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The Relationship between Political Instability and Economic Growth in Advanced Economies: Empirical Evidence from a Panel VAR and a Dynamic Panel FE-IV Analysis

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Maximilian W. Dirks and Torsten Schmidt[1]

The Relationship between Political Instability and Economic Growth in Advanced Economies: Empirical Evidence from a Panel VAR and a Dynamic Panel FE-IV Analysis

Abstract

This paper analyzes the relationship between political instability and economic growth in advanced economies. Using a panel of 34 advanced economies from 1996 to 2020, we first employ a panel VAR estimated via System GMM, which allows us to explore the endogenous relationship between economic growth and political instability and to identify potential transmission channels. Second, we use an instrumental variable approach that exploits variation in median temperature and spillover effects of political instability from culturally approximate countries to establish causality. The empirical results suggest that political instability reduces GDP by 4 to 7 % five years after the shock, mainly through lower investment and consumption. A one standard deviation increase in economic growth reduces political instability by half a standard deviation, five years after the shock.

JEL-Codes: C33, C26, O43, P16

Keywords: Political instability; economic growth; panel VAR; system GMM; Panel IV; local projection

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1 Introduction

An erosion of democratic norms - such as electoral fairness, political pluralism, and the freedom of speech - is a concern in many countries. This phenomenon, which political scientist Larry Diamond (2015) calls a "democratic recession", is not confined to developing countries. Even in established Western democracies, political movements continue to emerge that challenge or even damage democratic institutions (Diamond, 2015; Fukuyama, 2020). Recent examples show that the challenges to democratic systems are diverse in nature. A defining feature of a democracy is the peaceful transfer of power, even accepted by those who lose an election. However, the 2021presidential election in the United States has shown that this transfer of power can be contested, even in well-established democratic nations. In addition, separatist movements, such as the one present in Catalonia, can pose a significant threat to a country's political stability. Another example is the "yellow vest" movement in France, characterized by widespread civil unrest, including acts of vandalism, looting, and violent confrontations with law enforcement. The movement initially began as a protest against tax increases, but later broadened to include demands for a higher minimum wage and general tax cuts.

These events do not necessarily threaten the democratic order in general, but they certainly raise political instability by challenging trust in democratic institutions. This could have a negative impact on economic development as many business and household decisions are influenced by the stability of the institutional environment. This is supported by a number of empirical studies which find, in particular, effects of political instability on domestic investment (Asteriou and Price, 2001) and consumption (Bahmani-Oskooee and Maki Nayeri, 2020) due to precautionary motives. In addition, Acemoglu et al. (2005) argues that political instability can lead to weak institutions, which in turn negatively affect the economy in the long-run.

Although a vast literature has worked on the relationship between political instability and economic growth, the quantification of the relationship between the two variables is still pending for two reasons. First, previous studies have mainly focused on the relationship between political instability and economic growth in developing countries, while advanced economies with established democracies have been treated much less frequently. Second, there is an ongoing academic debate with respect to the direction of causation. While the first strand of the literature emphasizes the important role of political stability for the prospects of economic growth (Aisen and Veiga, 2013; Alesina and Rodrik, 1994; Cukierman et al., 1992; Uddin et al., 2017), the second strand argues that political stability depends on economic performance (Paldam, 1998; Campos and Nugent, 2002; Collier, 2004; Goldstone et al., 2010; Gassebner et al., 2016; Al-Shammari and Willoughby, 2019). However, there are few studies that have examined both directions of causality in a common empirical framework.

We therefore analyze the relationship between measures of political stability and economic growth in a panel of 34 advanced economies that are considered as liberal democracies from 1996 to 2020. The possibility of a bidirectional relationship between economic growth and political instability poses a particular challenge for the identification strategy. Therefore, we propose two different identification strategies with unique advantages.

In the first step of the analysis, we estimate a panel vector autoregression (panel VAR) model which by design treats economic growth and political instability as endogenous and does not impose a direction of Granger causality a priori. We use Choleski decomposition to compute the impulse-response functions (IRFs) and examine the empirical relationship between the two variables. The panel VAR approach allows us to examine potential transmission channels between political instability and economic activity in more detail. To this end, we decompose GDP into its main expenditure side components: private consumption, investment and government consumption.

In the second step of the analysis, we use a dynamic panel fixed effects instrumental variable (Dynamic Panel FE-IV) approach to identify the causal effect of economic growth on political instability and vice versa. We use the political instability of culturally approximate countries as an exogenous source of domestic political instability following Grechyna (2018) and Vu (2022) and exploit variation in median temperature to instrument economic growth following Miguel et al. (2004). To account for the dynamic relationship between the two variables and to compare IV results with panel VAR results, we estimate Jordà (2005) local projections. While panel VAR standard errors tend to be much smaller, local projections yield results much more robust to model misspecification (Plagborg-Møller and Wolf, 2021).

Our results contribute to the existing literature by identifying the causal effect and the relevant transmission channels. First, in line with the vast majority of the empirical literature, we provide empirical evidence, that political instability negatively affects economic growth. Both, the panel VAR and the Dynamic Panel FE-IV show that a one standard deviation shock in political instability causally reduces GDP by 4 to 7 % five years after the shock, mainly through lower investment and consumption. Second, we find evidence that low economic growth - through investment - fosters political instability, while neither private consumption nor government spending are relevant transmission channels. The empirical findings emphasize that political instability is not economically relevant for developing countries only, but has implications for the prosperity in advanced economies, too.

The structure of the paper is as follows. First, the measure of political instability used in the paper is discussed in Section 2.1, while Section 2.2 provides a brief overview of the transmission channels between political instability and the economy discussed in the relevant literature. In Section 3 we present the applied data, while the empirical approach of the Panel VAR estimation is explained in Section 4. Results and robustness tests of the Panel VAR estimation are reported and discussed in Section 5 and Section 6, respectively. Section 7 presents the instrumental variable strategies and the corresponding findings. Section 8 sums up our most relevant results.

2 Political instability in advanced economies

2.1 Measures of political instability

Political instability can be defined as the extent to which the distribution of power within a political system is challenged by internal or external political actors.[1] According to Jong-A-Pin (2009) four different dimensions of political instability can be distinguished: *1) Politically motivated aggression, 2) mass civil protests, 3) instability within the political regime,* and *4) instability of the political regime*. While most empirical studies focus on the relationship between political stability and economic growth in developing countries, *mass civil protests* and *instability within the political regime* are clearly relevant for advanced economies as well.

Relying on one-dimensional proxies, e.g. the number of purges or riots, regular and irregular regime changes, successful and unsuccessful coups d'etat, or government collapses, as frequently done in the empirical literature (Parvin, 1973; Asteriou and Price, 2001; Aisen and Veiga, 2006, 2013), leads to an omitted variable bias if the full extent of political instability remains unobserved (Jong-A-Pin, 2009). To limit this bias, multidimensional indices are frequently applied in the empirical literature (e.g. Cukierman et al., 1992; Barro, 1991; Alesina and Perotti, 1996; Obinger, 2000; Campos and Nugent, 2002; Blanco and Grier, 2009; Goldstone et al., 2010; Kim, 2010; Bernal-Verdugo et al., 2013; Gyimah-Brempong, 1999; Uddin et al., 2017; Andrijevic et al., 2020; Al-Shammari and Willoughby, 2019; Bernal-Verdugo et al., 2013; Akçoraoğlu and Kaplan, 2017; Busse and Hefeker, 2007).

Therefore, we employ the World Governance Indicator (WGI) of Political Stability and Absence of Violence/Terrorism. This frequently used multidimensional index (e.g. Uddin et al., 2017; Grechyna, 2018; Ezcurra, 2021; Vu, 2022) is constructed to measure the "perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including political violence and terrorism".

The advantage of the indicator is that it combines the information from many different subindicators that measure more specific aspects of political instability. The index is constructed by using an unobserved component model that comprises data from different sources (see Table 1). The rationale of aggregating data from different sources is that each subindicator is assumed to be a noisy signal of the underlying notion of political stability. The Method of Unobserved Components provides a way to extract the signal of interest while excluding noisy variation in the data (Kaufmann et al., 2011). Jong-A-Pin (2009) confirms that composite indices of political stability have a smaller measurement error.

A disadvantage of the indicator is that the combination of the data prevents a direct identification of the driving forces. However, the underlying data used to create the WGI of Political Stability and Absence of Violence/Terrorism is easily available. For example, when large shifts in the indicator occur it is often

[1] Therefore, it is conceptually different from the related concept of political uncertainty, which is uncertainty caused by a possible change in the political situation, where it is unclear how this change will be shaped and what consequences it may have. On the one hand, policy uncertainty may be a direct consequence of political instability. On the other hand, a high degree of policy uncertainty does not have to lead to political instability. For instance, policy uncertainty picked in most advanced economies in 2020 due to the COVID-19 Pandemic, while political instability has remained relatively unaffected.

possible to trace these developments back to their source, which improves the overall understanding of the data.

Therefore, we also examine the subindices of the WGI of Political Stability and Absence of Violence/Terrorism. Figure 1 shows the WGI of Political Stability and the Economist Intelligence Unit Riskwire and Democracy Index, Political Risk Services International Country Risk Guide, and the Global Insight Business Conditions and Risk Index for six selected countries. The data indicates an overall trend of increasing instability in most observed countries across all subindices and the aggregated index of political instability. The three subindices capture events of political instability corresponding to the dimension of *mass civil protest* and *instability within the political regime*. As they account for 96 % of the variance in the WGI of Political Stability, they indicate that these two dimensions are the predominant sources of political instability in advanced economies.

The main cause of increasing *instability within the political system* is a decrease in government unity, legislative strength and popular support (Howell, 2011). In line, Hadjar and Köthemann (2014) finds that the trust in political institutions in many advanced economies is decreasing since the 1980s. Since all examined advanced economies are considered to be liberal democracies, the increasing political instability is directly related to the growing pressure on the related institutions. We note that the underlying causes of this trend are multivariate. Diamond (2015) argues that the increased pressure on Western democracies is driven by bad governance, i.e., governments were not able to address the crucial problems of the society properly. Looking to the United States, he mentions the shutdown of the federal government in 2013, the increasing inability of the legislation to fulfill its obligations and the inability of Congress to pass a budget.

The second reason is a recent increase in *mass civil protest*, the causes of which are multivariate, too. Important drivers of social unrest are economic stagnation (Alesina and Perotti, 1996), cuts in government spending or tax rises (Ponticelli and Voth, 2020), rising inequality (Rodrik, 2018), economic crises and climate change (Brannen et al., 2022). In Europe, many movements are also associated with anti-migration and left and right wing populist movements as Cross-National Time-Series Data Archive (CNTS) data reveals, emphasizing the intervenes between populism and political instability.

2.2 Transmission of political instability in advanced economies

Many different transmission channels between political instability and the economy are discussed in the literature. The following section sums up the relevant findings with respect to the transmission channels between political instability and the components of GDP.

First, Asteriou and Price (2001) argue that political instability creates an environment of uncertainty affecting the investment behavior of risk-averse market agents. In an environment of increasing political instability, the resultant uncertainty about future developments would cause a more cautious attitude of investors. Postponing investment gives investors more time to reconsider their business decisions, but compared to a counterfactual without political instability, it leads to an immediate drop in investment. Furthermore, this uncertainty may lead to capital outflows (Alesina and Tabellini, 1989). Further empirical evidence is provided by Barro (1991), Alesina and Perotti (1996) and Blanco and Grier (2009).

	Subindex	Events of political instability
1	Economist Intelligence Unit Riskwire and Democracy Index	Orderly transfers, Armed conflict, Violent demonstrations, Social unrest, and International tensions / terrorist threat
2	Cingranelli Richards Human Rights Database and Political Terror Scale	Political Terror Scale
3	iJET Country Security Risk Ratings	Security risk rating
4	Institutional Profiles Database	Intensity of internal conflicts: ethnic, religious or regional, Intensity of violent activities, and Intensity of social conflicts (excluding conflicts relating to land)
5	Political Risk Services International Country Risk Guide (ICRG)	Government stability, Internal conflict, External conflict, and Ethnic tensions
6	Global Insight Business Conditions and Risk	Protests and Riots, Terrorism, Interstate war and Civil war

Table 1: Components of the WGI of Political Stability and Absence of Violence/Terrorism. Source: Kaufmann and Kraay (2020)

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Second, political instability leads to a restraint of consumption expenditures since risk-averse market agents increase their savings for precautionary motives. With respect to the literature on risk and uncertainty, this effect is well documented by the literature (Miles, 1997; Hahm and Steigerwald, 1999; Banks et al., 2001; Guariglia, 2002; Menegatti, 2007, 2010; Bahmani-Oskooee and Maki Nayeri, 2020). In addition, the behavior of private households with regard to purchases of durable goods is quite similar to the behavior of firms (Coibion et al., 2018). It is therefore likely that political instability also has an effect on private consumption. Likewise, the reverse relationship may hold as well. If budget restrictions become tighter due to e.g. decreased purchasing power, the dissatisfaction with the political regime in charge may increase leading to political instability.

Third, the effect of political instability on government consumption is less clear. On the one hand, Darby et al. (2004) argue that government consumption is positively affected by political instability since governments in unstable political environments seek to address short-term issues rather than long-term problems. On the other hand, governments under pressure may be urged to consolidate and, therefore, have to reduce government consumption. Vice versa, changes in government consumption may be a source of political instability. Ponticelli and Voth (2020) provide causal inference that fiscal retrenchment fuels political instability. Especially expenditure cuts, rather than tax rises, have significant effects on the occurrence of civil unrest and protest.

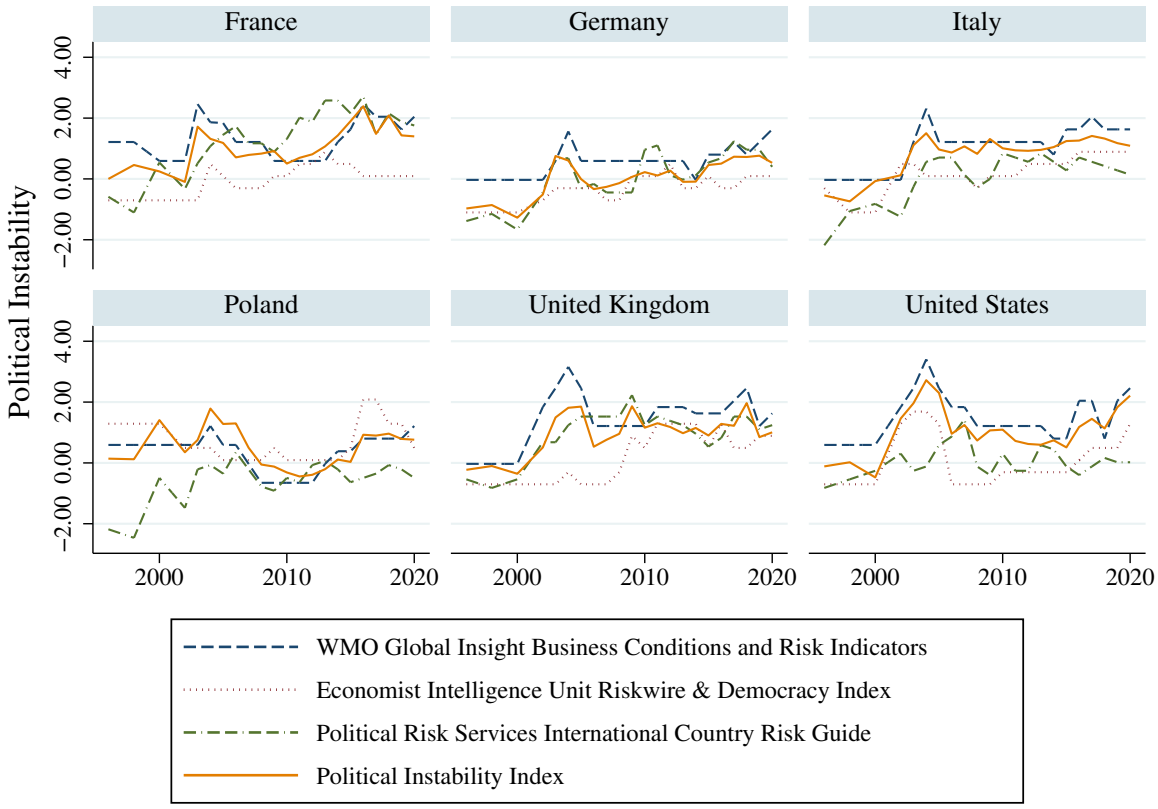

Figure 1: Different measures of Political Instability (standardized to mean = 0 and standard deviation = 1) between 1996 and 2020: WMO Global Insight Business Conditions and Risk Indicators (dashed line), Economist Intelligence Unit Riskwire and Democracy Index (dotted line), Political Risk Services International Country Risk Guide (dashed/dotted line), and the WGI of Political Stability and Absence of Violence/Terrorism (solid line). Events of political instability measured by the different measures are reported in Table 1.

3 Data

In this paper we use data for a panel of 34 selected advanced economies including the G7 countries, all member states of the European Union but Bulgaria, Romania and Malta, as well as Switzerland, Norway, and South Korea [2]. We focus on advanced economies for two reasons. First, most of the empirical literature focuses on developing countries. Although political instability is increasing in advanced countries, the dynamic relationship with economic growth remains largely unresolved. The selection of countries allows us to fill this research gap. Second, restricting the sample on advanced economies that are similar in terms of economic progress and political institutions is advantageous with respect to the empirical estimation since we can exploit the cross-country dimension in a homogenous estimation framework and increase the precision of inference.

Note, that the WGI of Political Stability and Absence of Violence/Terrorism captures political stability and ranges from approximately -2.5 to 2.5. For ease of exposition, we invert the index by multiplying by -1 and interpret it as an index of political *instability*. Hence, higher values are associated with a higher

[2]The panel includes data on Australia, Austria, Belgium, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and the United States.

degree of political instability. The index is available for all countries in the sample for the years 1996, 1998, 2000 and from 2002 to 2020. Missing data points are approximated using linear interpolation technique, to ensure a balanced panel.[3]

As shown in Table 2, the mean of political instability in the sample is -0.89. Compared to other regions in the world, such as Subsahara Africa, this indicates a high level of stability as can be seen in Figure 2. However, we note that instability has increased since the Global Financial Crisis by 15 %. Only in the Middle East and in former members of the Soviet Union a stronger increase in political instability was recorded in this period, as can be seen in Figure 3 that shows the absolute increase in political instability in the world since 2007. The highest values of political instability in the sample are measured in southern Europe (Italy, France, Spain, and Greece) after the European debt crisis. Additionally, the US and UK are characterized by a high general level of instability, while northern European countries and Switzerland tend to be more stable.

	Variable	Abbreviation	Mean	Std. Dev.	Min.	Max.	N	Source
1	Political Instability Index	pi	-0.889	0.412	-1.76	0.474	850	Kaufmann and Kraay (2020)
2	Economist Intelligence Unit Riskwire & Democracy Index	eiu	-0.812	0.126	-1	-0.35	830	The Economist Country Viewswire Service
3	WMO Global Insight Business Conditions and Risk Indicators	wmo	-0.872	0.1	-1	-0.5	850	IHS Markit World Economic Service
4	Political Risk Services	prs	-0.778	0.081	-0.977	-0.559	840	International Country Risk Guide
5	Real GDP (in billion constant 2015 USD) in growth rates	gy	0.023	0.034	-0.148	0.252	848	World Bank and OECD National Accounts
6	Investment (in billion constant 2015 US$) in growth rates	gi	0.033	0.111	-0.543	1.019	850	World Bank and OECD National Accounts
7	Consumption (in billion constant 2015 US$) in growth rates	gc	0.022	0.035	-0.174	0.184	850	World Bank and OECD National Accounts
8	Government consumption (in billion constant 2015 US$) in growth rates	gg	0.02	0.026	-0.1	0.15	850	World Bank and OECD National Accounts

Table 2: Summary statistics

Data for GDP in constant 2015 US-Dollar (USD) is taken from the World Bank and is available for the whole period from 1996 to 2020 for all 34 countries of the sample yielding 850 observations. Table 2 shows that GDP growth rates range between -14.8 % to 25.2 % indicating the huge impact of the financial crisis, the European debt crisis, and the COVID-19 Pandemic on economic development. In all countries in the sample, a significant decline in growth rates can be observed between 2008 and 2009 and in 2020. In addition, southern European countries experienced another drop between 2010 and 2011. Further, most advanced economies are facing stagnating or even declining growth rates. Various explanations and numerous potential drivers are discussed in the literature. Amongst the most common justifications are: decreasing returns from research and development (Bloom et al., 2020), structural transformation (Nordhaus, 2006), and problems in the transfer of technology (Andrews et al., 2016). Table 3 shows moderate correlations between the index of political instability and GDP growth rates.

[3]We note that interpolated data points do not affect the overall results.

We are also interested in the components of GDP, investment, private consumption and government consumption. We retrieve data on gross capital formation (in constant 2015 US$), general government final consumption expenditure (in constant 2015 USD) and households final consumption expenditure (in constant 2015 USD) from the World Bank. Since all GDP components contain a unit-root in levels, the variables are transformed into growth rates to achieve stationarity. Transformed GDP components have a negative correlation with political instability measured by the WGI as Table 3 reports.

	Variables	1	2	3	4	5	6	7	8
1	Political Instability Index	1.000							
2	Economist Intelligence Unit Riskwire & Democracy Index: Orderly transfers, Armed	0.723	1.000						
3	WMO Global Insight Business Conditions and Risk Indicators: Protests and riots,	0.840	0.418	1.000					
4	Political Risk Services International Country Risk Guide: Government stability,	0.634	0.393	0.455	1.000				
5	Real GDP (in billion constant 2015 US-Dollar) in growth rates	-0.140	-0.022	-0.140	-0.193	1.000			
6	Investment (in billion constant 2015 US$) in growth rates	-0.049	0.028	-0.050	-0.083	0.694	1.000		
7	Consumption (in billion constant 2015 US$) in growth rates	-0.149	-0.060	-0.155	-0.189	0.817	0.591	1.000	
8	Government expenditure (in billion constant 2015 US$) in growth rates	-0.068	-0.020	-0.070	-0.129	0.335	0.182	0.286	1.000

Table 3: Cross-correlation table

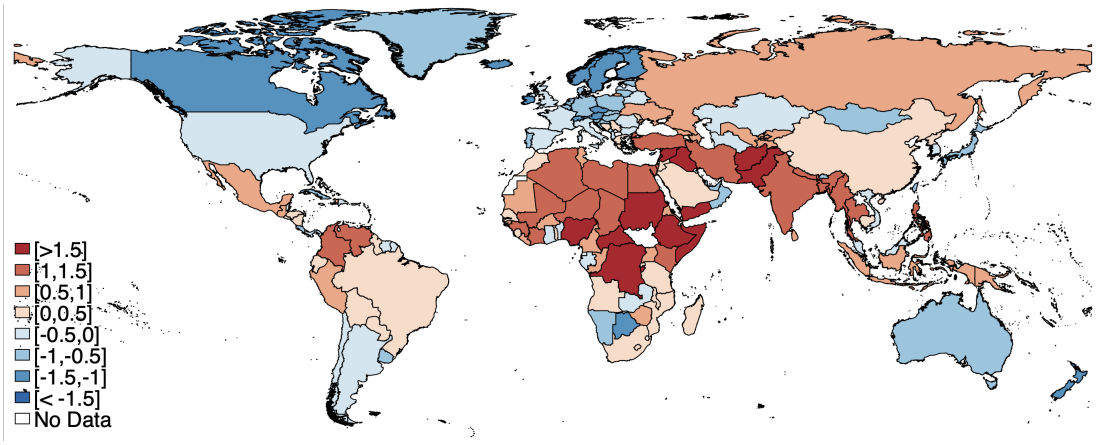

Figure 2: Average of political instability measured by the WGI of Political Stability and Absence of Violence/Terrorism (Kaufmann and Kraay, 2020) between 2007 and 2020. Higher values (red)/lower values (blue) correspond to higher/lower levels of average political instability. On average the political instability equals 0.05 with a standard deviation of 0.95.

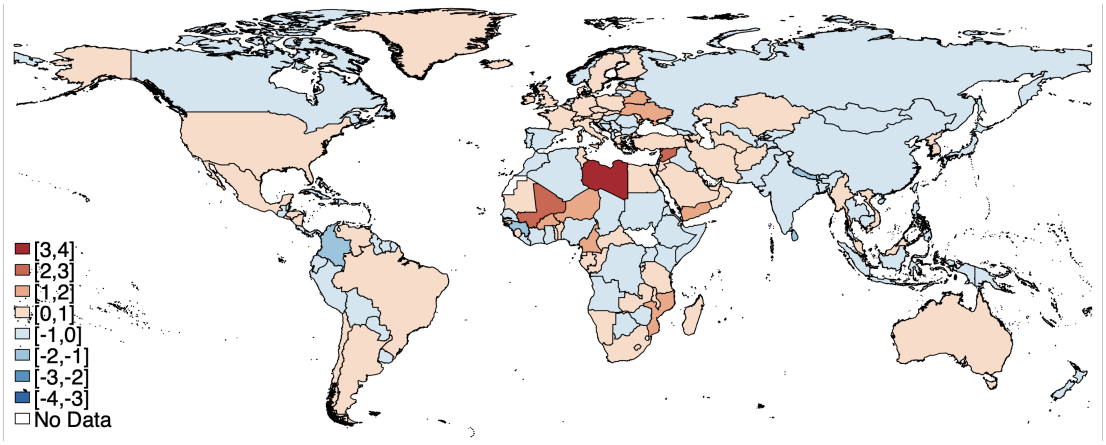

Figure 3: Absolute change of political instability measured by the WGI of Political Stability and Absence of Violence/Terrorism (Kaufmann and Kraay, 2020) since 2007. Higher values (red)/lower values (blue) correspond to an increase/decrease of average political instability. On average political instability has increased since 2007 by 0.02 with a standard deviation of 0.62.

4 Empirical approach

We use a homogenous panel VAR with fixed effects to analyze the relationship between economic growth and political instability of the form

$$Y_{i,t} = A_1 Y_{i,t-1} + A_2 Y_{i,t-2} + ... + A_p Y_{i,t-p} + \mu_i + e_{i,t} \tag{1}$$

where $Y_{i,t}$ is a vector of the endogenous variables, p is the lag length, μ_i is a vector of panel fixed-effects and $e_{i,t}$ denotes the idiosyncratic error for country i and year t, respectively. In specification I the vector contains economic growth and political instability. To identify the relevant economic transmission channels, we decompose economic growth into its three main components: government consumption, private consumption and investment. Since the degrees of freedom decrease with each variable added to the system, we hesitate from including more variables. The matrices A_1, A_2 to A_p are parameters to be estimated.

The panel VAR method allows us to take advantage of a panel structure with an increased sample size and statistical power, while controlling for time-invariant unobserved heterogeneity (e.g. monetary policy regimes, different political systems etc.) with the implementation of country fixed effects (Abrigo and Love, 2016).

Estimating the system described in equation 1 with first differences or fixed effects, leads to inconsistent estimators as the lagged dependent variables on the right-hand side are correlated with the error term in dynamic panels (Nickell, 1981). Especially for panels with no long T, this bias should not be underestimated as Monte Carlo simulations by Judson and Owen (1999) reveal. To limit the Nickell bias Judson and Owen (1999) suggest to estimate equation 1 with the Generalized Method of Moments (GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998). The Arellano-Bond estimator builds a system in which differenced variables are used as instruments for their levels and level-form variables are used as instruments for their differences vice versa.

To remove the fixed effect, we employ forward orthogonal deviation proposed by Arellano and Bover (1995) instead of first differences. This yields two advantages. First, it limits the loss of sample size in

the case of gaps in the panels (Roodman, 2009). Second, Hayakawa (2009) shows in a Monte Carlo simulation that GMM estimates employing forward orthogonal deviation outperform estimates obtained with first differences. The number of lags included in the panel VAR, is determined using the Modified Akaike Information Criterion. Additionally, we include the first four lags as "GMM-Style" instruments as suggested by Holtz-Eakin et al. (1988).

Abrigo and Love (2016) emphasize that the exogeneity of the implemented instruments is a necessary condition to achieve unbiased estimates. Therefore, we apply the Hansen test, which tests the null hypothesis of joint validity of instruments. However, Roodman (2009) argues that too many instruments will bias the Hansen statistic. Due to its methodology, the number of instruments rises with T and the number of variables included in the analysis. If too many instruments are included in the system GMM, the endogenous variables are overfitted. *"Unfortunately, there appears to be little guidance from the literature on how many instruments is too many"* (Roodman, 2009, p. 99). As a rule of thumb, Roodman (2009) suggests to treat Hansen p-values higher than 0.25 with caution.

To illustrate how the variables of the model are affected by each other, IRFs are computed based on the panel VARs regression output. To this end, a set of restrictions has to be applied. We use Choleski decomposition to identify the orthogonal shocks in the VAR. Choleski decomposition orders the examined variable with respect to their degree of endogeneity: Shocks on variables earlier in order affect the subsequent variables both contemporaneously and lagged, while subsequent variables affect previous variables with a lag (Abrigo and Love, 2016). We argue that political instability is by definition subject to recent developments in the political system such as elections, strikes, demonstrations, coups etc. and, therefore, fast-moving. Thus, we assume that it affects economic growth and, thus, government consumption, private consumption and investment contemporaneously and with delay. The economic variables, affect political instability with a lag only. Since no other study has employed a VAR to examine the effects of political instability on the economy, empirical evidence on the ordering is scarce. However, (Baker et al., 2016) have fitted a VAR to explore the effects of political uncertainty, a different but related concept, on economic variables placing the innovation from the political system at the beginning of the Choleksi order. Góes (2016), in contrast, employ a panel VAR estimating the effect of institutional quality on economic growth, placing the innovation in the political system at the end of the Choleski ordering. In order to stress the identified effect, Colombo (2013) places uncertainty after the block of macroeconomic variables as well. Therefore, results of alternative ordering are presented and discussed to test the robustness of the estimated model.

Motivated by Forni and Gambetti (2016) and Blanchard and Perotti (2002) we place government consumption second in order, followed by private consumption and investment, eventually. The rationale is that government consumption is relatively stable and much less dependent on the business cycle than consumption and investment (Caldara and Kamps, 2008). Therefore, we assume that it is not affected by private consumption and investment contemporaneously. Consumption is also highly persistent. We expect it to be influenced by investment only with a lag. However, investment tends to be highly dependent on the business cycle and on changes in the political system. Therefore, it should be affected contemporaneously by political instability, consumption and government consumption and placed at the end of the Choleski order.

As a result we use the following ordering of the system as our baseline: 1) Political Instability and 2) Economic Growth. In the estimation with decomposed GDP we argue for a Choleski ordering of 1) political instability, 2) government consumption, 3) private consumption and 4) investment.

Following the expenditure approach, GDP is by definition the sum of government consumption, investment and private consumption in addition to net exports. To estimate the effect of an orthogonal shock of political instability on economic growth and vice versa, we aggregate the estimated IRF of consumption, investment and government consumption. More precisely, IRFs of economic growth are the weighted sums of consumption growth, investment growth and government consumption growth with respect to their share of GDP. For the sake of simplicity, we assume net exports to be stable in order to compute the IRF with respect to economic growth.

5 Results

5.1 The relationship between political instability and economic growth

We start by analyzing the relationship between political instability and economic growth. We estimate the bivariate panel VAR with system GMM. The AIC criterion suggest a length of $p = 1$ and we include the first two lags as "GMM-Style" instrument. We note that the overall results are robust to a different number of lags of "GMM-Style" instruments. Further, the panel VAR is invertible and has an infinite order vector moving-average representation and is, thus, stable (Abrigo and Love, 2016).

We calculate IRFs for the consecutive five years after a shock (Figure 4). The horizon of 5 periods ahead was chosen, since non-cumulative IRFs become insignificantly different from zero five years after the shock. The IRFs are based on a one standard deviation shock. To estimate the confidence bands, 100 Monte Carlo simulations were employed using Gaussian approximation as proposed by Abrigo and Love (2016).

The estimated effect of economic growth on political instability is negative (Figure 4). The results indicate that political instability is reduced by 0.06 units, corresponding to one fifth of a standard deviation of political instability. The effect is statistically significant to the level of significance of 68 %.

Looking at the inverse relationship, we find that political instability has a negative and statistically significant effect on economic growth. Five years after a shock of political instability by one standard deviation, GDP is reduced by around 6 % as Figure 4 shows. Qualitatively, this is in line with the vast majority of the relevant literature (Barro, 1991; Chen and Feng, 1996; Aisen and Veiga, 2013).

5.2 The relationship between political instability, investment, consumption and government consumption

In the next step of the analysis, we decompose GDP into its main three components: investment, private consumption and government consumption to identify the relevant transmission channels. The regression output is displayed in Table A.1. MAIC criterion suggests a length of $p = 2$. We include the first four lags as "GMM-Style" instruments. The Hansen J-Statistic indicates that the selection of instruments is valid.

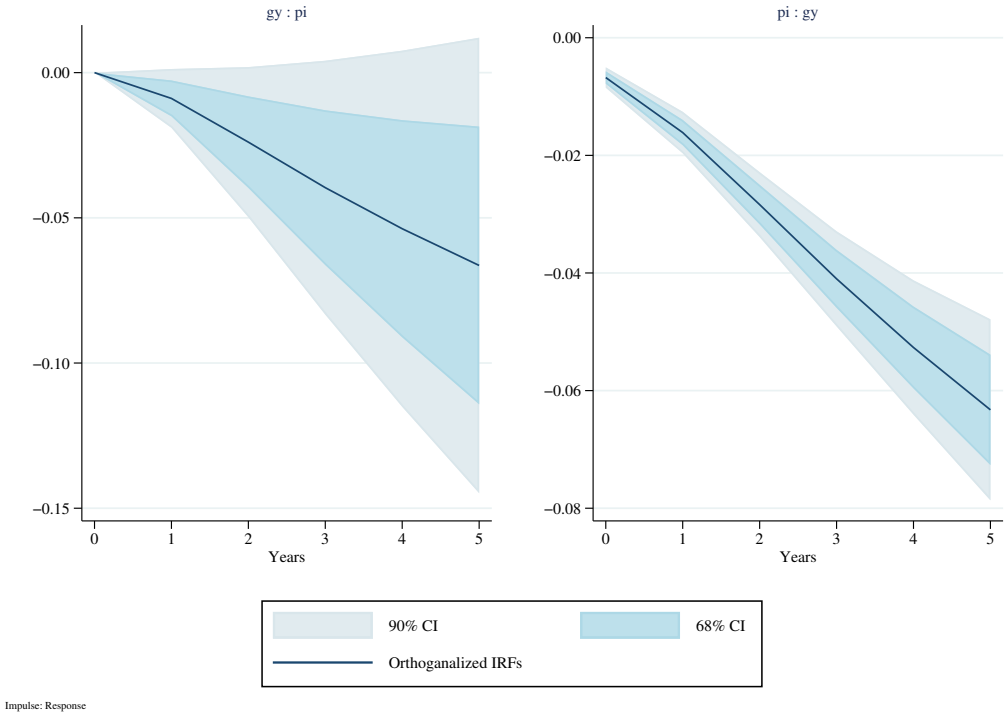

Figure 4: Cumulative impulse response functions of political instability and economic growth (specification I). This figure plots the cumulative effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) economic growth (gy). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively.

The panel VAR is stable, too. The corresponding orthogonalized IRFs and cumulative orthogonalized IRFs are presented in Figure A.1 and Figure 5, respectively, for the consecutive five years.

First, we look at the effects of political instability on consumption, investment, and government consumption. In line with the empirical literature (Alesina and Perotti, 1996; Perotti, 1996; Aisen and Veiga, 2013) we find that an increase in political instability by one standard deviation has a negative and statistically significant impact on investment. Figure 5 shows that after five years investment is decreased by approximately 10 % compared to a counterfactual without a shock of political instability. This result emphasizes the importance of political instability for private investment. Likewise, we find a negative effect on private consumption and government consumption. Our results suggest that five years after a shock in instability consumption falls by 7.5 % and government consumption by approximately 2.5 %. Risk-averse agents reduce their consumption if political instability is increasing. To approximate the overall effect of political instability on economic growth we aggregate the effects on consumption, investment and government consumption. We estimate that a shock of political instability decreases GDP by 7 % five years after a shock, eventually shifting the economy to a lower level of output. The cumulative effect of political instability is, therefore, very similar to the effect obtained in specification I.

Second, we test the Granger causal effects from our main macroeconomic variables on political instability. The results in the very right column of Table A.1 show the impulse response of political instability shocked by consumption, government consumption and investment, respectively. The results of our anal-

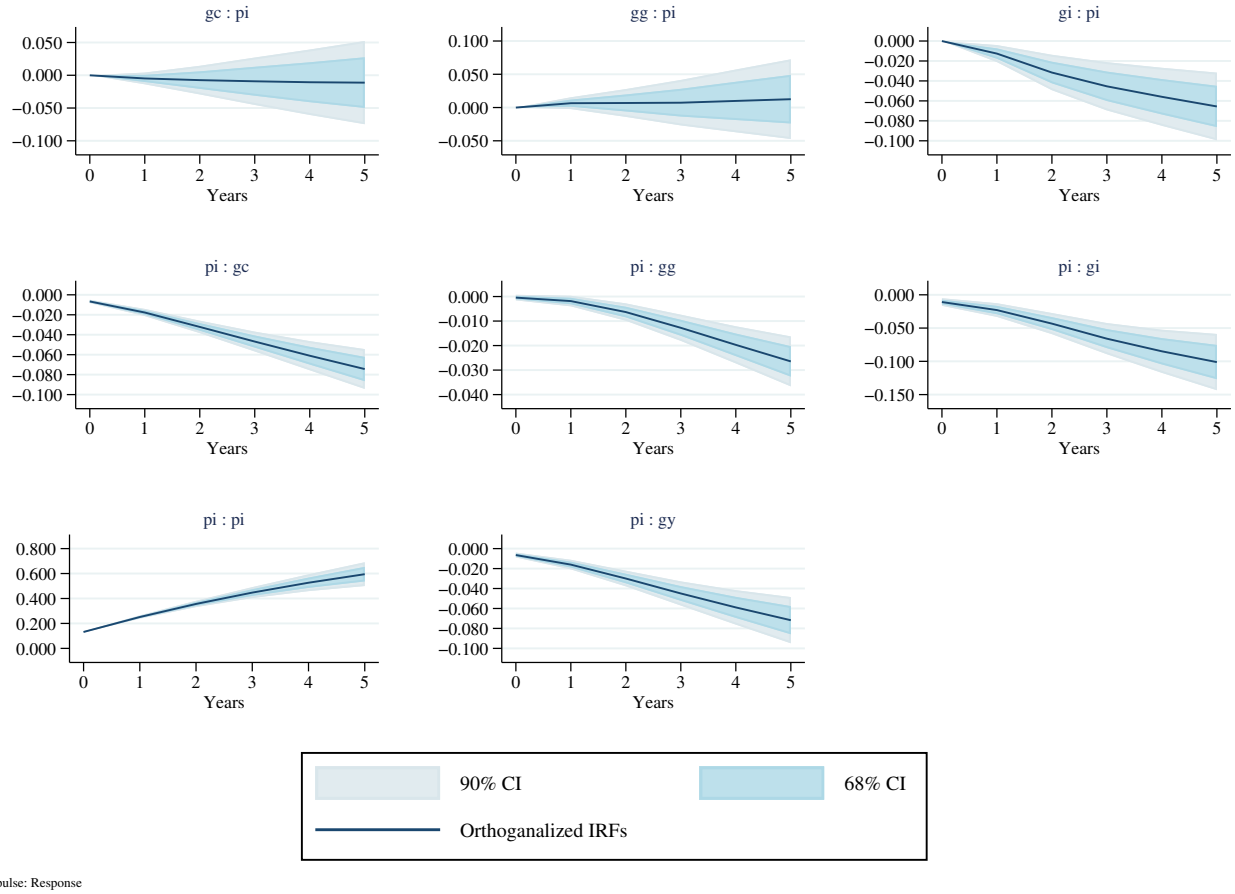

Figure 5: Cumulative impulse response functions of political instability, government consumption, private consumption and investment (specification II). This figure plots the cumulative effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) government consumption (gg), 3) private consumption (gc) and 4) investment (gi). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively. To compute the aggregated effect of political instability on economic growth the IRFs of political instability on consumption growth, investment growth and government consumption growth are summed up according to their share of real GDP.

ysis indicate that investment serves as the primary channel through which the business cycle affects political instability. Specifically, a one standard deviation positive shock to investment is associated with a reduction in political instability of approximately 0.06 units five years following the shock. This outcome is consistent with the findings of specification I, which similarly estimates a reduction in political instability of 0.06 units.

Third, we note that the IRFs of private consumption, government consumption, and investment with respect to a shock of one of the other variables have the expected signs and are statistically significant. In most cases the shocks take less than five periods until they become insignificant from zero.

Table A.2 shows the results from a variance decomposition analysis and indicates what percentage of the variance in the response variable is explained by the impulse variable. The analysis emphasizes the long-termed effect of political instability on the economy. In fact, the analysis shows that the explanatory power of political instability on all three economic variables under investigation increases over time. The variance of private consumption for instance is highly dependent on political instability variability as it explains up to 54 %. This long-term effect cannot be explained by the direct effects of demonstrations and protests (Matta et al., 2022). Therefore, we conclude that indirect effects, such as uncertainty or institutional inefficiency, must be the dominant channels. Since the political instability in advanced economies is closely related to increased pressure on liberal democracies our results are in line with the related research. Indeed, Acemoglu et al. (2005) argue that the shape of institutions has long-lasting effects on the economy since it shapes *inter alia* the conditions for investment. Furthermore, democratization is found to have a long-lasting effect on economic growth (Acemoglu et al., 2019). Our findings suggest that instability within these democratic institutions has an inverse and comparable long-lasting effect on the economy.

6 Robustness checks

In this section we present the results of some alternative model specifications to test the robustness of our results. In detail, we control for the effect of economic crises (specification III), we reverse the Choleski ordering (specification IV) and implement the Political Risk Services International Country Risk Guide Index as alternative measure for political instability (specification V). The results confirm our findings qualitatively and, to a certain degree, quantitatively.

6.1 Economic crises

Global recessions are periods of significant reductions in economic activity. Often, we can observe that investment and consumption decline, while the crises' effect on government consumption is less clear. Within the observed time period, the Great Recession of 2008/2009 in the advance of the global financial crisis and the economic crisis of 2020 in the wake of the COVID-19 Pandemic are of particular importance: Real economic output stagnated in 2008, declined by 3.5 % in 2009 and by 4.9 % in 2020.

To control whether economic crises drive the overall results, we include two dummies as exogenous variables in the panel VAR of equation 1. The first dummy accounts for the effects of the Great Recession

and is equal to one during the years of 2008 and 2009 and zero otherwise. The second dummy accounts for the effects of the COVID-19 Pandemic and is equal to 1 in 2020 and 0 otherwise. IRFs for specification III are displayed in Figure 6.

We can observe deviations in size with respect to some of the variables under investigation. The effect of political instability on investment after 5 periods decreases from -10 % to -7 % if controlled for global economic recessions. Likewise, the cumulative effect of political instability on private consumption and government consumption is reduced. However, the overall results in terms of signs and significance remain robust. On the aggregated level we find a negative effect of political instability on economic growth as such as GDP is decreased by approximately 4 % five years after a shock of political instability.

6.2 Alternative order

To assess whether our results depend on the causal ordering we follow a common approach in the literature and estimate a panel VAR with the reverse causal ordering: 1) investment 2) private consumption 3) government consumption and 4) political instability.

Impulse response functions for specification IV displayed in Figure 7 indicate that the negative effect of political instability on the economic components of GDP is robust to a different causal ordering in terms of sign, size and significance. Furthermore, we note that the responses of private consumption, investment, and government consumption to a shock of one of the economic variables are consistent with our previous results. With respect to the effect of a shock in one of the economic variables, we again find that an investment shock reduces political instability. However, the reverse order also shows a negative effect of private consumption on political instability.

6.3 Alternative measure

There is an ongoing debate in sociology and political science whether protests and demonstrations truly indicate a growing disconnection from the political system and a loss of faith in the political institutions (Daphi et al., 2021). Empirical evidence shows that demonstrators are generally associated with a lower level of political trust than the general public (Hooghe and Marien, 2013). However, Della Porta (2009) and Flesher Fominaya (2020) argue that demonstrations - in particular in Western democracies - may be a part of regular democratic participation which as such can also strengthen political stability.

If protests and demonstrations are a bad proxy for political instability, this may bias the results. To address this issue, we estimate equation 1 using the Political Risk Services International Country Risk Guide Index as an alternative measures of political instability that does not proxy for events related to the mass civil protest dimension of political instability.

Panel VAR impulse response functions for specification V reported in Figure 8 provide results similar to the main specification. Again, we find that instability has a decreasing effect on economic growth via a reduction in investment, private consumption, and government consumption. Although a shock of investment decreases political instability, the overall effect on economic growth is not significantly different from zero. The empirical findings suggest that the data on protests included in the WGI of Political Stability - that might not increase political instability - do not bias the overall results.

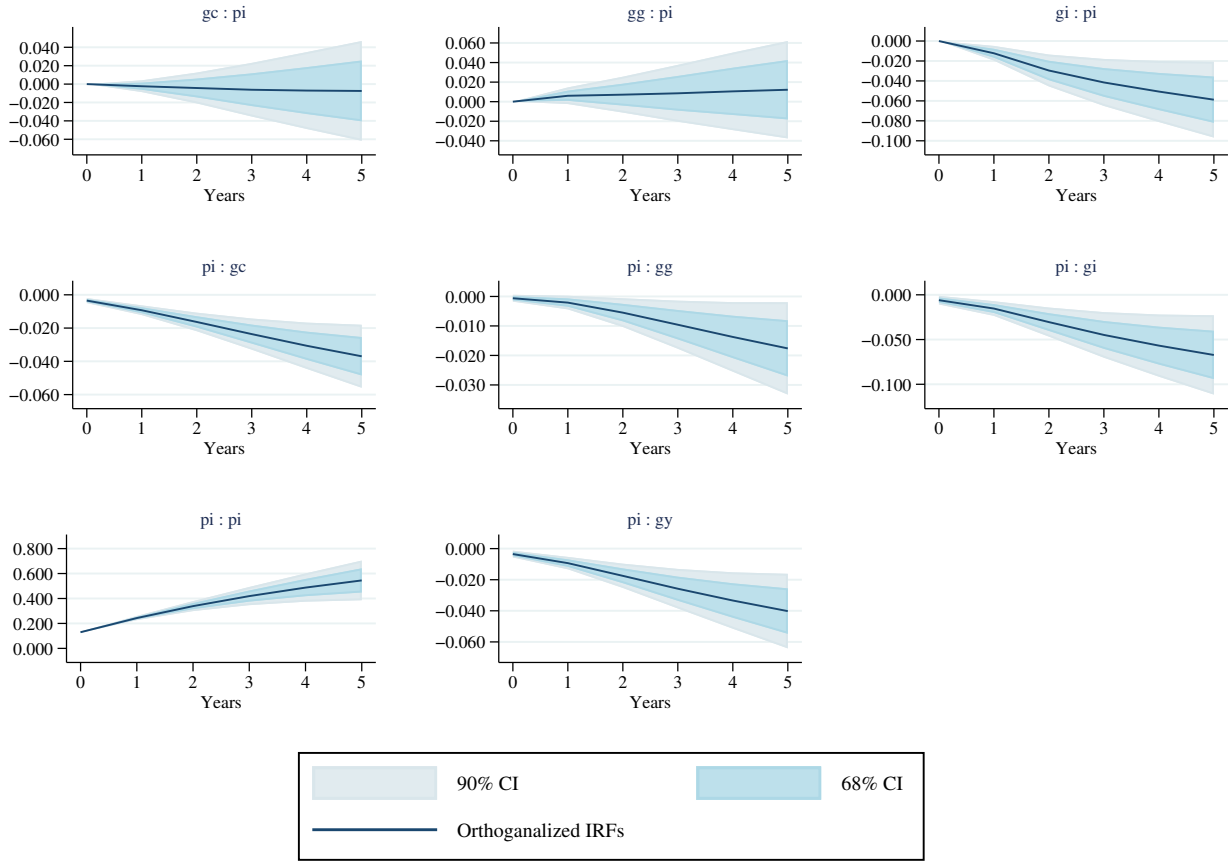

Figure 6: Cumulative impulse response functions of political instability, government consumption, private consumption and investment with Global Financial Crises and COVID-19 Pandemic dummy (specification III). This figure plots the cumulative effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) government consumption (gg), 3) private consumption (gc) and 4) investment (gi). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively. To compute the aggregated effect of political instability on economic growth the IRFs of political instability on private consumption growth, investment growth and government consumption growth are summed up according to their share of real GDP.

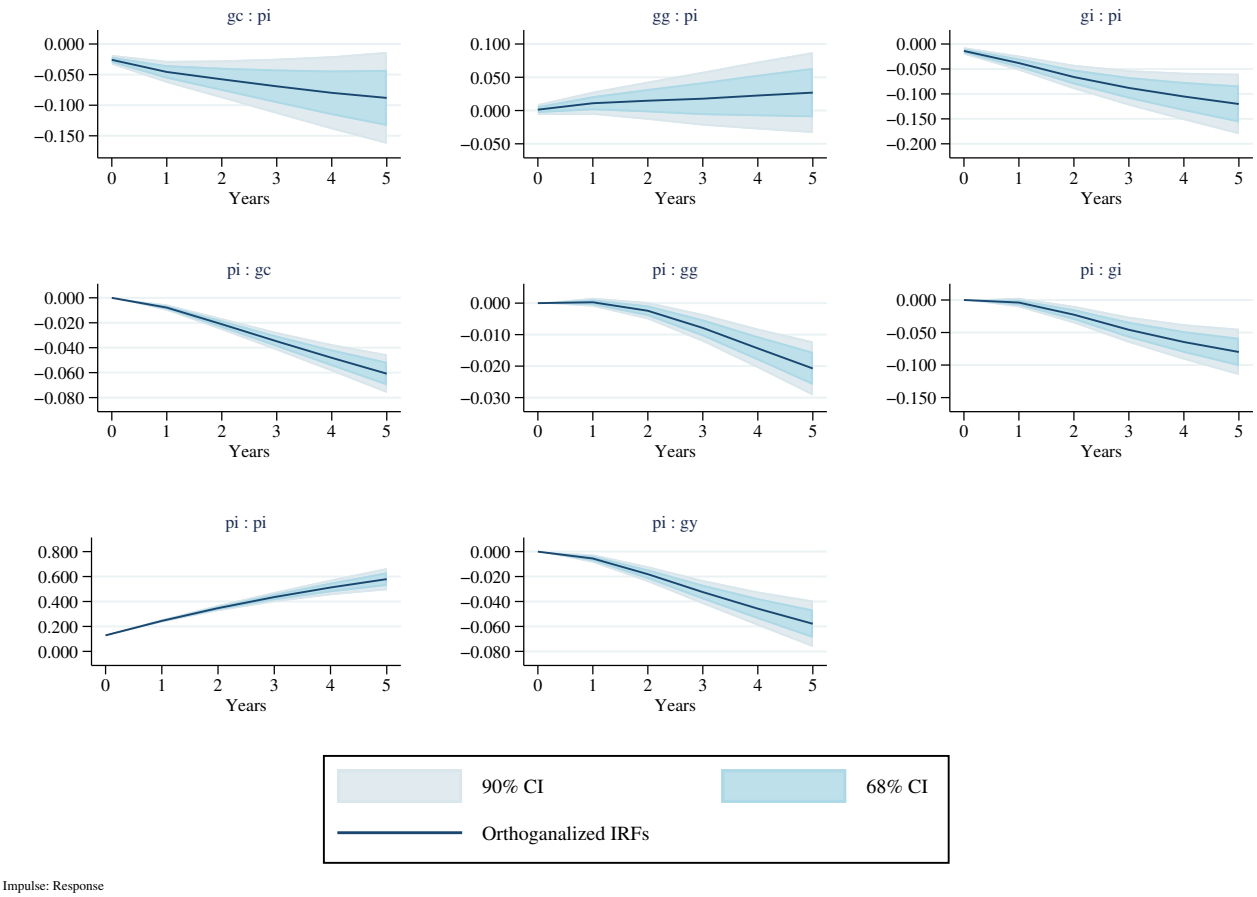

Figure 7: Cumulative impulse response functions of political instability, government consumption, private consumption and investment with alternative Choleski order (specification IV). This figure plots the cumulative effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) government consumption (gg), 3) private consumption (gc) and 4) investment (gi). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively. To compute the aggregated effect of political instability on economic growth the IRFs of political instability on private consumption growth, investment growth and government consumption growth are summed up according to their share of real GDP.

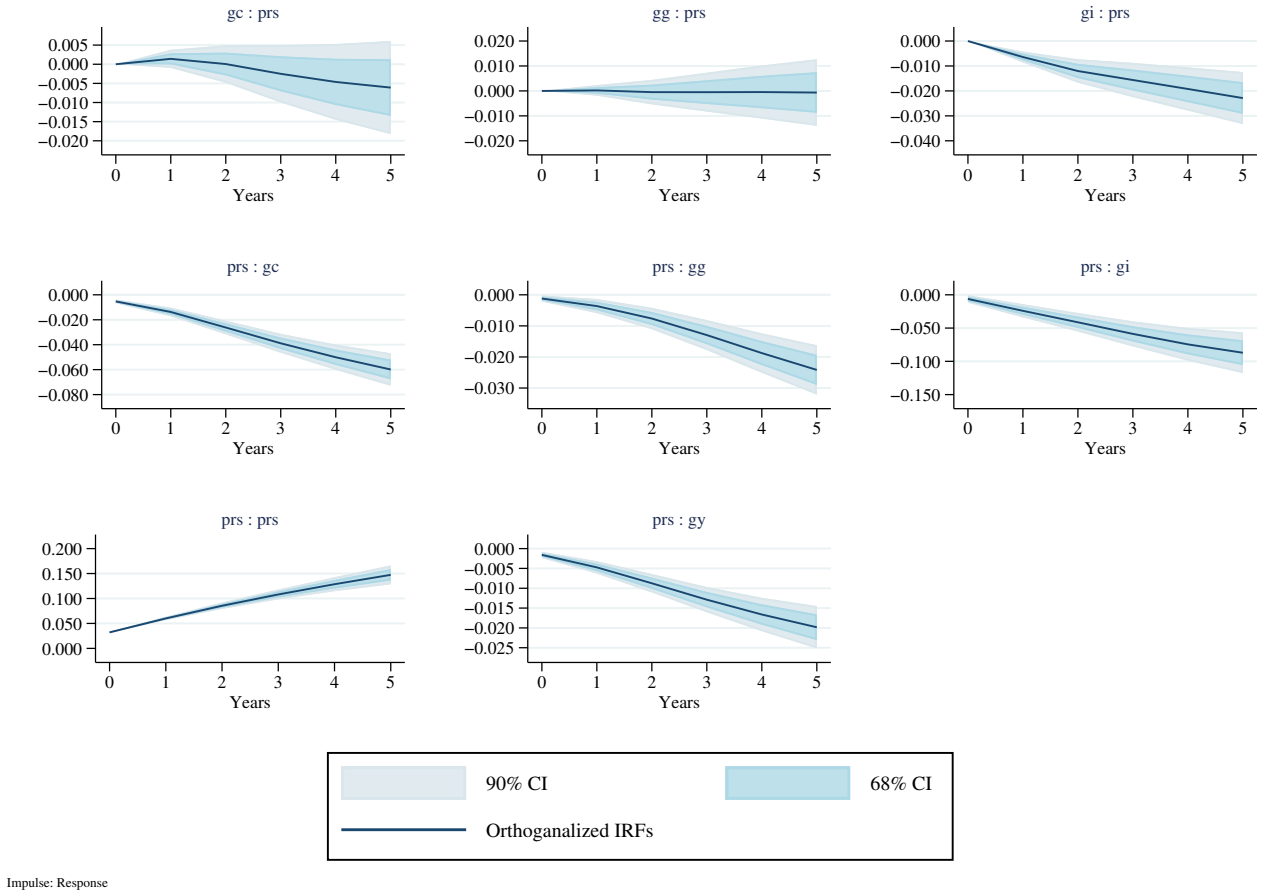

Figure 8: Cumulative impulse response functions of political instability, government consumption, private consumption and investment with the International Country Risk Guide Index as a measure of political instability (specification V). This figure plots the cumulative effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) government consumption (gg), 3) private consumption (gc) and 4) investment (gi). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively. To compute the aggregated effect of political instability on economic growth the IRFs of political instability on private consumption growth, investment growth and government consumption growth are summed up according to their share of real GDP.

7 Dynamic Panel FE-IV Approach

While VAR models are the preferred tool to examine dynamic relationships between variables, they are less well suited to identify causal relationships. Therefore, we implement an instrumental variable approach that allows us to examine the causal effect of political instability on economic growth and vice versa. Panel VAR results emphasize that the relationship between political instability and economic growth is dynamic. To compare IV results with the panel VAR results, we estimate a local projection (LP) with fixed effects *à* la Jordà (2005). The method allows us to compute IRFs based on the panel IV estimation. In fact, Plagborg-Møller and Wolf (2021) show that IRFs estimated by VARs and LPs do not differ substantially. However, IRFs estimated by LPs are more robust to misspecification. Therefore, they provide a good check of the robustness of the panel VAR results.

7.1 The causal effect of economic growth on political instability

Following Grechyna (2018) and Vu (2022) we utilize the political instability of culturally approximate countries as an external source of domestic political instability. To measure the political instability of country i, we utilize a jack-knifed regional average of political instability that exclude country i, in order to ensure that the exclusion restriction is upheld. Similar approaches have been employed in the democracy literature (Acemoglu et al., 2019), too. In the following analysis, we demonstrate that neighborhood political instability serves as a valid instrument, as both the relevance and exclusion restrictions are satisfied.

The relevance condition rests upon the assumption that neighborhood political instability significantly affects domestic political instability. Numerous examples illustrate the spread of political ideas across countries close in terms of culture or geography such as the Latin American wars of independence in the 19th century, the Revolution of 1848 after the French February Revolution, the Revolutions of 1917-1923 inspired by the successful Russian revolution, the protests against the Vietnam war in 1968, the Revolution of 1989 that ended in the dissolution of both the Soviet Union and global Marxism, the Arab spring or the recent spread of populism in Europe. The rationale is that citizens of culturally similar countries are closely tied to each other via an eased and regular exchange of information and face similar political challenges (Kuran, 1989; Lohmann, 1994; Ellis and Fender, 2011; Buera et al., 2011). Empirical evidence for spillover effects of neighborhood political instability from culturally close countries on domestic political instability is provided by Grechyna (2018). To deal with the problem of mutual reinforcement of domestic and neighborhood instability, Grechyna (2018) uses *"fundamental (exogenous) characteristics of neighbors' neighbors to instrument for the neighbors' political instability"* (p. 583). The findings are robust regardless of the level of development and, thus, should hold for our sample, too.

Economically, the exclusion assumption implies that neighborhood instability conditional on lags of GDP growth and country fixed effects has no direct effect on domestic GDP growth in period t. This assumption cannot be tested empirically. One concern may be that common economic developments drive the regional degree of political instability. However, following Acemoglu et al. (2019), we argue that cross-national shocks in the distribution of institutions are not driven by common economic trends,

since the regional spillovers of political instability are due to the fact that neighboring states often face *"similar histories, political cultures, practical problems, and close informational ties"* (p. 80). To control for this concern, the effect of political instability on economic growth will be estimated conditional on time fixed effects.

A second concern is that an increase in political instability in the neighborhood has a direct impact on domestic economic growth, as, for example, domestic production declines because domestic firms expect a drop in foreign sales due to spending restraint. If this is the case, a negative effect of political instability on exports is expected which will be tested in the progress of the paper. However, an empirical investigation of this issue shows that neither domestic exports nor imports are affected by foreign political instability. We conclude that the exclusion restriction is fulfilled.

To construct the instrumental variable, we group the 34 countries in the sample according to groups suggested by the United Nations (UN) Geoscheme based on the M49 coding classification. Following Grechyna (2018) and Vu (2022) the instrument is the group-specific average of political instability without domestic political instability. We note that we deviate from the UN Geoscheme grouping in two cases: First, we have combined the North America group and the Australia and New Zealand group because otherwise each group would contain only two countries. Second, the United Kingdom and Ireland were grouped in Western Europe rather than Northern Europe. We note that the qualitative results of our estimate are robust to these adjustments.

The following dynamic panel model is estimated via 2SLS estimation:

$$Y_{i,t+h} = \sum_{l=1}^{2} \beta_{h,l} Y_{i,t-l} + \gamma_h pi_{i,t} + \mu_{i,h} + \tau_{t,h} + \varepsilon_{i,t,h} \tag{2}$$

where $Y_{i,t}$ corresponds to economic growth and $pi_{i,t}$ to the WGI indicator of political instability instrumented by neighborhood political instability. The parameter h denotes the projection horizon, γ_h and $\beta_{1,h}$ are the projection coefficients and $\varepsilon_{i,t,h}$ is the projection error term. Country fixed effects are denoted by $\mu_{t,h}$ while time fixed effects are denoted by $\tau_{t,h}$.

Results are reported in Table 4. Column (1) shows the first stage of the Dynamic Panel FE-IV estimation. The results reveal that neighborhood political instability has a significant effect on domestic political instability conditional on economic growth and country and time fixed effects. We emphasize that general macroeconomic shocks, e.g. the Financial Crisis or the COVID-19 Pandemic, do not drive this relationship since we have controlled for time fixed effects. Further, we note that the F-statistic is higher than the conventional threshold of 10 indicating that the relevance condition is fulfilled and neighborhood political instability is not a weak instrument. Indeed, the model accounts for approximately 30 % of the total variance in political instability. Table 4 also shows that past economic growth has a significant negative effect on political instability, emphasizing the simultaneous relationship between both variables.

The subsequent columns report the estimated effect of a shock of political instability by one standard deviation - initially and for the 5 subsequent years. We report a negative and significant effect of political instability on economic growth on impact and for the first period after the shock (Columns 2-3). More precisely, a one standard deviation shock of political instability decreases economic growth by 1.6 percentage points initially and by 2 percentage points one year after the shock. Up to the third year after the shock, the coefficient remains negative but becomes insignificant (Columns 4-6).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	First Stage:	Second Stage: Real GDP growth					
	Political Instability	h=0	h=1	h=2	h=3	h=4	h=5
Political Instability Index	-	-0.0164**	-0.0200**	-0.0097	-0.0104	0.0024	0.0077
		(0.0073)	(0.0078)	(0.0074)	(0.0081)	(0.0081)	(0.0084)
Neighborhood Political Instability	0.2546***	-	-	-	-	-	-
	(0.0382)						
L.Real GDP (in billion constant 2015 USD) in growth rates	-2.3973***	0.3515***	-0.0055	-0.0134	-0.1655***	0.0187	-0.0515
	(0.7885)	(0.0430)	(0.0467)	(0.0449)	(0.0475)	(0.0467)	(0.0526)
L2.Real GDP (in billion constant 2015 USD) in growth rates	-2.672***	-0.1730***	-0.1123**	-0.1660***	-0.0196	-0.1245**	-0.1167**
	(0.7821)	(0.0432)	(0.0472)	(0.0456)	(0.0481)	(0.0528)	(0.0536)
Constant	0.0097	0.0209***	0.0336***	0.0489***	0.0342***	0.0328***	0.0379***
	(0.0858)	(0.0042)	(0.0045)	(0.0043)	(0.0045)	(0.0044)	(0.0044)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	780	780	746	712	678	644	610
Number of Groups	34	34	34	34	34	34	34
R-squared within	0.3073	0.5938	0.5250	0.5665	0.5397	0.5771	0.6007
F-statistics	12.79	43.2170	33.9212	37.9951	35.1809	37.9710	40.8839
P-value of F-statistics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 4: Local projection estimation results for a Dynamic Panel FE-IV: The effect of political instability on economic growth. The dependent variable used in each regression is indicated in the respective column heading. Variation in neighborhood political instability conditional on country and time fixed effects is exploited as an exogenous source of variation in domestic political instability. First stage estimates are reported in column 1, while local projection results of the Dynamic Panel FE-IV estimation are presented in Columns 2-7. Sample period: 1996-2020; Standard errors in parentheses; Significance levels at which the null hypothesis is rejected: $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 9 shows the cumulated IRF of the estimated model in comparison with the effect estimated with the bivariate panel VAR. First, the cumulated IRF computed with the Dynamic Panel FE-IV estimation indicates that GDP is affected significantly by political instability for the subsequent 5 years after a shock on the 68 % level. Second, we find that IV estimates are not significantly different from the panel VAR estimates - even to a level of significance of 90 %. Third, five years after a shock of political instability both models indicate that GDP is reduced by approximately 4% to 7%.

7.2 The causal effect of political instability on economic growth

To establish causality from economic growth to political instability, we need an instrument for economic growth. In the related literature it is common to exploit variation in weather data as an exogenous source. The study nearest to our research question is Miguel et al. (2004) that employs rainfall data as an instrument for economic growth to estimate the causal effect on civil conflict. Related to this we use median temperature in the countries as an instrument for economic growth.

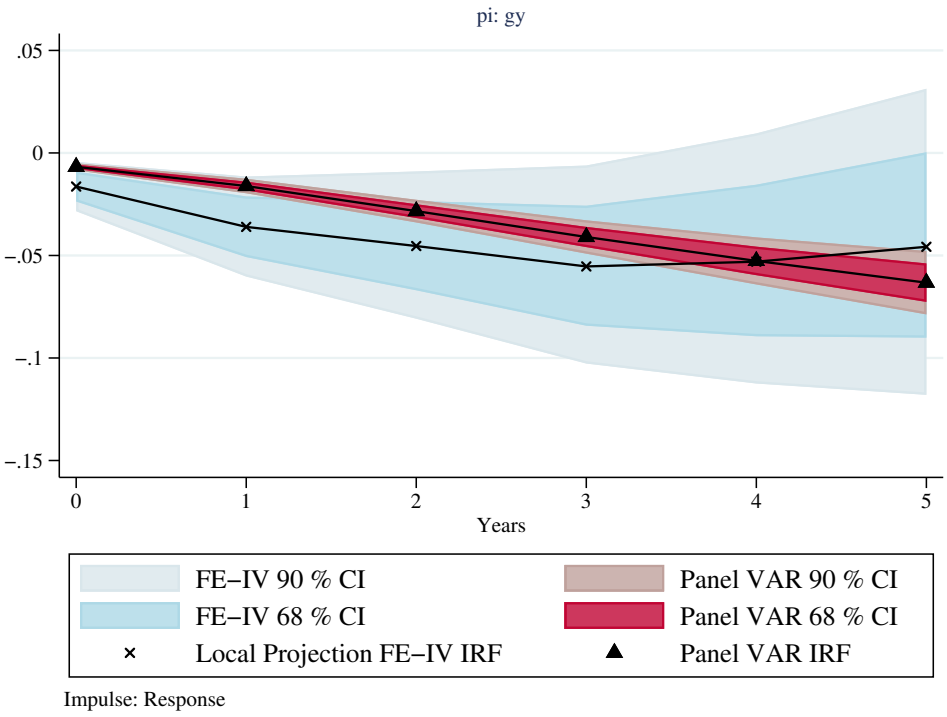

Figure 9: Panel VAR and Dynamic Panel FE-IV estimates of the cumulative effect of political instability on economic growth. This figure plots the cumulative effect of a shock by one standard deviation in political instability on economic growth on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) economic growth (gy). Panel IV effects (crosses) are estimated using Jordà (2005) local projections. 68 % and 90 % confidence bands are presented by red and light red areas, respectively. Panel VAR estimates (triangles) are based on the model discussed in section 5.1. 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively.

The relevance condition is based on the assumption that high temperatures have a significant impact on economic growth. A negative effect on agricultural production seems to be the obvious channel (Lesk et al., 2016). However, the empirical literature also suggests that industrial production may also be affected by high temperatures (Jones and Olken (2010), Hsiang (2010) Dell et al. (2012)). There are several channels through which high temperatures affect production. For example, labor productivity is negatively associated with high temperatures, transportation costs increase when river water levels drop during hot summers with low precipitation, or, as observed in France in the summer of 2022, power plants must be curtailed because rivers become too warm for the cooling water they discharge.

The exclusion restriction rests upon the assumption that political instability is not affected by temperatures directly or through a channel other than economic growth. Since the link between aggression and temperatures is well documented in the literature, weather shocks may affect political instability through political violence such as riots or protest. The rationale is that weather extremes, such as droughts, e.g. increase crop scarcity, which eventually leads to food insecurity and social unrest (Salehyan and Hendrix, 2014). However, Dell et al. (2012) argues that a significant relationship between temperature and political instability is limited to developing countries, while in developed countries no significant association between both variables can be found. Thus, we argue that the exclusion restriction is not violated.

To estimate the causal effect of economic growth on political instability, we estimate the local projection of the following dynamic panel model via 2SLS estimation:

$$PI_{i,t+h} = \zeta_h Y_{i,t} + \sum_{l=1}^{2} \theta_{l,h} PI_{i,t-l} + \mu_{i,h} + \tau_{t,h} + \xi_{i,t,h} \tag{3}$$

where $Y_{i,t}$ corresponds to economic growth, instrumented by median temperature obtained from the World Bank Climate Change Knowledge Portal, ζ and θ are the projection coefficients and ξ is the error term.

The results of the first stage in column 1 of Table 5 show that temperature has a negative and significant effect on economic growth. The corresponding F-statistic indicates that the relevance condition holds and we do not face the problem of a weak instrument. As suggested by the previous analysis, lags of political instability have significant effects on economic growth, too. The first stage model explains 55.3 % of the variation in economic growth.

	(1)	(2)	(3)	(4)	(5)	(6)
	First Stage:	Second Stage: Political instability				
	Real GDP growth	h=1	h=2	h=3	h=4	h=5
Real GDP (in billion constant 2015 USD) in growth rates	-	-0.1000	-0.0145	-0.0148	-0.1385	-0.0071
		(0.0808)	(0.0814)	(0.0756)	(0.0850)	(0.0727)
L.Political Instability Index	-0.6365***	0.5255***	0.4392***	0.3040***	0.0352	0.0161
	(0.1999)	(0.0808)	(0.0855)	(0.0821)	(0.0951)	(0.0832)
L2.Political Instability Index	0.3808*	-0.0432	-0.1305**	-0.1872***	-0.1168	-0.1504**
	(0.1985)	(0.0623)	(0.0659)	(0.0647)	(0.0736)	(0.0642)
Temperature	-0.1535**	-	-	-	-	-
	(0.0600)					
Constant	1.5383***	-0.4886***	-0.7153***	-0.9440***	-1.1306***	-1.0339***
	(.5829)	(0.0438)	(0.0465)	(0.0464)	(0.0529)	(0.0465)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	779	747	714	680	646	612
Number of Groups	34	34	34	34	34	34
R-squared within	0.5534	0.4451	0.3477	0.2788	.	0.1052
F-statistics	35.68	24.4756	14.7891	10.5882	5.6402	3.1936
P-value of F-statistics	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 5: Local projection estimation results for a Dynamic Panel FE-IV: The effect of economic growth on political instability. The dependent variable used in each regression is indicated in the respective column heading. Variation in median temperature conditional on country and time fixed effects is exploited as an exogenous source of variation in economic growth. First stage estimates are reported in column 1, while local projection results of the Dynamic Panel FE-IV estimation are presented in Columns 2-6. Sample period: 1996-2020; Standard errors in parentheses; Significance levels at which the null hypothesis is rejected: $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

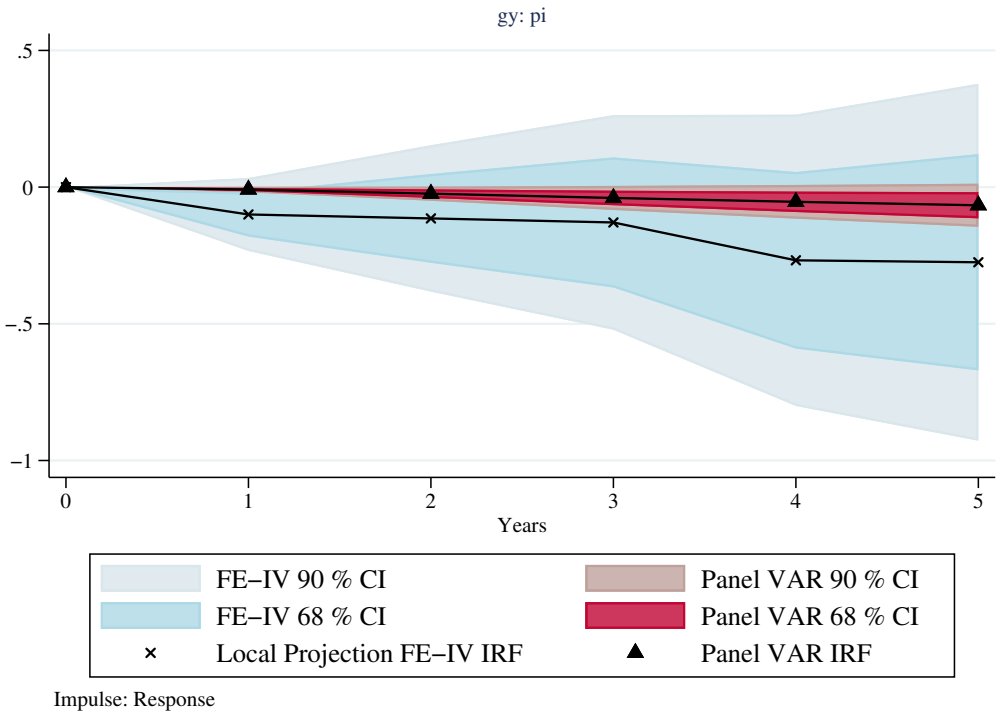

Figure 10: Panel VAR and Dynamic Panel FE-IV estimates of the cumulative effect of economic growth on political instability. This figure plots the cumulative effect of a shock by one standard deviation in economic growth on political instability on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) economic growth (gy). Panel IV effects (crosses) are estimated using Jordà (2005) local projections. 68 % and 90 % confidence bands are presented by red and light red areas, respectively. Panel VAR estimates (triangles) are based on the model discussed in section 5.1. 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively.

The results for the second stage are reported in columns 2 to 6 showing the causal effect of a shock of economic growth by one standard deviation on political instability for the first and subsequent periods after a shock. We note that we assume in line with the Choleski order employed in the panel VAR estimation that economic growth does not affect political instability contemporaneously. Therefore, the effect of economic growth on political instability is equal to zero in period $h = 0$. The results indicate that political instability is negatively affected by economic growth. However, large standard errors typically found in IV settings prevent the identification of an effect significant from zero to any conventional level of significance. The results further emphasize that political instability follows an autoregressive process. The model explains about 44.5 % of the total variation in political instability for $h = 1$.

Figure 10 shows the cumulated IRF of the estimated model in comparison with effect estimated in the panel VAR of the main specification with standard errors estimated with 100 Monte-Carlo repetitions. First, we note that standard errors estimated by the IV approach are much larger than the standard errors estimated by the panel VAR approach. The estimated effect of economic growth on political instability, however, has the same sign and are of similar size. Both models predict a decrease of political instability by 0.2 to 0.3 units corresponding to approximately half a standard deviation of political instability (see Table 2). Although the effect is not statistically significant, it may be economically relevant. Hence, the

IV estimates qualitatively reproduce our panel VAR estimates which emphasizes the robustness of our results.

8 Conclusion

Political stability has deteriorated in many advanced economies. The economic implications of this recent trend are still not yet fully understood. In particular, it is an open question whether and through which channels economic growth affects political stability or vice versa. To close this research gap, we estimate a panel VAR of political instability and economic growth as well as its components and calculate IRFs. In addition, we use a Dynamic Panel FE-IV estimation to establish causality between the two variables.

Panel VAR results indicate that a one-standard deviation shock to political instability significantly and substantially reduces economic output by 4 to 7 %, depending on the specification. Decomposing GDP into its main components - private consumption, investment and government consumption - shows that investment and private consumption are the main transmission channels through which the economy is affected by a shock to political instability. The reverse effect shows that a one standard deviation shock to economic growth reduces the political instability by one-fifth of a standard deviation. The empirical analysis suggests that investment and, depending on the Choleski ordering, private consumption are important transmission channels.

Dynamic Panel FE-IV results confirm the panel VAR results qualitatively and, to some extent, quantitatively. To examine the dynamic effects of a one standard deviation shock, we rely on Jordà (2005) local projections. Exploiting neighborhood political instability as an instrument for domestic political instability, we find that GDP is reduced by 4 % five years after the shock. Using temperatures as an exogenous source of variation in economic growth shows that economic growth also drives political instability.

Since both empirical strategies attempt to solve the endogeneity problem between political instability and economic growth in different ways but yield very similar results, we find clear evidence of a causal effect of political instability on economic growth. With respect to the reverse direction of causation, the results suggest that economic growth has a causal effect on political instability, too, although the results are associated with greater statistical uncertainty. Taken together, our results suggest that political instability is also important for the economic development of advanced economies.

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A Appendix

	Political Instability	Private Consumption	Investment	Government cons.
L.Political Instability	0.9043***	-0.0614***	-0.0307+	0.0020
	(0.0487)	(0.0112)	(0.0299)	(0.0073)
L2.PoliticalInstability	-0.0188	-0.0240**	-0.0436*	-0.0086+
	(0.0445)	(0.0094)	(0.0254)	(0.0063)
L.Consumption	0.1165	0.3858***	1.2045***	0.2330***
	(0.2367)	(0.0957)	(0.3072)	(0.0496)
L2.Consumption	0.2623+	-0.1895**	-0.0973	0.0795+
	(0.2362)	(0.0956)	(0.2690)	(0.0532)
L.Investment	-0.1481**	0.0434**	0.0023	0.0019
	(0.0587)	(0.0173)	(0.0670)	(0.0109)
L2.Investment	-0.0952*	0.0191+	-0.1687***	-0.0001
	(0.0543)	(0.0178)	(0.0553)	(0.0111)
L.Government consumption	0.4433+	0.0940+	0.0949	0.3073***
	(0.2860)	(0.0829)	(0.2362)	(0.0604)
L2.Government consumption	-0.3932+	0.2729***	-0.4245**	-0.0870+
	(0.2514)	(0.0712)	(0.2110)	(0.0542)
Number of obs.:	748	Number of groups		34
Hansen J-statistic:	39.4262	Hansen p-value:		0.172
Var order:	2	Lags of GMM instruments:		4

Table A.1: Panel VAR results of specification II estimated via System GMM. The dependent variable used in each regression is indicated in the respective column heading. Sample period: 1996-2020; Standard errors in parentheses; Significance levels at which the null hypothesis is rejected: + $p < 0.33$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

		Impulse variable:			
Response variable:	Step	pi	gg	gc	gi
Political Instability (pi)	2	0.990	0	0	0
	4	0.980	0	0	0.0100
	6	0.980	0	0	0.0100
	8	0.980	0	0	0.0100
	10	0.980	0	0	0.0200
Government	2	0	0.900	0.100	0
Consumption (gg)	4	0.100	0.700	0.190	0
	6	0.220	0.610	0.170	0.0100
	8	0.290	0.550	0.150	0.0100
	10	0.330	0.520	0.150	0.0100
Private	2	0.140	0.0300	0.820	0.0100
Consumption (gc)	4	0.340	0.0600	0.590	0.0200
	6	0.450	0.0500	0.480	0.0200
	8	0.510	0.0400	0.430	0.0200
	10	0.540	0.0400	0.400	0.0200
Investment (gi)	2	0.0200	0.0300	0.350	0.600
	4	0.0900	0.0300	0.320	0.550
	6	0.130	0.0300	0.310	0.530
	8	0.160	0.0300	0.300	0.510
	10	0.170	0.0300	0.300	0.510

Table A.2: Variance decomposition analysis of specification II. The Table shows how much of the forecast error variance for any variable in a system, is explained by innovations to each explanatory variable over time. Steps correspond to years.

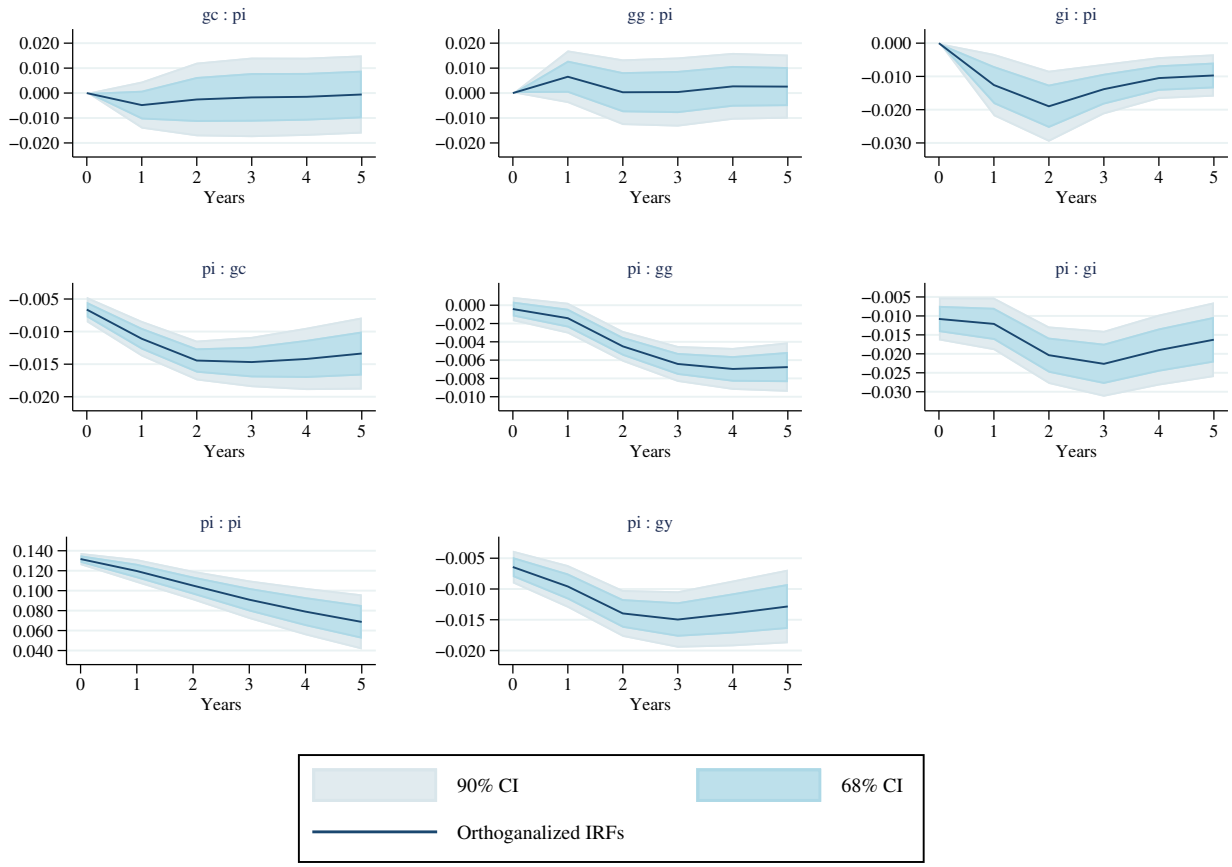

Figure A.1: Impulse response functions of political instability, government consumption, private consumption and investment. This figure plots the effect of a shock by one standard deviation in the impulse variable on the response variable on impact and for the subsequent five years. To compute the IRFs Choleski decomposition is employed. The causal ordering is: 1) political instability (pi) and 2) government consumption (gg), 3) private consumption (gc) and 4) investment (gi). 68 % and 90 % confidence bands are generated by Monte-Carlo with 100 repetitions and presented by blue and light gray areas, respectively. To compute the aggregated effect of political instability on economic growth the IRFs of political instability on consumption growth, investment growth and government consumption growth are summed up according to their share of real GDP.