t), unemployment rate (UR_t) and price level (CPI_t) accounted for by $GTMU$. All figures reported in the Table refer to the model where the financial variables (i) SPI_t and (ii) LTR_t are added to the baseline vector and ordered before macroeconomic quantities and prices (i.e., $\mathbb{Y}_t = [GTMU^j_t, SPI^j_t, LTR^j_t, IP^j_t, UR^j_t, CPI^j_t]$). Sample: 2004:M1-2017M12.

Dynamic impulse responses.

Figure A.2.6: Dynamics Impulse Responses to *GMTU* Shocks



Notes: This figure reports dynamic orthogonalized impulse responses of IP, UR and CPI to $GTMU$ shock for the US, UK, France and Germany. Impulse responses are computed using a rolling window of 36 months. Yearly responses – computed as averages of monthly figures – for the period 2006-2017 are reported. All VARs are estimated with a constant. The horizontal axis identifies quarters.

Table A.2.2: Correlation: Dynamic Responses to *GTMU* shocks vs. immigration stock/flow

	Panel A: GTMU - Stock			Panel B: GTMU - Flow					
	US								
				Permanent Immigrants			Temporary Immigrants		
	IP	UR	CPI	IP	UR	CPI	IP	UR	CPI
1	0.262	-0.043	-0.002	0.529	0.364	-0.75	-0.407	0.419	0.218
	[0.815]	[-0.129]	[-0.005]	[1.763]	[1.106]	[-3.206]	[-1.26]	[1.304]	[0.63]
5	-0.396	0.374	0.033	-0.372	0.63	-0.716	-0.319	0.127	0.512
	[-1.292]	[1.21]	[0.1]	[-1.134]	[2.297]	[-2.899]	[-0.951]	[0.363]	[1.688]
10	-0.48	0.518	0.075	-0.216	0.458	-0.482	-0.193	0.165	0.41
	[-1.641]	[1.818]	[0.225]	[-0.627]	[1.458]	[-1.555]	[-0.555]	[0.474]	[1.271]
20	-0.289	0.506	0.085	0.326	0.192	-0.41	-0.429	0.235	0.215
	[-0.907]	[1.76]	[0.257]	[0.977]	[0.555]	[-1.273]	[-1.342]	[0.683]	[0.622]
	UK								
	IP	UR	CPI	IP	UR	CPI			
1	-0.603	-0.201	-0.536	0.441	0.668	0.326			
	[-2.265]	[-0.614]	[-1.906]	[1.39]	[2.539]	[0.975]			
5	-0.46	0.344	-0.189	0.747	0.131	0.02			
	[-1.556]	[1.099]	[-0.577]	[3.18]	[0.373]	[0.056]			
10	-0.53	0.493	-0.19	0.785	0.144	0.092			
	[-1.874]	[1.7]	[-0.582]	[3.585]	[0.411]	[0.262]			
20	-0.623	0.401	-0.274	0.273	0.139	0.164			
	[-2.39]	[1.313]	[-0.854]	[0.803]	[0.398]	[0.47]			
	France								
	IP	UR	CPI	IP	UR	CPI			
1	0.373	-0.343	-0.009	-0.883	0.135	0.647			
	[1.138]	[-1.033]	[-0.026]	[-5.326]	[0.385]	[2.4]			
5	0.134	-0.454	0.637	-0.721	0.712	-0.119			
	[0.382]	[-1.441]	[2.338]	[-2.941]	[2.868]	[-0.338]			
10	0.143	-0.321	0.589	-0.383	0.568	-0.434			
	[0.409]	[-0.958]	[2.063]	[-1.172]	[1.953]	[-1.363]			
20	0.447	-0.332	0.498	0.043	0.255	-0.433			
	[1.412]	[-0.995]	[1.623]	[0.122]	[0.746]	[-1.36]			
	Germany								
	IP	UR	CPI	IP	UR	CPI			
1	-0.256	-0.311	-0.317	0.379	0.061	-0.56			
	[-0.796]	[-0.981]	[-1.004]	[1.157]	[0.174]	[-1.913]			
5	-0.54	0.256	0.223	0.01	0.31	0.643			
	[-1.927]	[0.793]	[0.688]	[0.028]	[0.923]	[2.372]			
10	-0.307	0.195	0.169	0.095	-0.033	0.432			
	[-0.968]	[0.595]	[0.514]	[0.27]	[-0.094]	[1.356]			
20	-0.119	0.069	0.009	0.201	-0.169	0.261			
	[-0.36]	[0.208]	[0.027]	[0.58]	[-0.486]	[0.765]			

Notes: This table shows the correlation between the stock/flow of immigrants (in each country) and the dynamic responses (at 1, 5, 10 and 20 months horizon) on selected macro variables to GTMU shocks. *t-statistics* are reported in square brackets. Sample: 2007-2017 for GTMU - Stock, except for France for which the period is 2007-2016; 2007-2016 for GTMU - Flow