ISSN 1791-3144

DEPARTMENT OF ECONOMICS

DISCUSSION PAPER SERIES

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Discussion Paper No. 04/2024

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UK Foreign Direct Investment in Uncertain Economic Times

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July 3, 2024

Abstract

This paper uses time-varying Bayesian models to assess the impact of the shifting, and progressively more volatile (especially since the EU Referendum vote in 2016) macroeconomic landscape on Foreign Direct Investment (FDI) inflows to the UK. FDI inflows are depressed in response to higher UK-specific economic and geopolitical uncertainty. A stronger real exchange rate and a higher interest rate also have a negative effect. It benefits from lower UK corporate tax rates and higher US uncertainty, the latter creating investment opportunities in the UK. Rising economic policy uncertainty since the EU Referendum, has led to FDI losses of up to 0.5% of GDP.

Keywords: Foreign Direct Investment, economic policy uncertainty, Brexit.
JEL Codes: C11; C32; F21; F23; F30.

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We thank two anonymous reviewers and Mark Spiegel (the editor) for their most insightful comments and suggestions on an earlier version of the paper. We also thank Michael Ellington (University of Liverpool), Nigel Driffield (Warwick Business School), Athanasios Tagkalakis (Bank of Greece and University of Patras), and conference participants at the Society for Nonlinear Dynamics and Econometrics (SNDE) Symposium in 2024 (organized by the University of Padova Italy), for very useful comments. Any remaining errors are our own.

1 Introduction

"Uncertainty is an uncomfortable position.
But certainty is an absurd one."

Voltaire

Governments around the world are keen to attract investments from foreign multinationals. This is not surprising. It has long been recognised that Foreign Direct Investment (FDI) inflows significantly contribute to the domestic (or host) economy. Mathew et al. (2021) note, for instance, that even though just 4% of local business units in the UK are foreign owned, they account for nearly 40% of UK turnover and, in addition, foreign firms account for between 12% and 21% of local business employment in all twelve regions of the UK.

The impact of FDI on the domestic (host) economy has received considerable academic attention over the years. Among other studies, Graham and Krugman (1993) and Girma et al. (2001) show that firms undertaking FDI tend to be more productive than domestic firms. The main argument is that firms pursuing FDI have to be more productive to overcome the sunk costs of entering a new market and facing the competition of domestic firms; in fact, FDI flows are long-term investments that are burdensome to reverse (International Monetary Fund, 1993). The higher productivity of foreign-owned firms compared to domestic firms is supported by the empirical findings of Girma et al. (2001) and Lipsey and Sjöholm (2004), among others. Batten and Jacobs (2017) find that foreign companies that invest in the UK are around 50% more productive than domestically owned ones. Batten and Jacobs (2017) suggest three reasons for their findings: foreign-owned companies invest more in R&D (they spend up to five times more on R&D than domestic firms); they have better management; and they collaborate with other organisations and promote the diffusion of ideas. In addition, FDI increases competition and consequently productivity by forcing domestic firms to increase their efficiency to remain competitive with their foreign competitors (see e.g., Blomström, 1986; Griffith et al., 2002). Last but not least, Haskel et al. (2007) show the existence of knowledge spillovers from foreign-owned companies in the UK to domestic ones.

The positive impact of FDI on the UK economy raises the important issue of what drives FDI inflows to the country. This is the main focus of our paper. In addressing this issue, we note that UK macroeconomic developments have been challenging not least after Brexit (Britain's exit from the European Union following the European Referendum in June 2016) and, more recently, the COVID-19 pandemic and Russia's invasion of Ukraine. In addressing the possible impact of Brexit on FDI decisions, the UK Trade Policy Observatory of Sussex University modelled, in 2018, a counterfactual Britain that had voted "Remain" and found that the "Leave" vote had reduced the number of foreign investment projects in the UK by 16% to 20%.[1] On the other hand, Warren Buffett, the American business magnate, declared in an interview with The Financial Times in 2019 that he was "ready to buy something in the UK tomorrow", therefore handing a big endorsement to Britain after the Brexit vote. McGrattan and Waddle (2020) relied on simulations from a multi-country model to argue that FDI inflows to the UK largely depended on how Britain's trade relationship with the EU would evolve over time.[2]

[1] The UK Trade Policy Observatory of Sussex University constructs a "synthetic" UK (i.e., the counterfactual) as a weighted average of other similar countries. It derives a series of weights for each country in the control group and applies them to the post-Brexit period to compute the counterfactual. The predictors of FDI used to compute the "synthetic" UK include, among others, GDP, population, trade openness, and corporate tax rates. The countries are Australia, France, Ireland, the Netherlands and the US.

[2] Broadbent et al. (2023), instead, rely on UK industry-level data to estimate that three years after the EU Referendum vote, total investment in the UK has fallen by 1.9% relative to the pre-Referendum trend. Noting that Japan is the fifth largest investor into the

Figure 1a looks at this issue in more detail by plotting area-specific inward FDI to the UK based on annual data between 1992 and 2021 (at the time of writing, in mid-2024, UK's Office for National Statistics had not updated the dataset beyond 2021). Inward FDI flows from Europe and Asia, in particular, reached a peak in 2016 (FDI flows from the Americas peaked in 2018). Notice also, from Figure 1b, that FDI inflows have been more volatile over the recent years based on ten-year rolling standard deviation measures.[3]

From a methodological point of view, this paper contributes to the literature by considering, in an empirical manner, the degree of importance of a number of explanatory variables for FDI inflows to the UK in the context of time-varying models. These models are flexible enough to capture non-linearities in economic and financial data (Granger, 2008). We model the impact of the shifting, and progressively more volatile, macroeconomic landscape on FDI decisions in the UK based on Bayesian time-varying parameter Vector AutoRegressive (TVP-VAR) models that allow for the impact of a number of macroeconomic/financial drivers of FDI decisions to change over time. Our models draw on elements of the earlier work of Chan et al. (2019) but also exploit new developments in Bayesian econometrics by considering the additional effects of higher dimensional data sets (see the discussion in Chan (2023b) and references therein). Time variation originates from the coefficients of the equations in the VAR models and the variance-covariance matrix of the shocks, the latter allowing us to analyse the dynamics of the contemporaneous relations among FDI and its drivers in the VAR.

Our benchmark model is a TVP-VAR setup where the percentage share of FDI inflows in nominal GDP is modelled as part of a fairly small information set including economic policy uncertainty, the ten-year interest rate and real exchange rate fluctuations. We employ a measure of uncertainty that relies, among others, on the work of Choi et al. (2023) who find cross-country evidence that economic and political uncertainty reduces capital (namely, bank credit, portfolio debt and equity) inflows in recipient countries. Our reliance on the potential impact of interest rate fluctuations on FDI decisions draws, for instance, on Auer (2019) who uses US and Canadian data to document that monetary policy tightening in the host country reduces FDI inflows; in addition, Kellard et al. (2022) note that higher interest rates in the host country make other destinations more attractive for FDI and find that higher sovereign yields in the Euro Area discourage FDI inflows there.

We also follow Froot and Stein (1991) who emphasise how changes in the real exchange rate affect the relative wealth levels of domestic and foreign investors which, in turn, impact on the actual relative purchasing power of investors. In Froot and Stein (1991), a real exchange rate depreciation favours foreign purchasers of domestic assets and higher FDI inflows. Alternatively, a real exchange rate depreciation leads to higher FDI inflows through the effect of currency movements on relative labour costs; in this case, FDI represents capital in search of relatively cheap labour (Klein and Rosengren, 1994). We also note the work of Driffield and Karoglou (2019) who rely, instead, on the nominal exchange rate to find that when macroeconomic volatility is low, FDI inflows to the UK respond positively to sterling's nominal appreciation. Driffield and Karoglou (2019) also find some statistical (albeit weak) evidence that sterling's appreciation deters FDI inflows in periods of high macroeconomic volatility.[4]

UK, Cieślik and Ryan (2022) use sectoral FDI data to find a statistically significant relationship between the Brexit announcement (proxied by a dummy variable taking the value of one from 2016 onwards) and decreased FDI from Japan in the UK.

[3] From Figure 1a, FDI inflows can be negative. This relates to a number of reasons such as disinvestment in assets or reinvested earnings that are negative. This issue is discussed by the Organisation for Economic Cooperation and Development (OECD) in its April 2023 report on FDI.

[4] The work of Driffield and Karoglou (2019) does not account for a specific time-series measure of volatility. Rather, macroeconomic volatility is inferred by their Markov regime-switching Vector AutoRegressive model. In a three-variable model of economic policy uncertainty, net inflows of FDI (% of GDP), and total imports and exports (% of GDP), An et al. (2023) rely on a fairly short quarterly sample between 2006 and 2021 to find that FDI in the UK reacts negatively and strongly to economic policy uncertainty in 2021, that is, immediately after the end of the transition agreement between the UK and the EU.

We then consider the role of corporate tax policy (namely the spread between the UK corporate tax rate and world corporate tax rates) as well as the role of geopolitical risk. Noting that the UK is an open economy that is highly integrated into the global trade and financial systems (see e.g., Cesa-Bianchi et al., 2021), we then enhance our benchmark information set to include additional variables, namely international economic policy uncertainty (proxied by either US economic policy uncertainty or economic uncertainty in the Organization for Economic Cooperation and Development (OECD) countries), the international business cycle (proxied by either US GDP growth or OECD GDP growth), and the infectious disease (pandemic) volatility tracker. These are employed since the world environment could affect the UK economy and could therefore play a part in decisions made by international investors to invest in the UK. We estimate large(r) Bayesian models on our enhanced information set (of domestic and international variables) due to the advantage of such models in producing credible impulse responses (impulse responses that have the expected economic sign) and delivering better forecasting performance (Bańbura et al., 2010). More specifically, we adopt, in our extended dataset, the high(er)-dimensional hybrid TVP-VAR models of Chan (2023b) that rely on Bayesian shrinkage and sparsification methods to automatically decide, for each equation, whether the VAR coefficients are time-varying or not and whether the parameters of the contemporaneous relations among variables are time-varying or not, at the same time while retaining stochastic volatility features in each equation of the VAR.

We provide a number of key findings. First, FDI responds negatively to an increase in UK economic policy uncertainty (and alternative UK-specific economic and geopolitical uncertainty measures) as well as an increase in the 10-year interest rate and a real exchange rate appreciation. Higher interest rates would be associated with higher inflation, lower growth and would question political and economic stability. Therefore, higher interest rates impact adversely on FDI inflows. In addition, the negative impact of a stronger real exchange rate on FDI offers support to the argument of Froot and Stein (1991) that currency movements on relative wealth across countries alter the relative wealth of firms across countries and therefore impact on their FDI decisions; in this setup, a real appreciation of the exchange rate discourages foreign purchasers of domestic assets and depresses inward FDI. At the same time, the negative impact of a real exchange rate appreciation on FDI inflows offers support to the cost-channel effect of Klein and Rosengren (1994) noted above. Our second finding is that the impact of all economic policy uncertainty, interest rate and real exchange rate shocks on FDI has increased since early 2000. Third, corporate tax policy can, to some extent, mitigate the negative impact of UK-specific economic and geopolitical uncertainty on FDI since lower corporate tax rates in the UK relative to the rest of the world have the potential of strengthening FDI inflows to the UK. Fourth, our counterfactual analysis suggests that post EU Referendum uncertainty has impacted negatively on FDI inflows by as much as 0.5% of nominal GDP which is considerable since, historically, the average share of FDI inflows in UK nominal GDP has been 2.1%. Finally, higher US uncertainty (and uncertainty in the OECD countries excluding the UK), which creates additional investment opportunities elsewhere, benefits FDI inflows to the UK.

The structure of the paper is as follows. Section 2 discusses the dataset and Section 3 presents the empirical methodology. Section 4 reports and discusses our findings. Section 5 reports robustness tests and extensions to our empirical model. Section 6 summarises our findings and discusses policy implications. It also offers some ideas for further research in the area.

2 Dataset

We retrieve UK FDI inflows, covering the period from 1963Q1 to 2013Q4, from the Federal Reserve Bank of St. Louis database (FRED). We extend the FDI inflows up to 2023Q3 based on quarterly data from the OECD.[5]

In addition to FDI data, we employ UK data on Economic Policy Uncertainty (EPU). The EPU index follows the seminal work of Baker et al. (2016) and gauges the number of news articles in UK newspapers containing the terms "uncertain" or "uncertainty", "economic" or "economy", as well as policy relevant terms, that is, "policy", "tax", "spending", "regulation", "Bank of England", "budget", and "deficit".[6] In addition, the nominal Gross Domestic Product (GDP) and the ten-year UK interest rate are employed (from the ONS database and the Bank of England historical database). We also use the four-quarter sterling real effective exchange rate growth (this takes into account both nominal exchange rate developments and the inflation differential vis-à-vis trade partners; an increase indicates an appreciation of sterling) available from the Bank of International Settlements (BIS)[7] website. The geopolitical risk indicator for the UK is obtained from the website of Matteo Iacoviello. The latter is the product of an algorithm that computes the share of articles mentioning adverse geopolitical events in UK newspapers. As Caldara and Iacoviello (2022) note, geopolitical risk refers to "the threat, realisation, and escalation of adverse events associated with wars, terrorism, and any tensions among states and political factors that affect the peaceful course of international relations".

In alternative models, we use the spread between the UK corporate tax rate and the average OECD corporate tax rate available from the OECD database (these are annual data from 2002 onwards; we extend the data back to 1981 based on the taxfoundation.org database). We also use an alternative measure of economic and policy uncertainty, namely the World Uncertainty Index for the UK discussed by Ahir et al. (2022). The index reflects the frequencies of the words "uncertainty", "uncertain" and "uncertainties" in the quarterly Economist Intelligence Unit country reports. We employ this index since Ahir et al. (2022) find that their measure -while correlated with EPU- is more country-specific and less global in nature than the EPU one.

In addition, we use data on four-quarter real US GDP growth (available from the FRED database) and four-quarter real OECD growth (available from the OECD database) as proxies for world GDP growth. We also employ the US Economic Policy Uncertainty index (available from the Economic Policy Uncertainty website).[8] In addition, we use the world uncertainty indices for OECD countries, namely the ones discussed by Ahir et al. (2022). Finally, the infectious disease equity market volatility tracker is also considered. This tracker, available from 1985 onwards, is based on approximately 3000 US newspaper articles that contain economic terms (such as "economy" and "financial"), stock market terms (such as "stock market" and "equity"), volatility terms (such as "uncertainty" and "risk"), and infectious disease terms (such as "epidemic", "pandemic", "virus", "flu", "coronavirus", "MERS" and "SARS").

Figure 2 plots the data used in our benchmark model. More specifically, we plot four-quarter eco-

[5] The FDI data obtained from FRED are in millions of £. The FDI data obtained from OECD are in millions of $; these are transformed into £ using the $/£ exchange rate from the Bank of England's historical database.

[6] The Economic Policy Uncertainty website contains two separate EPU measures for the UK. The first EPU measure is a historical index from 1900 to 2008. The second EPU measure is from 1998 onwards. We splice the two EPU measures by regressing the first (historical) index on the second one over the common sample 1998Q1-2008Q4 and then update the historical one forward using the fitted values of the estimated equation.

[7] The Eurozone enters with the highest trade weight of 62.2% in BIS's sterling real effective exchange rate followed by the US with a trade weight of 16.6%.

[8] For the US, we combine the historical EPU index (available from 1900 to 2014) with the second EPU measure (available from 1985 onwards). We splice the two US EPU indices by regressing the first (historical) index on the second one over the common sample 1985Q1-2014Q4 and then update the historical one forward using the fitted values of the estimated equation.

nomic policy uncertainty growth (EPU), the four-quarter difference of the ten-year interest rate (10-year rate), the four-quarter real effective exchange rate growth (RER) and the percentage share of Foreign Direct Investment inflows in nominal GDP. In what follows, and for simplicity, the latter variable is denoted by FDI. The FDI series became particularly volatile after the second quarter of 2013. In particular, the standard deviation of the FDI series in the period after the EU referendum increased by 74%. All data used for robustness reasons in alternative models are plotted in Figure A1 in the Appendix.

3 Methodology

The TVP-VAR(p) model is written in reduced form as:

$$y_t = b_t + \sum_{i=1}^{p} B_{i,t} y_{t-i} + u_t, \tag{1}$$

where b_t and $B_{i,t}$ are $n \times 1$ and $n \times n$ matrices of time-varying coefficients and $u_t \sim N(0, \Sigma_t)$. We can rewrite equation (1) in block form as:

$$y_t = X_t \beta_t + u_t, \tag{2}$$

where $X_t = I_n \bigotimes [1, y_{t-1}, \ldots, y_{t-p}]$ and $\beta_t = \text{vec}([b_t, B_{1,t}, \ldots, B_{p,t}])'$.[9] Furthermore, we assume that β_t follows an independent random walk:

$$\beta_t = \beta_{t-1} + u_t, \quad u_t \sim N(0, Q), \tag{3}$$

where β_0 is treated as an unknown parameter and Q is a diagonal matrix with q_i denoting the elements in the main diagonal.

Following, Chan et al. (2019), we decompose the variance-covariance matrix Σ_t as $\Sigma_t = A' D_t^{-1} A$ where A is a lower unitriangular matrix and D_t is a diagonal matrix with non-zero elements $h_{i,t}$, which are modelled as:

$$log(h_t) = log(h_{t-1}) + u_t^h, \quad u_t^h \sim N(0, s_{h,i}^2), \tag{4}$$

where h_0 is treated as an unknown parameter.

The model is estimated over the 1963Q1-2023Q3 period using $p = 4$ lags based on the Akaike information criterion. To estimate the model, we use the Gibbs sampling algorithms proposed by Chan et al. (2019).[10] The blocks of the Gibbs sampling algorithm build on the earlier work of Primiceri (2005). First, we run a burn-in sample of 50,000 iterations which is discarded. Next, we build the posterior distributions from a sample of 50,000 draws. The selection of prior distributions takes the form:

$$\begin{aligned} \beta_0 &\sim N(0, 1) \\ q_i &\sim IG(3, 0.001) \\ \alpha &\sim N(0, 0.01) \\ h_{i,j}^2 &\sim IG(1, 1) \\ h_0 &\sim N(0.01, 0.05) \end{aligned}$$

[9] I_n denotes the $n \times n$ unit matrix, $\bigotimes$ denotes the Kronecker product and vec the column-wise vectorisation of a matrix.
[10] The TVP-VAR is estimated in R using the package bvartools.

where $N(\mu, \sigma)$ denotes the Normal distribution with mean μ and standard deviation σ and $IG(\alpha, \beta)$ is the inverse Gamma distribution with shape and scale parameters α and β, respectively.

4 Empirical results

For our benchmark model in this paper, the y_t vector of $n = 4$ endogenous variables takes the following form: y_t = [EPU, 10-year rate, RER, FDI]′. To set the stage, and before discussing the results of the TVP-VAR(p) model, we begin by estimating a time-invariant (Bayesian) VAR(p) model over the whole sample 1963Q1-2023Q3 using $p = 4$ lags based on the Akaike information criterion.[11] For the time-invariant VAR model, we consider the hierarchical Minnesota priors as in Giannone et al. (2015) and the posterior sample is obtained using the Metropolis-Hastings algorithm (we retain the same number of burn-in and posterior draws as in the TVP-VAR model).[12]

Figure 3 reports impulse responses of the time-invariant VAR(p) model. We use the Cholesky identification scheme where, as the ordering of the variables in the y_t vector suggests, EPU is the least endogenous variable, and FDI, our main variable of interest, is the most endogenous one and responding contemporaneously to all remaining variables (we return to this issue in Section 5.1 below).

From Figure 3, the median response to one-standard-deviation shocks over a horizon of 16 quarters suggests that shocks to EPU, the 10-year interest rate and RER affect negatively FDI. The contemporaneous effects of EPU and the 10-year interest rate are both statistically insignificant and the corresponding peak effects, occurring after one quarter are -0.2 and -0.6, respectively. While the impact of EPU on FDI is statistically insignificant over the entire impulse horizon, the statistical impact of the 10-year interest rate on FDI persists for up to 14 quarters. A real effective exchange rate shock yields a substantial decrease in FDI on impact (this is approximately equal to -0.3) but its effect fades out after one quarter. The negative, yet insignificant, impact of EPU on FDI is consistent with the argument that rising economic uncertainty in the recipient country impacts negatively on capital inflows in that country; see e.g. Choi et al. (2023) and references therein. Higher interest rates raise financing costs and reduce FDI inflows; a finding also empirically confirmed by Kellard et al. (2022).[13]

What about the negative impact of RER on FDI? Currency movements on relative wealth across countries affect FDI by altering the relative wealth of firms across countries. Consequently, a real appreciation of the exchange rate discourages foreign purchasers of domestic assets and depresses inward FDI (see Froot and Stein, 1991). Alternatively, FDI represents capital in search of relatively cheap labour (Klein and Rosengren, 1994). Consequently, higher relative labour costs in the recipient country impact negatively FDI inflows to that country.

Having discussed the results of the time-invariant VAR model, we proceed by estimating the TVP-VAR model, where, again, y_t = [EPU, 10-year rate, RER, FDI]′, therefore assuming the same Cholesky ordering as in the time-invariant VAR model. Figure 4 plots the median contemporaneous response of FDI to one-standard-deviation shocks to the other variables in the TVP-VAR. The time-varying model

[11] Effective estimation is over the 1965Q1-2023Q3 period since we use four-quarter growth rates for EPU and RER, the four-quarter difference of the 10-year rate and a lag length of 4 in our empirical model.

[12] Domestic economic policy uncertainty drives domestic real exchange rate depreciations (see e.g. Nilavongse et al., 2020) and could raise the cost of domestic financing, by affecting lenders' perceptions of risk (see e.g. Keynes, 2024).

[13] In alternative models, we also use the four-quarter difference of the spread between the 10-year rate and a measure of the 10-year global rate as a proxy of sovereign risk. In this context, rising sovereign risk reduces FDI inflows; see e.g. the discussion in Kellard et al. (2022) and references therein. The 10-year global rate is proxied by a weighted average of the 10-year US, Canadian, Eurozone, and Japanese yields. We use weights of 48%, 4%, 36%, and 12% on the US, Canadian, Eurozone and Japanese yields, respectively based on each one's individual GDP (PPP, constant, international 2017 prices) as a share of their total GDP. Results available on request are qualitatively similar to what we report using the 10-year rate.

allows us to examine the effect of shocks occurring throughout our sample. Along with the median response (solid line), we plot the 68% credible interval (dashed lines), that is, the responses obtained using the 68% of the posterior sample which provide a clearer view regarding the location of the parameter values. In all cases, we observe a mild response of FDI before 1995 (EPU exerts a somewhat stronger impact during 1984Q2-1984Q4, arguably related to the miners' strike throughout 1984 and up to early 1985, that is, the biggest industrial dispute in post-war Britain). The response of FDI is stronger to all shocks occurring from around 2000 onwards and particularly to shocks during 2000Q3 and 2005Q3 when the UK economy was expanding fast (in the early 2000s, annual UK growth was particularly strong, reaching 5.0% in 2000 and then somewhat slowing down to 3.6% in 2005).[14]

FDI also starts responding strongly to all shocks from early 2013 onwards. This rising strong impact on FDI could arguably relate to David Cameron's Bloomberg speech. In January 2013, David Cameron (prime minister at that time) announced his government's intention for an EU Referendum within the next four years. Arguably then, and following Cameron's speech, international investors started paying closer attention to the UK economic performance to make FDI decisions not least because they were also worried about the results of the Scottish Independence Referendum (the latter took place in September 2014 and the Scottish electorate rejected Independence).

The median responses of the TVP-VAR in Figure 4 also suggest a contemporaneous peak effect of approximately -0.5 from EPU on FDI; a peak effect of -0.3 from the 10-year rate on FDI, and a peak effect of -0.4 from RER on FDI. All three contemporaneous effects are statistically significant in contrast to the time-invariant VAR where only the 10-year interest rate had a statistically significant contemporaneous effect. At the same time, the peak effects of the TVP-VAR, with the exception, again, of the 10-year interest rate, are higher than those recorded by the time-invariant VAR. These results suggest that by calculating average effects over the whole sample, the time-invariant VAR offers less flexibility compared to the TVP-VAR, the latter one tracing important economic and statistical differences across data points.

Figure 5 plots the median response together with the 68% credible intervals of FDI to one-standard-deviation shocks in the remaining variables over a horizon of 16 quarters. We do this for three different dates, 1997Q2, 2016Q2, and 2022Q4. In 1997Q2 (in May 1997, that is), the Bank of England (BoE) was granted operational independence over monetary policy. The second date coincides with the EU Referendum. The final date, towards the end of our sample, follows significant economic and political challenges from mid-2022 onwards that receded to a large extent when Rishi Sunak became prime minister in October 2022 (we return to this issue below when discussing our counterfactual analysis). These dates are therefore interesting because they relate to particular economic events. Notice also from Figure 2 that the EPU growth rate values for 2016Q2 and 2022Q4 are both in the 96th percentile of the distribution, whereas the EPU growth rate value for 1997Q2 is in the 40th percentile of the distribution. This allows us to compare the impact of all EPU, 10-year interest rate and RER shocks on FDI during distinct periods of high(er) and low(er) uncertainty but also among periods of high(er) uncertainty.[15]

We note that for all dates, shocks to EPU, the 10-year interest rate, and RER have a statistically significant impact on FDI for up to 8 quarters. Shocks to EPU and the 10-year interest rate record their highest impact on FDI in 2016Q2, whereas the RER impact on FDI is very similar in 2016Q2 and 2022Q4.

[14] Figure A2 in the Appendix plots the evolution, over time, of the variances of the error terms in the equations where a shock is imposed. We observe that after 2000 the variance of all error terms increases which arguably explains the increased (contemporaneous) impact of each shock on FDI.

[15] As a further check, we have chosen, as an additional date, 1969Q1 where the corresponding EPU growth rate value is in the 4th percentile of the distribution (the House of Lords judges the 1960s to be one of the UK's most economically successful decades). Results, available on request, indicate that, for 1969Q1, the median response of FDI to one-standard-deviation shocks in all EPU, 10-year interest rate and RER are qualitatively similar to what we report for 1997Q2.

It therefore appears that international investors were relaxed about the transfer of monetary policy from the UK government to the BoE in 1997Q2 and consequently, the response of FDI decisions to economic/financial shocks appears weaker than what we observe for the remaining periods.

Next, we turn our attention to the forecast error variance decomposition and the historical decomposition of FDI movements based on our TVP-VAR model. Figure 6a reports the posterior median of the percent share of forecast error variance of FDI attributable to all shocks at a short-run horizon of $h = 1$ quarter. Figure 6b repeats the analysis at a longer-run horizon of $h = 20$ quarters.

At the $h = 1$ short-run horizon and the $h = 20$ longer-run horizon, the importance of EPU shocks rises over time to account for up to 71% of FDI's fluctuations by 2016Q4. At both horizons, the importance of EPU shocks drops to just under 50% of FDI's fluctuations towards the end of the sample. At the $h = 1$ and $h = 20$ horizons, the importance of interest rate shocks reaches a peak of 77% of FDI's fluctuations in 1999Q4 and then become much less important; at the end of our sample, they only account for 10% of FDI's fluctuations. At both $h = 1$ and $h = 20$ horizons, RER shocks rise in importance; by the end of the sample they account 25% of FDI's forecast error variance at the $h = 1$ horizon and 45% of FDI's forecast error variance at the $h = 20$ horizon. At both the $h = 1$ short-run horizon and the $h = 20$ longer-run horizon, FDI-own shocks become less important over time and account for no more than 11% of FDI's fluctuations at the end of our sample.

Figure 7 reports a historical decomposition of FDI into the contribution of the different shocks. The broad picture of the decomposition is that FDI-own shocks, interest rate and EPU shocks contribute significantly to FDI fluctuations over the whole period, with real exchange rate shocks playing a more limited role. Following the 2008-2009 financial crisis and the subsequent implementation of Quantitative Easing policies that kept long-term interest rates low, interest rate shocks have contributed positively to FDI movements. The decomposition also confirms the importance of economic policy uncertainty shocks to FDI. In fact, EPU shocks have contributed negatively to FDI following the EU Referendum in 2016Q2 and up to the end of our sample. This turbulent period saw two general elections and four prime ministers in office following the resignation of David Cameron (immediately after the EU Referendum vote) that fuelled economic policy uncertainty.

To reinforce that point, Figure 8 runs a counterfactual scenario for FDI. In particular, it illustrates the effects of EPU by using the estimates of our TVP-VAR model to infer what FDI would have been had EPU remained at its pre-European Referendum average value. To do so, we construct the difference between the fitted values of the estimates of model (1) and the fitted values of the counterfactual model (1) which sets the post 2016Q1 values of EPU equal to the 1965Q1-2016Q1 average value of EPU. [16] A negative value of this difference indicates that FDI is lower because of higher uncertainty. Uncertainty contributed negatively to FDI movements up to the order of 0.5% of GDP in 2021Q1 (the UK eventually left the EU on December the 31st 2020, that is, four and a half years after the Referendum vote).[17] The average share of FDI inflows in UK nominal GDP has been 2.1% over the 1965Q1-2023Q3 period (and equal to 1.8% over the 2016Q2-2023Q3 period). With this in mind, an FDI loss of up to 0.5% of GDP due to uncertainty is a substantial one. With the Brexit issue finally settled, the contribution of uncertainty to FDI developments became less prominent between 2021 and mid 2022. The negative contribution of uncertainty to FDI developments started becoming more prominent again from mid-2022 onwards (a

[16] From 2016Q2 onwards, we set EPU equal to 84.14, that is, the average EPU value over the 1965Q1-2016Q1 period. Since our model uses the four-quarter EPU growth, our counterfactual implies four-quarter EPU growth rate values of -12.02%, for 2016Q2, 5.77% for 2016Q3, 20.91% for 2016Q4 and -30.01% for 2017Q1. From 2017Q2 onwards, the counterfactual four-quarter EPU growth rate values are all equal to 0. Contrast this with the actual four-quarter EPU average growth rate over the 2016Q2-2023Q3 period, which is much higher and equal to 8.5%.

[17] The UK formally left the EU on 31 January 2020. Nevertheless, a transition agreement kept the UK in the customs union and the single market until the 31st of December 2020.

year that saw the resignation of Prime Minister Boris Johnson followed by the brief premiership of Liz Truss before Prime Minister Rishi Sunak eventually took over as prime minister in October 2022).

5 Robustness tests

5.1 Alternative identification schemes

As an alternative identification scheme, we use a Cholesky ordering where, for both the time-invariant VAR model and the TVP-VAR model, y_t is given by: y_t = [EPU, FDI, 10-year rate, RER]′. As the ordering of the variables in the y_t vector suggests, EPU remains the least endogenous variable, followed by FDI and then the 10-year rate. Here, RER is the most endogenous variable. In this identification scheme, the contemporaneous response of FDI to both the 10-year rate and RER is equal to 0. Figure 9 plots the median response together with the 68% credible intervals of FDI to one-standard-deviation shocks in the remaining variables for the time-invariant VAR model. The response of FDI to all three variables is negative; however, the response to EPU is statistically insignificant. The negative impact of the 10-year rate on FDI lasts for 12 quarters and the negative impact of RER on FDI is more short-lived, for 1 quarter.

Since the contemporaneous response of FDI to both the 10-year rate and RER is equal to 0, we do not plot, for the TVP-VAR model, contemporaneous responses throughout time. Instead, we plot, in Figure 10, the median response together with the 68% credible intervals of FDI to one-standard-deviation shocks in the remaining variables over a horizon of 16 quarters for the three different dates, namely 1997Q2, 2016Q2, and 2022Q4. In line with the results in Figure 5, the response of FDI to all three variables is negative. On the other hand, the peak responses are smaller in size; at the same time, the responses are more short-lived compared to what we see in Figure 5.

As a further robustness check, and to identify the structural shocks in the TVP-VAR model, we impose the sign restrictions of Table 1. More specifically, for y_t = [EPU, 10-year rate, RER, FDI]′ in our TVP-VAR model, we impose the restriction that the contemporaneous response of FDI to all three variables (that is, EPU, 10-year rate and RER, respectively) is negative. We impose the above three sign restrictions using the algorithm of Rubio-Ramirez et al. (2010). Figure 11 plots the median response together with the 68% credible intervals of FDI to one-standard-deviation shocks in the remaining variables over a horizon of 16 quarters for the three different dates, that is, 1997Q2, 2016Q2, and 2022Q4. Compared to the results in Figure 5, the response of FDI to all three variables is smaller in size.

5.2 The role of corporate tax policy

Corporate taxation is an important policy variable for attracting FDI (see e.g. Becker et al., 2012; Devereux, 2007). To examine the role of corporate tax policy, we re-estimate the TVP-VAR model (1) using the two-year moving average corporate tax rate spread (CTRS) instead of the real exchange rate.[18] In this case, the vector of endogenous variables is: y_t = [EPU, CTRS, 10-year rate, FDI]′. Due to data availability on corporate tax rates, effective estimation is over the 1983Q1-2023Q3 period.

Figure 12 reports the median impact response together with the 68% confidence levels of FDI to the corporate tax rate spread and economic policy uncertainty. FDI responds negatively to an one-standard-deviation shock in the corporate tax rate spread and the impact gradually gets stronger to reach a peak

[18] Corporate tax rates are set once per year or even less frequently. We use in our model the two-year moving average of the spread between the UK and the OECD corporate tax rate on the grounds that international investors look beyond annual changes in corporate tax policy to make FDI decisions. Including both the real exchange rate and the corporate tax rate spread in our model produced unstable estimates.

in 2016Q4, that is, shortly after the EU Referendum vote. In addition, the response to an one-standard-deviation economic policy uncertainty shock is smaller in size than the one we observe in Figure 4 but the pattern of movements is similar.

5.3 Alternative measure of economic uncertainty and geopolitical risk

Next, we consider an alternative measure of UK economic and policy uncertainty, namely the World Uncertainty Index for the UK discussed by Ahir et al. (2022), which is more country-specific and less global in nature than the EPU index. In addition, we consider the role of UK-specific geopolitical risk from the website of Matteo Iacoviello. From an empirical point of view, we re-estimate the TVP-VAR model (1) (with $y_t =$ [WUI, 10-year rate, RER, FDI]′), that is, by using the UK-specific three-quarter weighted moving average World Uncertainty Index instead of UK four-quarter economic policy uncertainty growth over the sample period 1963Q1-2023Q3.[19] We then re-estimate the TVP-VAR model (1) (with $y_t =$ [GPR, 10-year rate, RER, FDI]′), that is, by using the UK-specific four-quarter geopolitical risk growth (GPR) instead of UK four-quarter economic policy uncertainty growth over the sample period 1963Q1-2023Q3. From Figure 13, the impact response of FDI to WUI and GPR is negative throughout our sample and the impact response to GPR is much more volatile than the WUI one or the impact response to economic policy uncertainty reported in Figure 4; results for the remaining variables (available on request) are qualitatively similar to what we report in Figure 4.

5.4 Extension to the hybrid TVP-VAR model

So far our analysis has relied on a fairly standard TVP-VAR model with four endogenous variables. Nevertheless, additional variables, such as economic policy uncertainty in the rest of the world, the world business cycle, and the infectious disease volatility tracker price movements might play a part in FDI decisions to invest in the UK. The use of (somewhat) higher dimensional datasets in TVP-VAR models is challenging because of intensive computations and over-parameterisation issues. In a new paper, Chan (2023b) adapts the non-centred parameterisation of Frühwirth-Schnatter and Wagner (2010) to tackle this very issue by introducing hybrid TVP-VARs, that is, VARs with time-varying parameters in some equations but constant coefficients in others. An efficient Bayesian shrinkage and sparsification method is used by Chan (2023b) that automatically decides, for each equation in the VAR, whether the VAR coefficients are constant or time-varying and whether the parameters of the contemporaneous relations among variables are constant or time-varying. Consequently, the framework of Chan (2023b) tackles overparameterisation concerns by allowing the data to determine the appropriate time-varying structures rather than imposing time variation. The hybrid TVP-VARs retain stochastic volatility. The argument is that since it is well documented that time-varying volatility is of great importance for small VARs, it should be even more so for large(r) VARs (see the discussion in Chan (2023a) and references therein).

Following Chan (2023b) our hybrid TVP-VAR model takes the form:

$$y_t = b_0 + \sum_{i=1}^{p} B_{i,0} y_{t-i} + A_0 y_t + \Gamma^{\beta}(\tilde{b}_t + \sum_{i=1}^{p} \tilde{B}_{i,t} y_{t-i}) + \Gamma^{\alpha} \tilde{A}_t y_t + \varepsilon_t, \tag{5}$$

where b_0, $B_{i,0}$ are constant coefficient matrices and A_0 is a lower triangular contemporaneous impact

[19] The index is available from worlduncertaintyindex.com. Ahir et al. (2022) recommend the use of the three-quarter weighted moving average series. We have followed their advice and report results based on this very series.

matrix. The matrices $\tilde{b}_t$, $\tilde{B}_{i,t}$ and $\tilde{A}_t$ are the time-varying counterparts of b_0, $B_{i,0}$ and A_0, respectively. Furthermore, we set $\tilde{b}_t = 0$, $\tilde{B}_{i,t} = 0$ and $\tilde{A}_t = 0$. For the error terms, we assume that, $\varepsilon_t \sim N(0, D_t)$, where $D = \text{diag}(h_{i,t})$. Finally, we define $\Gamma^\beta = \text{diag}(\gamma_i^\beta)$ and $\Gamma^\alpha = \text{diag}(\gamma_i^\alpha)$, where γ_i^β and γ_i^α are indicator variables which take the values 0 and 1. For example, $\gamma_i^\alpha = 1$ being equal to 1 denotes that the elements in the i^{th} row of the matrix of contemporaneous impact $\tilde{A}_t$ are assumed to evolve over time. The model nests a variety of alternative VAR models, including a TVP-VAR model with stochastic volatility, similar to the one used in the previous sections. All time-varying parameters are assumed to evolve as a first order autoregressive processes.

The main difference from our benchmark model is that the hybrid TVP-VAR model automatically decides whether the parameters are time-varying or constant in each VAR equation. Specifically, γ_i^β and γ_i^α are treated as unknown parameters, estimated with the rest of the model's parameters using a Markov chain Monte Carlo (MCMC) algorithm. Chan (2023b) assumes that γ_i^β follows independent Bernoulli distributions $P(\gamma^\beta = 1) = p_i^\beta$. The prior distributions for the success probabilities p_i^β are assumed to be Beta distributions, $p_i^\beta \sim B(a_{p_i^\beta}, b_{p_i^\beta})$. Similar assumptions are made for γ_i^α. The second difference is that in contrast to other TVP-VAR models (e.g. Cogley and Sargent, 2005; Primiceri, 2005; Chan et al., 2019), Minnesota-type priors are assumed here for the prior distributions of the parameters. The selection of prior distributions is based on the fact that hybrid TVP-VAR can incorporate a large VAR when the number of endogenous variables is increased.[20] Allowing for time-variation in a large VAR causes the number of parameters to proliferate. Minnesota priors can reduce the number of parameters by shrinking insignificant parameters toward zero. This is achieved by (i) cross-variance shrinkage, that is, coefficients on lags of other variables are shrunk more aggressively than those of own lags, and (ii) by treating differently the lags of a variable, that is, incorporating in the priors the assumption that lower-order lags are more important than higher order lags (see also Carriero et al., 2015; Chan, 2021).

The hybrid TVP-VAR is formulated in structural form and the multivariate stochastic volatility specification is based on matrix (the lower unitriangular matrix) A_t. Thus, the model is not order-invariant. Here, the vector of endogenous variables y_t, is given by: y_t = [IDVT, US EPU, US GDP, EPU, 10-year rate, RER, FDI]′, where IDVT is the four-quarter growth of the infectious disease equity market volatility tracker, US EPU is the four-quarter US economic policy uncertainty growth and US GDP is the four-quarter real US GDP growth. The rest of the variables, related to the UK economy, are described in Section 2.

The ordering in the TVP-VAR indicates that the infectious disease tracker is the most exogenous variable followed by US economic policy uncertainty and then by US GDP growth. For the UK variables, we use the same ordering as in our benchmark model. There is no prior economic expectation on the impact, if any at all, of the pandemic tracker on FDI. Arguably also, the possible impact of US economic policy uncertainty and US GDP growth on FDI is far from certain. This is because an increase in US economic policy uncertainty might lower FDI in the US and channel FDI opportunities towards the rest of the world, including the UK. At the same time, however, spillover concerns from US economic policy uncertainty to the rest of the world might put upward pressure on UK uncertainty, therefore depressing UK FDI. In addition, an increase in US GDP growth might attract additional FDI to the US and create fewer FDI opportunities for the rest of the world, including the UK. Nevertheless, stronger US growth might have a positive spillover impact on the UK economy and, consequently, make the UK more attractive for inbound FDI.[21]

[20] For example, in our benchmark model we consider 4 endogenous variables while in the hybrid TVP-VAR model we consider 7 endogenous variables.

[21] Kose et al. (2017) provide a (non-technical) discussion of the extent of global spillovers from changes in US growth, US monetary and fiscal policies, US economic policy uncertainty and US financial uncertainty.

We estimate our hybrid TVP-VAR model over the period 1985Q1-2023Q3 (the beginning of our sample is dictated by our data availability on the infectious disease volatility tracker) using $p = 4$ lags.[22] The results are based on 50,000 iterations of the MCMC algorithm after we discard the first 50,000 as burn-in sample. We proceed by reporting, in Table 2, the posterior means of γ_i^{β} and γ_i^{α}, that is, the control indicators of time variation in the VAR coefficients and the contemporaneous relationships among the endogenous variables, respectively, where $i = 1, \ldots, n$ and $n = 7$ variables. From Table 2, only a small number of estimates are essentially 0 and many others are higher than 0.5. That is, there is considerable evidence of time-varying parameters across equations. Notice also that the estimates of γ_i^{β} and γ_i^{α} in a given equation are often very different. For instance, it appears that there is very little variation in the VAR coefficients of the FDI equation but, at the same time, the contemporaneous impact of the remaining variables on FDI is time-varying.

In Figure 14, we report the median impact response of FDI to one-standard-deviation shocks to the variables in the hybrid TVP-VAR throughout the sample. There is no evidence of statistically significant effects from the pandemic variable or US GDP growth on UK FDI. On the other hand, shocks to US uncertainty increase UK FDI throughout the sample. From Figure 4 and Figure 14, the hybrid TVP-VAR reports less variation in all UK effects, namely from EPU, 10-year rate and RER on FDI, compared to the benchmark TVP-VAR. This is arguable because the hybrid TVP-VAR, in contrast to the benchmark TVP-VAR, imposes time variation only in the contemporaneous impact matrix of the FDI equation (and not in the rest of the coefficients).

As a robustness check, we have estimated our hybrid TVP-VAR model (5) using an alternative information set, namely y_t = [IDVT, OECD WUI, OECD GDP, WUI, 10-year rate, RER, FDI]′. Compared to our earlier hybrid TVP-VAR, this model replaces four-quarter US economic policy uncertainty growth (US EPU) by OECD's three-quarter weighted moving average World Uncertainty Index (OECD WUI), and four-quarter real US GDP growth (US GDP) by OECD's four-quarter real GDP growth (OECD GDP). The model also replaces UK-specific four-quarter economic policy uncertainty growth (EPU) by the UK-specific three-quarter weighted moving average World Uncertainty Index (WUI).[23]

Figure A3 in the Appendix reports the median impact response of FDI to one-standard-deviation shocks to the variables of the hybrid TVP-VAR throughout time using y_t = [IDVT, OECD WUI, OECD GDP, WUI, 10-year rate, RER, FDI]′. In line with our results in Figure 14, there is no evidence of a statistically significant effect from either the pandemic variable or world growth (proxied by OECD's output) on UK FDI. As with US uncertainty earlier on, World uncertainty (proxied by OECD WUI) has a positive, and statistically significant, impact on FDI in the UK. FDI responds negatively to the remaining, UK-specific, variables. From Figure A3, the pattern of response of FDI to UK-specific variables is similar to those reported in Figure 14 (but smaller in size in the case of WUI and RER compared to those reported in Figure 14).

Whether we use US economic policy uncertainty or OECD-related uncertainty, the response of FDI to these measures is positive. Our findings suggest that US uncertainty and OECD-related (minus the UK) uncertainty create FDI opportunities elsewhere, including the UK. But why might this be the case? The survey of Kamin (2013) examines whether globalisation increases or reduces spillover effects; countries that become more integrated with the global economy are also increasingly sensitive to external shocks. On the other hand, countries that are well integrated with the global financial economy are less

[22] The effective estimation is over the 1987Q1-2023Q3 period (due to data availability on IDVT). We estimate the hybrid TVP-VAR model by adopting the MATLAB codes available from the website of Joshua Chan to our dataset.

[23] The effective estimation is over the 1987Q1-2023Q3 period (due to data availability on IDVT). The OECD WUI does not include the UK. To construct the OECD WUI we use country-level WUI data provided by Ahir et al. (2022). The use of the three-quarter moving average version of the WUI for country-level is recommended by Ahir et al. (2022).

exposed to the risk of a negative shock coming from a single country. In the context of a time-varying global VAR model, Cuaresma et al. (2019) find that economies that are well integrated with the global financial economy are less exposed to the tightening of US monetary policy. According to the KOF globalisation indices that measure the economic, social and political dimensions of globalisation (discussed in Gyglia et al. (2019) and available from the KOF Swiss Economic Institute), the UK is a highly globalised economy; the latest available data for 2021 show that the UK has a globalisation reading of 88.39 compared to 87.19 for France, 82.85 for Italy and 81.32 for the US (Germany has a slightly higher, than the UK, globalisation reading of 88.97). This, in line with Cuaresma et al. (2019), arguably points to less negative spillover effects to the UK which, in our context, would also open the door for additional FDI to the UK when external uncertainty is on the rise. We also note the work of Mumtaz and Theodoridis (2017) which documents that OECD-related economic uncertainty shocks impact much less on UK output volatility (as well as the volatility of inflation, the short-term interest rate and stock returns) compared to their impact on the corresponding variables of other OECD economies.[24] Arguably then, in the presence of rising OECD-related uncertainty shocks, inward FDI to the UK becomes more attractive compared to other OECD destinations.

6 Concluding remarks

This paper has used time-varying Bayesian VAR models to assess the impact of the shifting, and progressively more volatile, macroeconomic landscape on FDI inflows to the UK. FDI matters because it increases competition and boosts productivity in the domestic economy. With this in mind, we have asked the empirical question of what drives FDI inflows to the UK. FDI responds negatively to an increase in UK economic policy uncertainty, an increase in the ten-year interest rate and a real exchange rate appreciation. Lower corporate tax rates in the UK relative to the rest of the world can, to some extent, mitigate the negative impact of UK-specific economic and geopolitical uncertainty on FDI. Finally, higher external economic uncertainty benefits UK FDI. Our results suggest that to attract (additional) FDI inflows to the country, UK policy-makers need to suppress economic policy uncertainty. This is an important point to make because, as our counterfactual analysis suggests, post EU Referendum uncertainty has depressed FDI inflows to the UK up to 0.5% of GDP. This is a considerable figure since FDI inflows have historically (since the 1960s) accounted, on average, for 2.1% of the country's GDP.

UK policy-makers should also keep in mind that corporate policy has an important role to play towards attracting FDI. A 2023 survey of 56 US companies doing business in the UK indicated that to (continue to) invest in the UK, they would like the UK government (a) to strengthen its political and trade relations with the EU and (b) to ensure that the UK corporate tax environment remains competitive.[25] From Figure A1 in the Appendix, the UK corporate tax rate has remained below the OECD corporate tax average rate between 2011 and 2022. In 2023, the UK government raised the UK corporate tax from 19% to 25% bringing it above the corresponding OECD corporate tax rate by 1.4 percentage points. Given the importance of corporate policy shocks for FDI developments recorded in our paper, the expectation is that a change in UK corporate policy of this magnitude will most likely depress FDI in the years ahead. In this case, one would be looking for possible mitigating effects from lower economic policy uncertainty; in fact, at the end of 2023, UK economic policy uncertainty recorded a significant drop of 28%

[24] The only exception is US output volatility which is affected slightly less than UK output volatility by OECD economic uncertainty shocks.

[25] Their opinion matters: data from the ONS suggests that, between 20008 and 2021, an average of 40.78% of the total FDI inflows to the UK came from US companies.

compared to the end of 2022.

In practice, of course, international investors make simultaneous FDI decisions to channel their capital across different countries. This suggests that future research in this area could examine FDI decisions in the context of economic policy uncertainty effects based on a multi-country Bayesian panel vector autoregression of large dimensions with time-varying parameters and stochastic volatility (see e.g. Koop and Korobilis, 2019). In addition, Bayesian models, like the ones discussed in this paper, could allow for the time variation in the parameters of the VAR model to be driven, and therefore explained, by economic shocks identified within such models (Leiva-León and Uzeda, 2023). We intend to address these issues in future work.

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Table 1: Sign restrictions.

	EPU	10-year rate	RER	FDI
Response of FDI	-	-	-	

Notes: (i) The table reports the sign restriction imposed to the response of FDI to shocks in each variable of the TVP-VAR model (1) in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%) and FDI is the percentage share of FDI inflows in nominal GDP. + and - denote a positive and negative response of FDI, respectively. (ii) The restrictions are imposed only for one period.

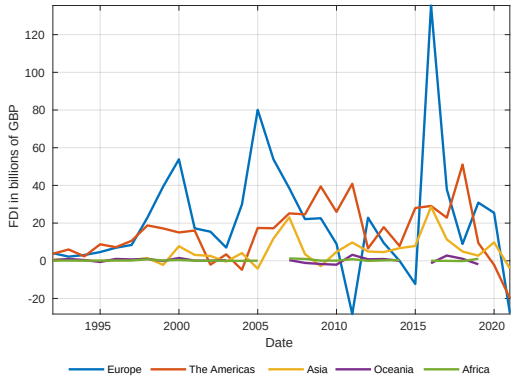
Table 2: Posterior means of γ_i^β and γ_i^α for the hybrid TVP-VAR model.

Equation	γ_i^β	γ_i^α
IDVT	0.0358	-
US EPU	0.0038	0.9966
US GDP	0.0034	0.5452
EPU	0.4720	0.7094
10-year rate	0.0000	0.9472
RER	0.0096	0.4548
FDI	0.2906	0.9532

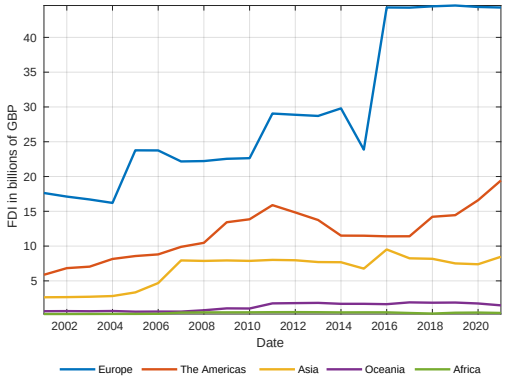
Notes: i) Posterior means of γ_i^β and γ_i^α for the hybrid TVP-VAR model (5) in the text, where y_t = [IDVT, US EPU, US GDP, EPU, 10-year rate, RER, FDI]′, and $n = 7$ variables. IDVT is the four-quarter growth (%) of the infectious disease equity market volatility tracker, US EPU is the four-quarter US economic policy uncertainty growth (%), US GDP is the four-quarter US real GDP growth (%), EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%) and FDI is the percentage share of FDI inflows in nominal GDP. A value greater than 0.5 indicates time variation in the associated parameters.

Figure 1: Inward FDI flows to the UK by area.

(a) Inward FDI flows to the UK by area, 1992-2021.

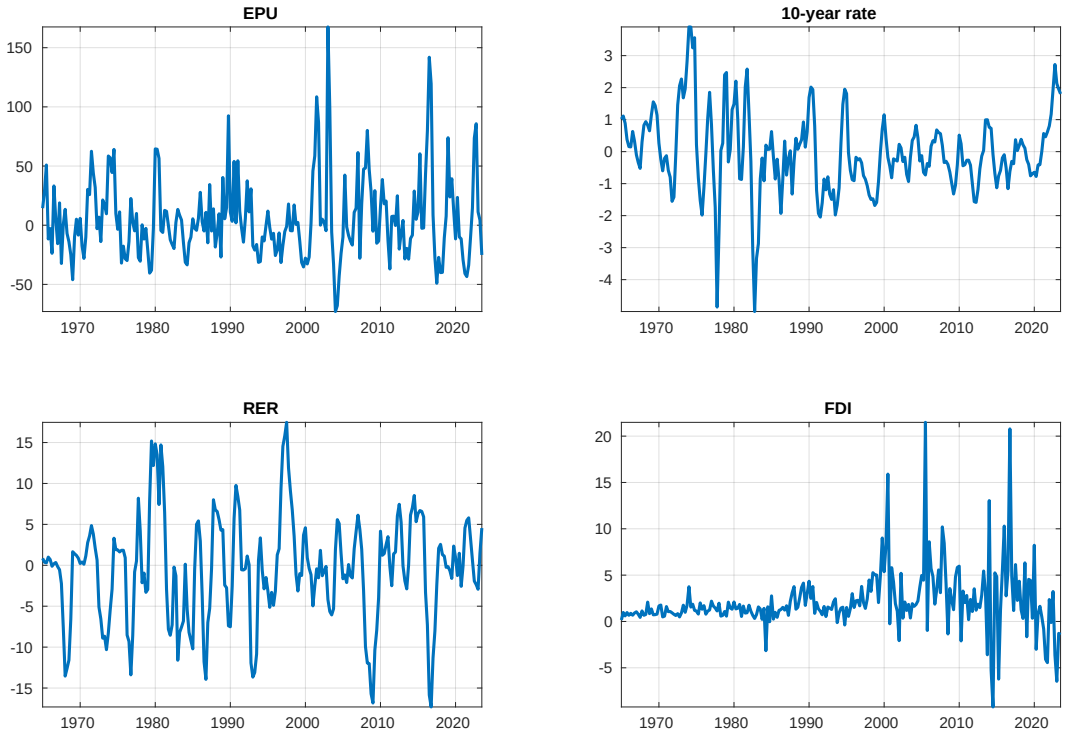


(b) Ten-year rolling standard deviation of inward FDI flows to the UK.



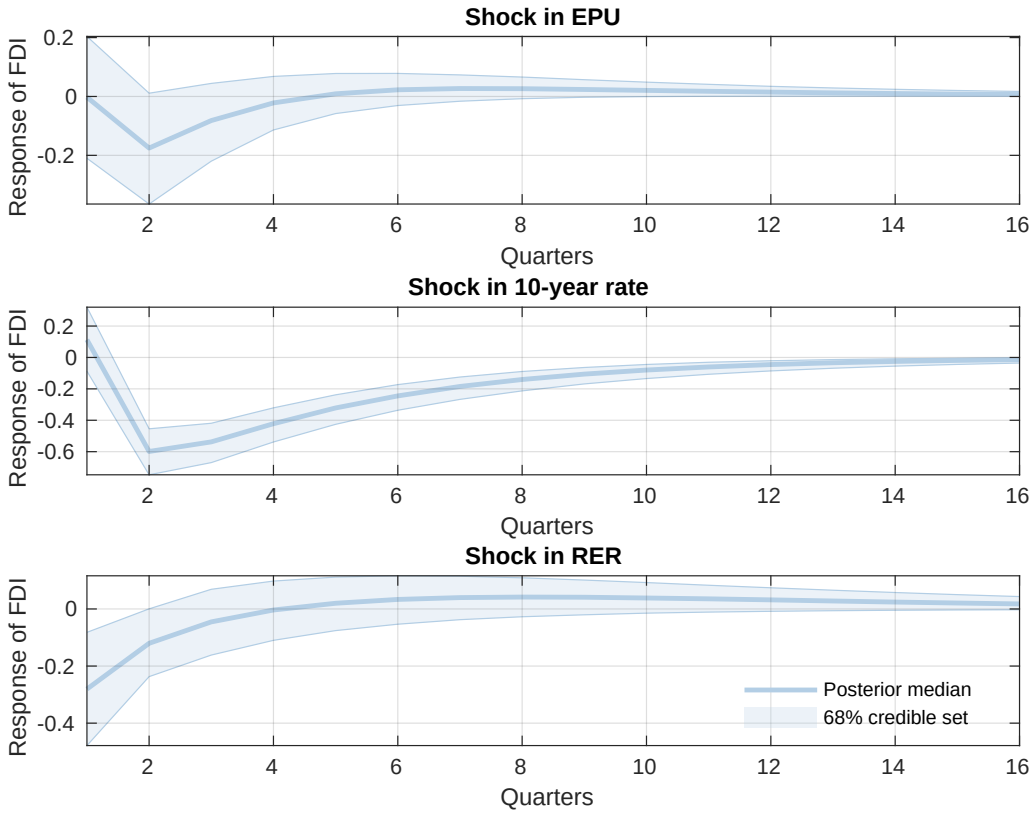
Source: Office for National Statistics (ONS).

Figure 2: Variables used in the benchmark model.



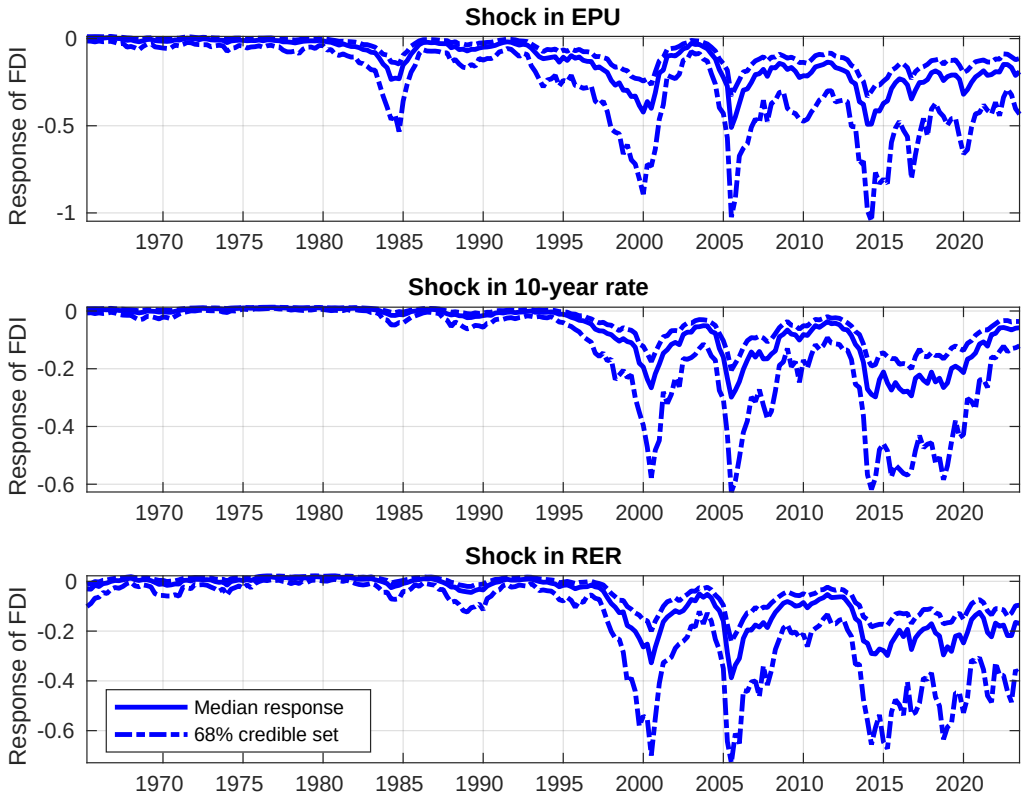
Notes: EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP.

Figure 3: Impulse response of FDI to one-standard-deviation shocks.



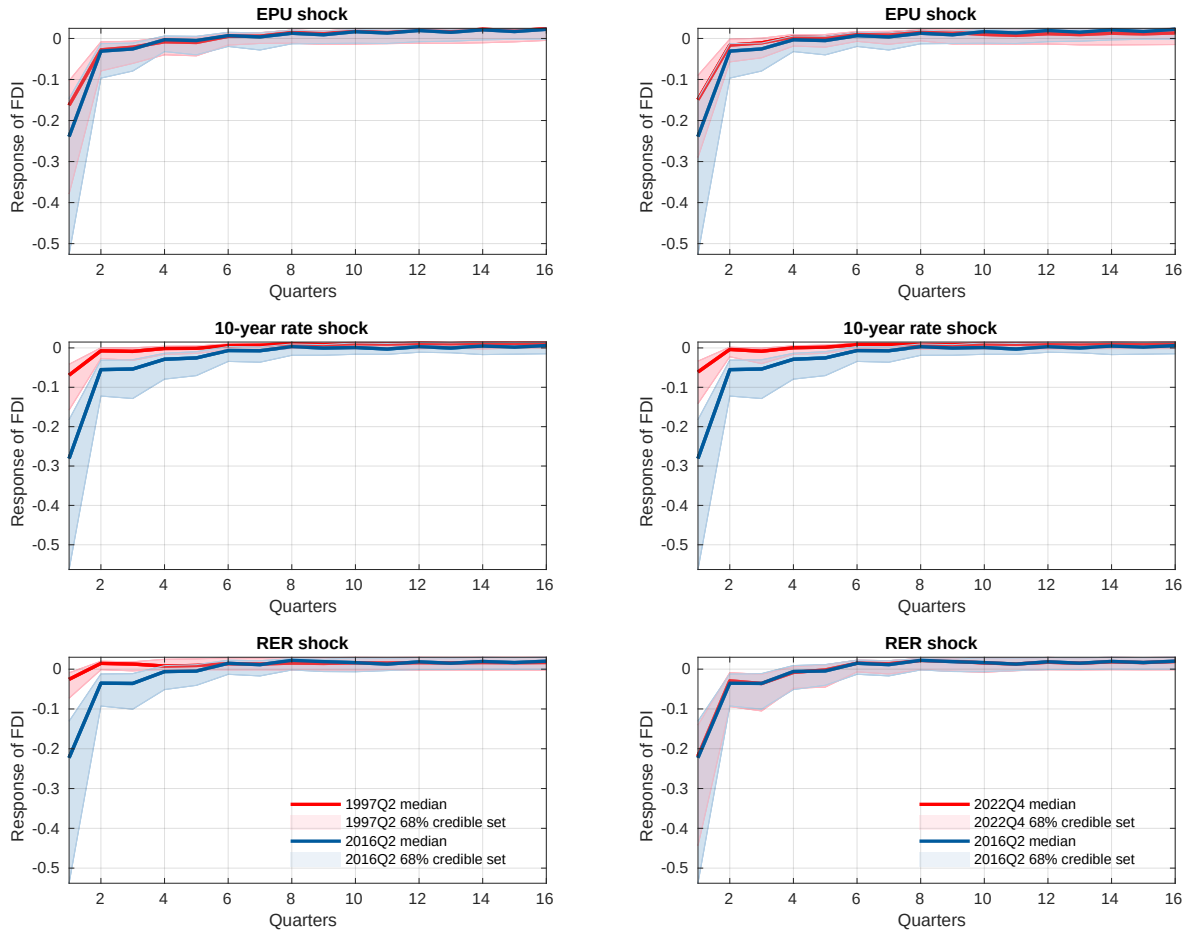
Notes: Results are based on time-invariant VAR model discussed in the text, where the vector of endogenous variables is y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 4: Contemporaneous impulse response of FDI.



Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

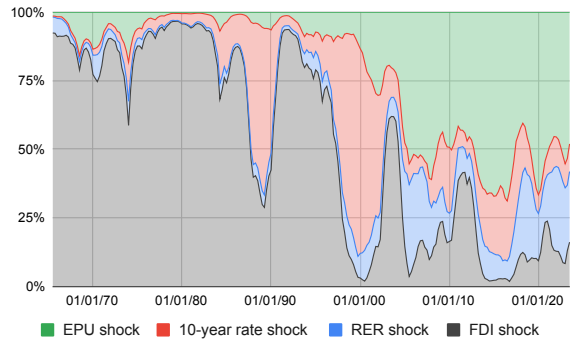
Figure 5: Impulse responses of FDI to shocks in TVP-VAR variables for specific periods.



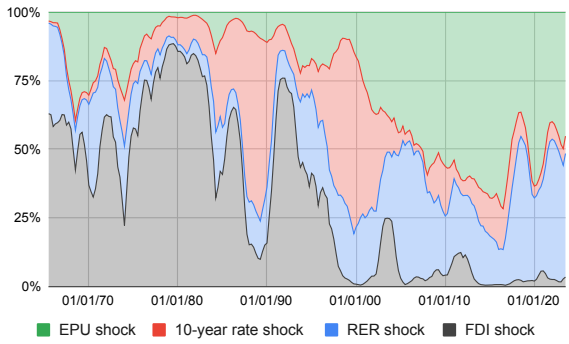
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 6: Forecast error variance decomposition of FDI.

(a) Horizon: 1 quarter

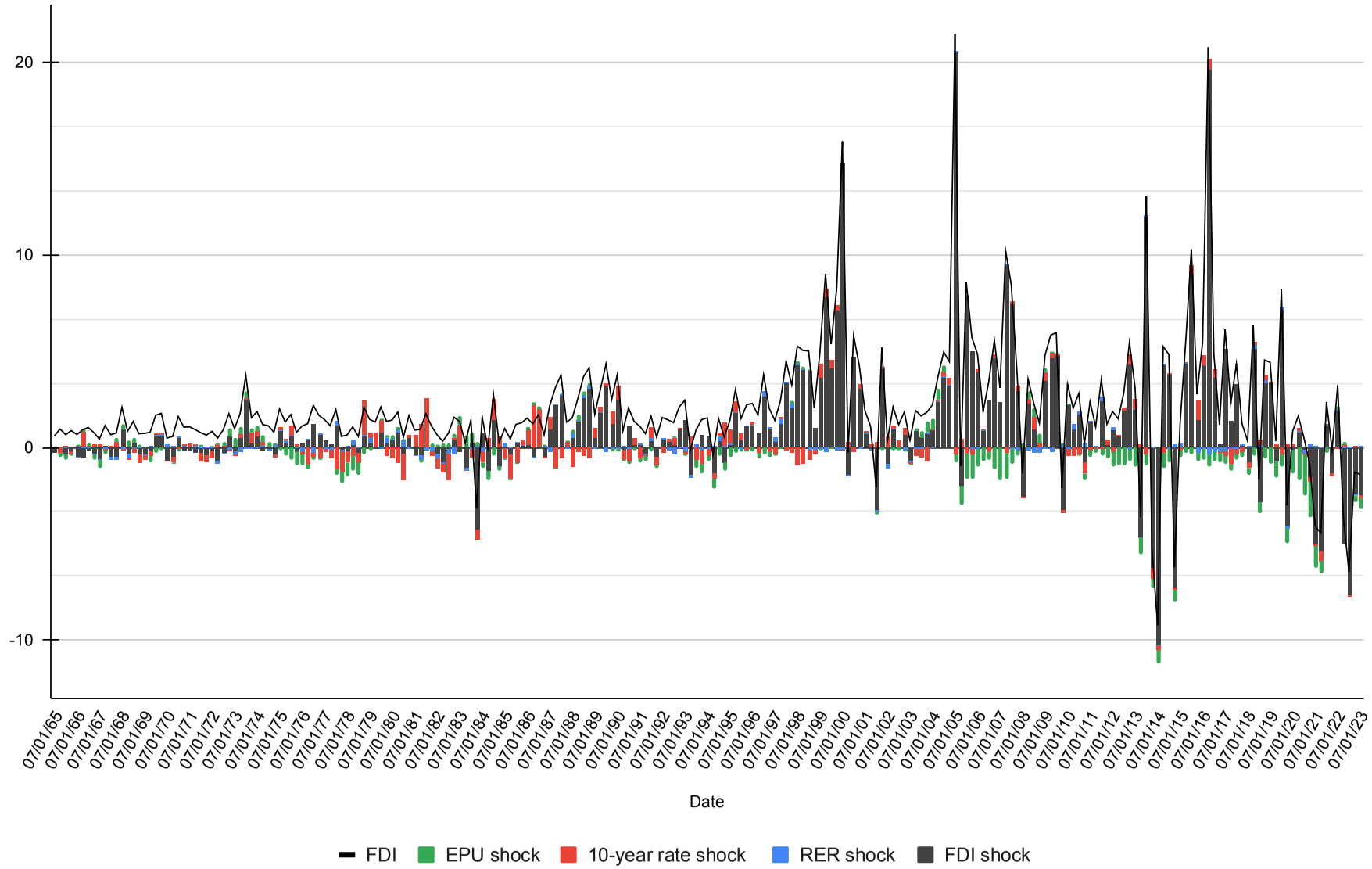


(b) Horizon: 20 quarters



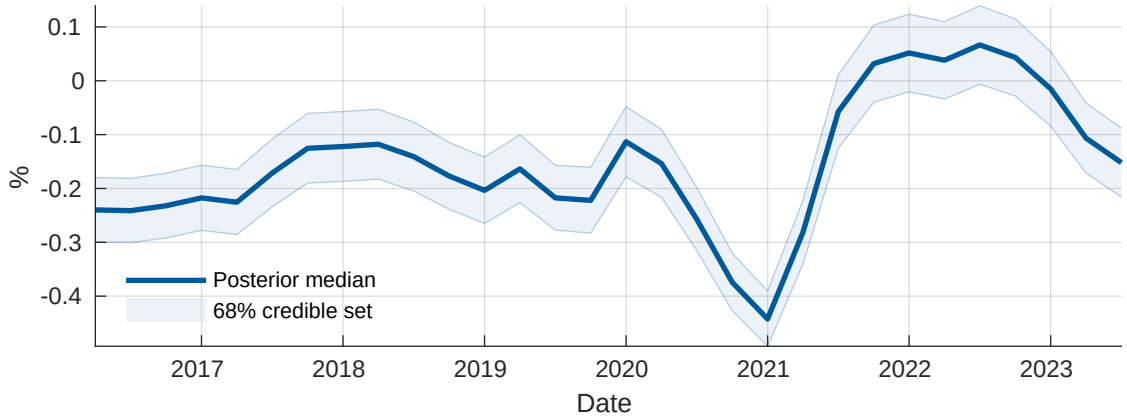
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 7: Historical decomposition of percentage share of FDI inflows in nominal GDP.



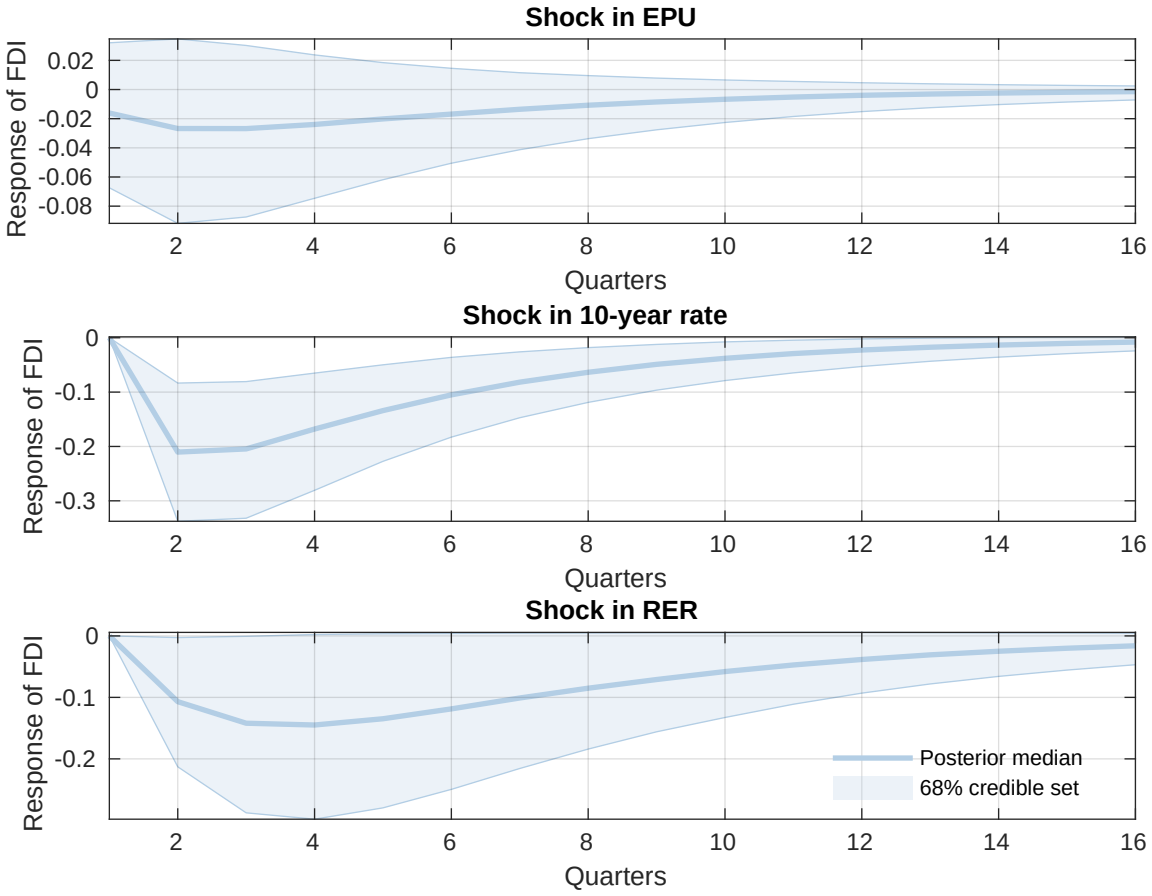
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 8: The impact of post 2016Q1 uncertainty on FDI together with the 68% posterior confidence levels.



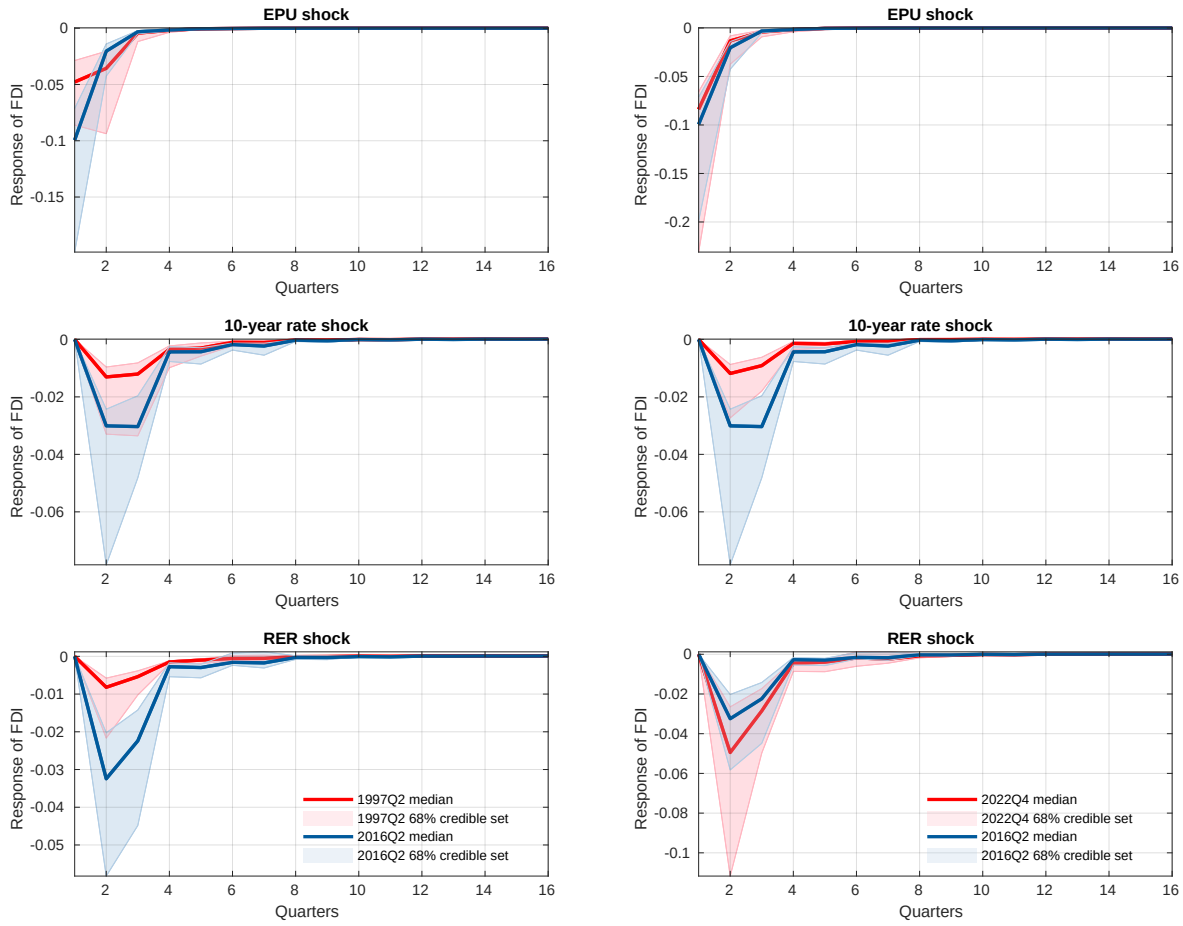
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The plot shows the difference between estimated FDI values from the benchmark model and the counterfactual model.

Figure 9: Impulse response of FDI to one-standard-deviation shocks using an alternative Cholesky ordering.



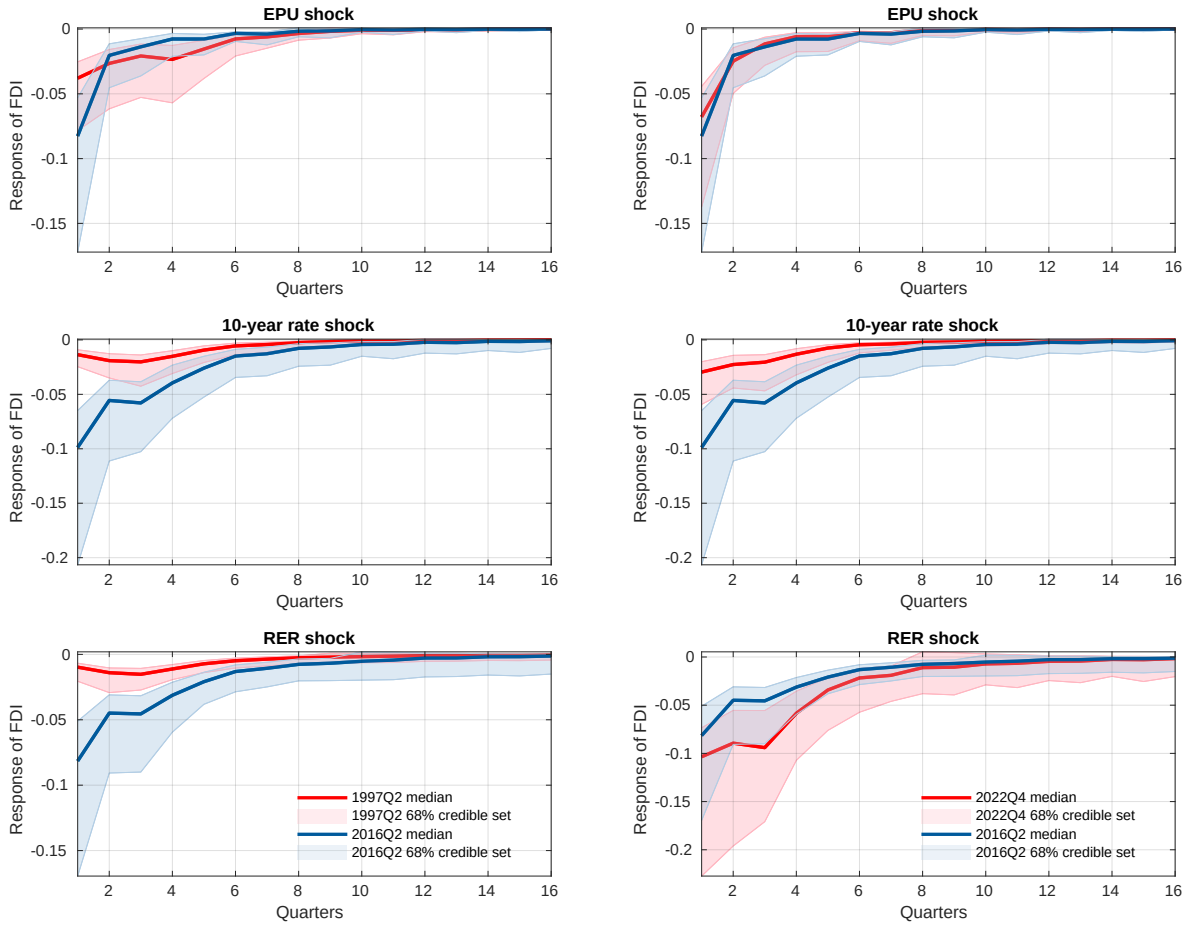
Notes: Results are based on time-invariant VAR model discussed in the text, using an alternative Cholesky ordering, where the vector of endogenous variables is y_t = [EPU, FDI, 10-year rate, RER]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 10: Impulse responses of FDI to shocks in TVP-VAR variables for specific periods using an alternative Cholesky ordering.



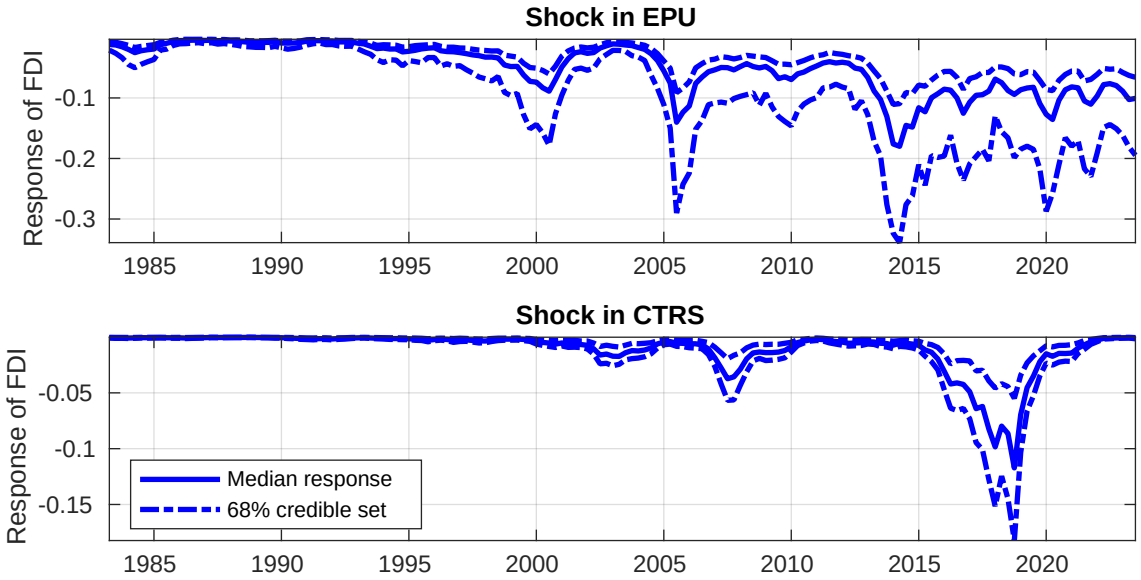
Notes: Results are based on TVP-VAR model (1) discussed in the text, using an alternative Cholesky ordering, where y_t = [EPU, FDI, 10-year rate, RER]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure 11: Impulse responses of FDI to shocks in TVP-VAR variables for specific periods using sign restrictions.



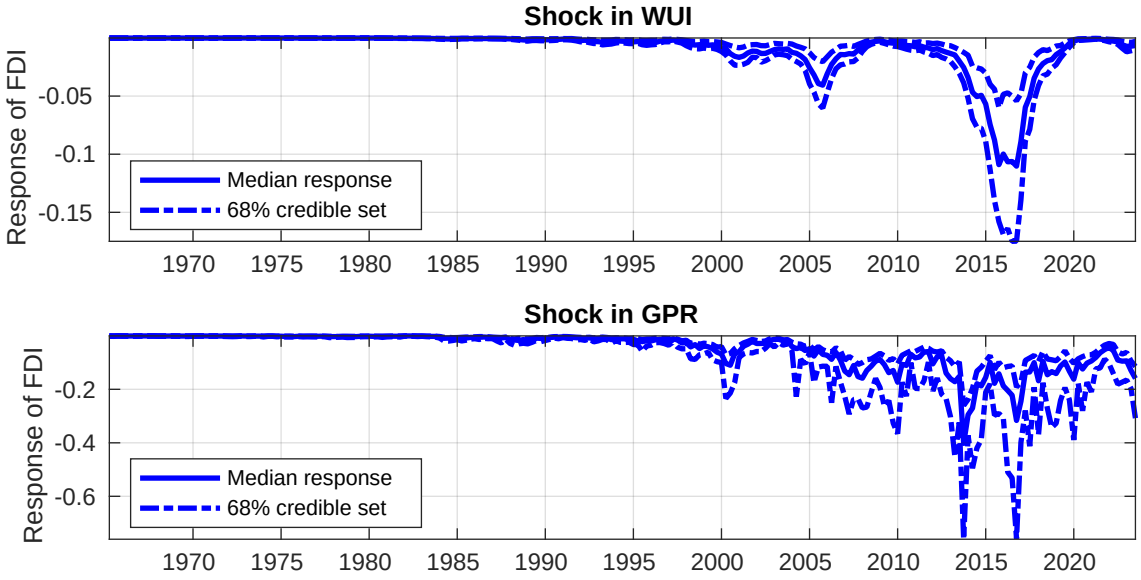
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period. Identification of shocks is based on sign restrictions reported in Table 1.

Figure 12: Contemporaneous impulse response of FDI to shocks to EPU and CTRS.



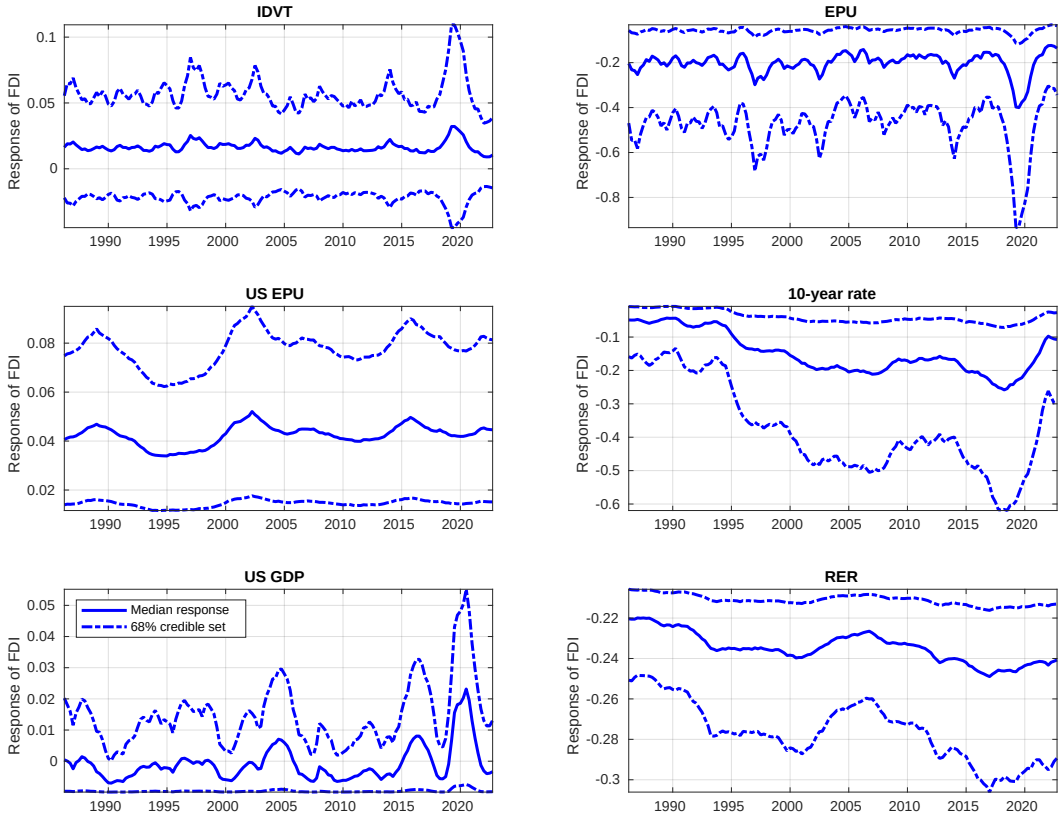
Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, CTRS, 10-year rate, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), CTRS is the two-year moving average corporate tax rate spread between the UK and OECD (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), and FDI is the percentage share of FDI inflows in nominal GDP. Due to data availability for the corporate tax rate spread, the effective estimation is over the 1983Q1-2023Q3 period.

Figure 13: Contemporaneous impulse response of FDI to shocks to WUI and GPR.



Notes: Results are based on TVP-VAR model (1) discussed in the text, where y_t = [WUI, 10-year rate, RER, FDI]′ (top) and y_t = [GPR, 10-year rate, RER, FDI]′ (bottom). WUI is the UK-specific three-quarter weighted moving average World Uncertainty Index, GPR is the four-quarter growth (%) of the UK-specific geopolitical risk index, 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

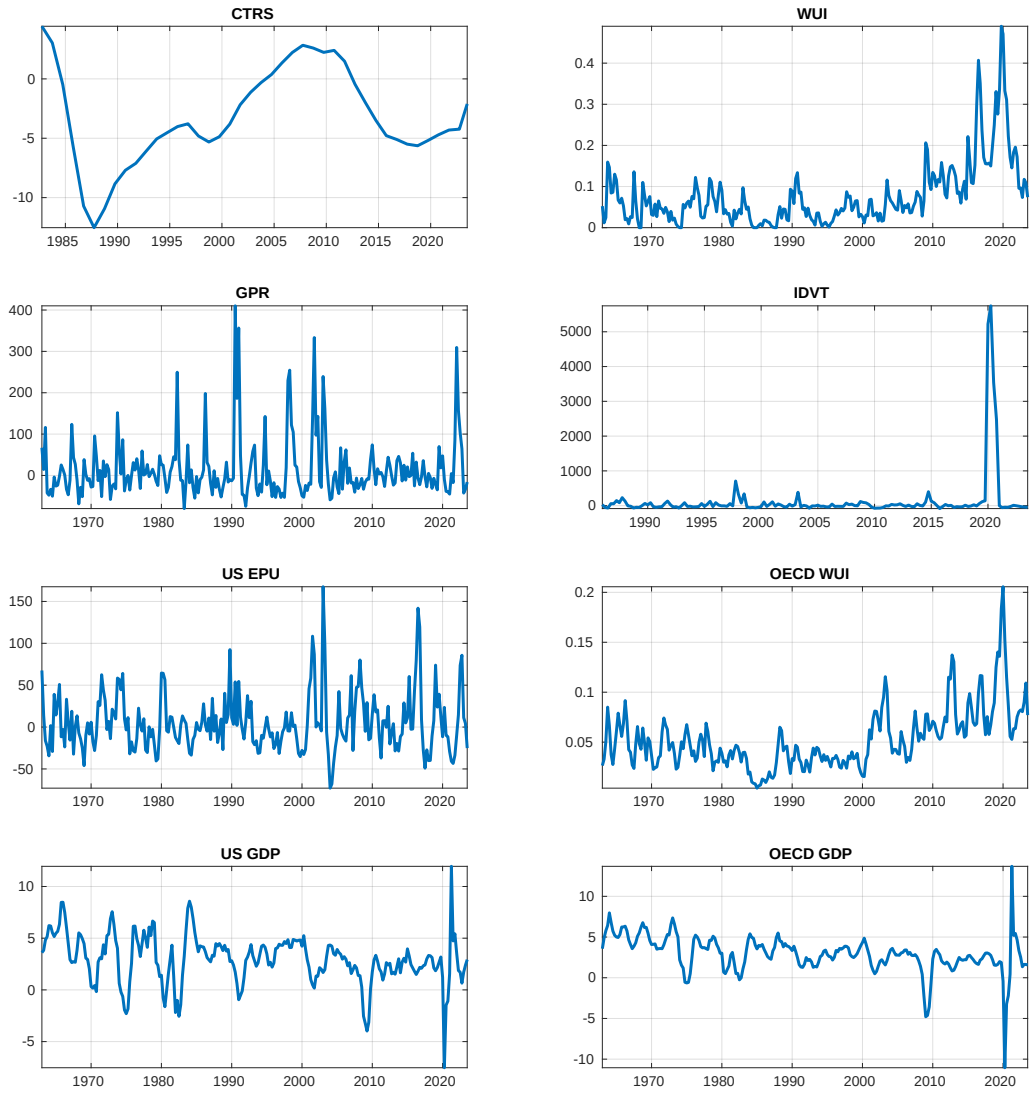
Figure 14: Contemporaneous impulse response of FDI (large hybrid TVP-VAR model).



Notes: Results are based on TVP-VAR model (5) in the text where y_t = [IDVT, US EPU, US GDP, EPU, 10-year rate, RER, FDI]′. IDVT is the four-quarter growth (%) of the infectious disease equity market volatility tracker, US EPU is the four-quarter US economic policy uncertainty growth (%), US GDP is the four-quarter US real GDP growth (%), EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1987Q1-2023Q3 period.

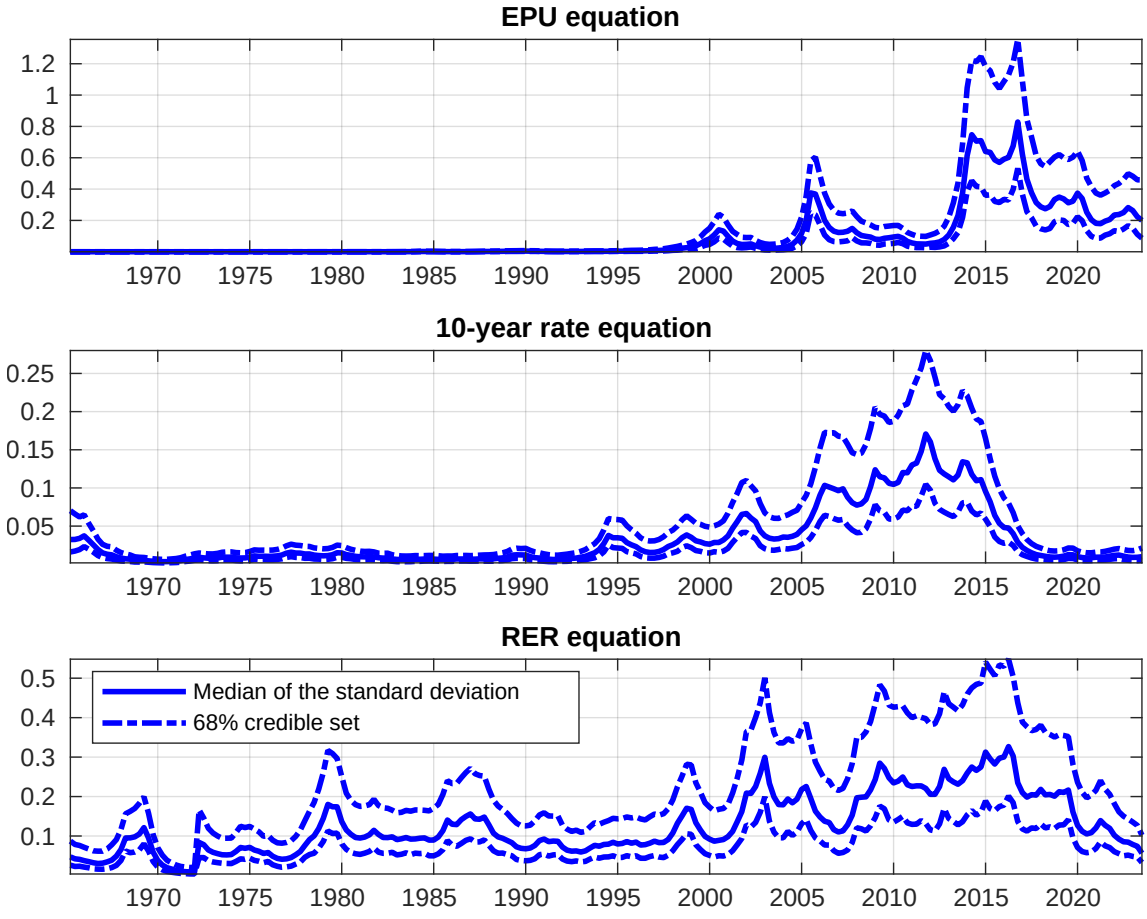
A Appendix-Supplementary figures

Figure A1: Additional variables used in the robustness tests.



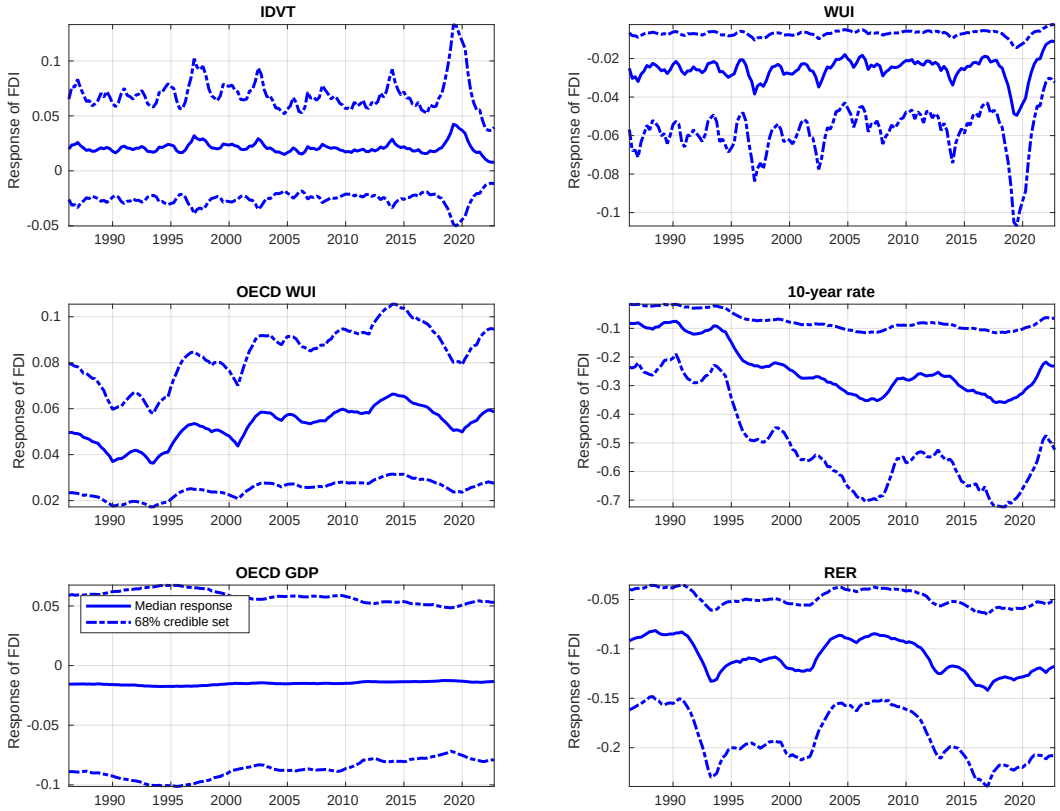
Notes: CTRS is the two-year moving average corporate tax rate spread between the UK and OECD (%), GPR is the four-quarter growth (%) of the UK-specific geopolitical risk index, US EPU is the four-quarter US economic policy uncertainty growth (%), US GDP is the four-quarter US real GDP growth (%), WUI is the UK-specific three-quarter weighted moving average World Uncertainty Index, IDVT is the four-quarter growth (%) of the infectious disease equity market volatility tracker, OECD WUI is the OECD three-quarter weighted moving average World Uncertainty Index (excluding the UK), and OECD GDP is OECD's four-quarter real GDP growth (%).

Figure A2: Posterior median of the standard deviations of the residuals.



Notes: The figure reports the posterior median of the standard deviation of the residuals for the TVP-VAR equations where in each equation the dependent variable is EPU, 10-year rate and RER. Results are based on TVP-VAR model (1) discussed in the text, where y_t = [EPU, 10-year rate, RER, FDI]′. EPU is the four-quarter economic policy uncertainty growth (%), 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1965Q1-2023Q3 period.

Figure A3: Contemporaneous impulse response of FDI (large hybrid TVP-VAR model) to shocks to alternative measures of GDP growth and policy uncertainty.



Notes: Results are based on TVP-VAR model (5) in the text where y_t = [IDVT, OECD WUI, OECD GDP, WUI, 10-year rate, RER, FDI]′. IDVT is the four-quarter growth (%) of the infectious disease equity market volatility tracker, OECD WUI is the OECD three-quarter weighted moving average World Uncertainty Index (excluding the UK), OECD GDP is OECD's four-quarter real GDP growth (%), WUI is the UK-specific three-quarter weighted moving average World Uncertainty Index, 10-year rate is the four-quarter difference of the 10-year interest rate (%), RER is the four-quarter real effective exchange rate growth (%), and FDI is the percentage share of FDI inflows in nominal GDP. The effective estimation is over the 1987Q1-2023Q3 period.