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The Political Polarization Index [*]

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Abstract

American politics have become increasingly polarized in recent decades. To the extent that political polarization introduces uncertainty about economic policy, this pattern may have adversely affected the economy. According to existing theories, a rise in the volatility of fiscal shocks faced by individuals should result in a decline in economic activity. Moreover, if polarization is high around election dates, businesses and households may be induced to delay decisions that involve high reversibility costs (such as investment or hiring under search costs). Testing these theories has been challenging given the low frequency at which existing polarization measures have been computed (in most studies, the series is available only biannually). In this paper, I provide a novel high-frequency measure of polarization, the *political polarization index* (PPI). The measure is constructed monthly for the period 1981-2013 using a search-based approach. I document that while the PPI fluctuates around a constant mean for most of the sample period prior to 2007, it has exhibited a steep increasing trend since the Great Recession. Evaluating the effects of this increase using a simple VAR, I find that an innovation to polarization significantly discourages investment, output, and employment. Moreover, these declines are persistent, which may help explain the slow recovery observed since the 2007 recession ended.

JEL Classification: E3, H3
Keywords: polarization, political ideology, American politics, economic policy uncertainty, business cycles, electoral cycle.

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1 Introduction

American politics have become increasingly polarized in recent decades. The distance between the ideal points of Democratic and Republican legislators, as measured by roll-call votes by McCarty, Poole, and Rosenthal (2006), has increased considerably since the 1980s. In addition, the distribution of their ideological views has become more concentrated around each party's average value.[1] Increasing political polarization is relevant for the evolution of economic variables because it introduces additional uncertainty regarding public policy. This is particularly important around election dates, where the identity of the decisive policymaker may change, causing fluctuations in the course of fiscal policy and private-sector regulation. The degree to which increasing polarization affects private decisions is difficult to quantify given that existing measures of polarization are available only at low-frequencies (mostly at a biannual level). Identification of its effects over the business cycle thus becomes challenging.

In this paper I construct a novel high-frequency measure of polarization, the *political polarization index* (PPI). The methodology is similar to that developed by Baker, Bloom, and Davis (2013) for computing economic policy uncertainty. It is based on a search-based approach that measures the frequency of newspaper coverage of articles reporting political disagreement about government policy, normalized by the total number of news articles within a given period. The search is performed monthly in major US newspapers for the sample period January 1981 (when a relatively large number of digitalized news becomes available) to April 2013. I show the time-series behavior of the PPI, and its relationship to the number of tax expirations in Congress, the economic policy uncertainty index from Baker, Bloom, and Davis (2013), and the 'Congress disapproval ratings' collected by Gallup. I find the following set of stylized facts. First, the PPI fluctuates around a constant mean for most of the sample, but exhibits an increasing trend at the outset of the Great Recession, peaking at the end of 2012. This pattern is positively related to the large number of tax expirations during this period, which also show an increasing trend since 2007. Second, the PPI spikes around election dates, with the difference between polarization around election and non-election periods being statistically significant for both presidential and midterm elections. It also takes large values around fiscal policy debates, such as the approval of Obamacare, the debt ceiling debate, and the fiscal cliff. Interestingly, it tends to be low surrounding military conflict or national security threats such as the Gulf Wars and 9/11. This suggests that American politics are very polarized regarding economic policy or private-sector regulation reforms, but less divided when it comes to national defense issues. The Gallup disapproval ratings around these events provide independent evidence of this claim.

I then use the political polarization index to quantify the effects of an innovation in the PPI on the real economy. In particular, I analyze changes in employment, output, and investment that result in a 64-point increase in the PPI (equivalent to the increase in the index between 2007 and 2012). I find that employment decreases as a result of the polarization shock, with a peak loss of 1.75 million jobs after six quarters. Investment decreases up to 8.6% after five quarters, and output shrinks about 2%. These declines are not only large, but also persistent, which may help explain

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[1]Bonica and Rosenthal (2013a) find similar results using the pattern of contributions made by legislators' supporters. Jensen, Kaplan, Naidu, and Wilse-Samson (2012) provide independent evidence of this, analyzing political discourse from Google Books and the digitalized Congressional Record during this period.

part of the slow recovery following the Great Recession. Intuitively, a polarization shock increases the volatility of fiscal policy (see Azzimonti and Talbert, 2013). This in turn reduces economic activity because it increases economic policy uncertainty, which has been shown to negatively affect the economy (see, for example, Baker, Bloom, and Davis, 2013 or Fernández-Villaverde and Rubio-Ramírez, 2010). These effects are even more pronounced in periods preceding elections, as agents may choose to delay decisions subject to large reversibility costs, such as investment or hiring associated with large search costs (see Canes-Wrone and Park, 2011, or Schaal 2012). To test this hypothesis I study the behavior of de-trended employment, investment, and output in the quarter before a presidential election or a midterm election is held. These variables tended to be lower in pre-election quarters with greater-than-average PPI for both, Congressional elections, but I find no significant difference in quarters preceding presidential elections.

The paper is organized as follows. A description of how the political polarization index was constructed is included in Section 2, which also discusses the PPI's time-series behavior. Section 3 quantifies the effects of political polarization in the economy, and Section 4 contains concluding remarks.

2   Political Polarization Index

A main objective of this section is to construct a high-frequency index of political polarization to later assess the effects of polarization on the economy. Existing measures, such as the one developed by McCarty, Poole, and Rosenthal (2006) using roll-call votes in Congress or the one based on campaign contributions constructed by Bonica and Rosenthal (2013), are available only biannually. They display too little variability at business cycle frequencies to allow for identification of the impact of political polarization on the behavior of macroeconomic variables. Higher-frequency measures could be computed from Congressional approval ratings (a Gallup poll), but they are available sporadically from 1981, quarterly from 1995, and monthly only since 2001, providing too few observations to conduct proper econometric analysis. The measure developed in this paper attempts to fill a gap in the literature by quantifying political polarization at monthly and quarterly frequencies.

2.1   Index construction

I follow a similar methodology to that in Baker, Bloom, and Davis (2013) in constructing the political polarization index (PPI). In particular, I use a search-based approach that measures the frequency of newspaper coverage of articles reporting political disagreement about government policy. The identification assumption underlying the index is that greater media-coverage of ideologically divisive issues or legislative gridlocks is associated with higher polarization episodes.

The search is performed in Factiva (by Dow Jones), a comprehensive database of news articles that provides access to more than $36,000$ sources (such as newspapers, journals, magazines, television and radio transcripts, photos, etc.) from almost 200 countries in 28 languages. The database covers the period 1980 to 2013, although reliable coverage starts only in 1981. An advantage of using Factiva's search engine versus the ones provided by each particular source is that the quality of the search outcome is homogeneous and an identical set of predefined filters can be applied. In

particular, I restrict the search to major US newspapers (see Table 3 in the Appendix for details) where news is written in English and refers to events occurring in the US. In addition, I exclude editorials and commentaries from the search in an attempt to reduce potential ideological biases.

To construct the index, I counted the number of articles including terms related to political polarization that are published each month in major US newspapers, between January 1981 and April 2013. In particular, I search for articles containing at least one term in each of the following two general categories:

<u>Polarization and Inaction:</u> polarization, polarized, disagreement, standstill, stalemate gridlock, deadlock, fail to compromise.

<u>Policy and Politics:</u> White House, Capitol Hill, Senate, Congress, partisan, Republican, Democrat, GOP, political, public policy, federal budget, tax, national debt, federal debt, deficit, debt ceiling, balanced budget, defense spending, constitutional reform, war on terror, entitlement, public welfare , social security, health care, minimum wage, unemployment insurance , unemployment benefits.

The first category attempts to identify disagreement between policymakers or its consequences in terms of government inaction. The second category ensures that the article refers to disagreement about political issues or government policy. Variations on the set of words above are also considered, for example 'disagreement', 'disagree', and 'disagreeing' are all included in the search, as well as plurals such as 'disagreements'. In addition, I included a third category that uses combinations of specific terms used either in the media jargon or the political science literature to describe political polarization more directly.

<u>Specific Terms:</u> political division, political divide, partisan division, partisan divide, division in Congress, gridlock in Washington, divided American politics, division of ideology, ideological divisions, ideological differences among/between parties and variations of these.

The search captures disagreement not only about economic policy (e.g., related to budgetary decisions, tax rates, deficit levels, welfare programs, etc.), but also about private sector regulation (e.g., financial and immigration reform), national defense (e.g., wars, invasions), and other dimensions that divide policymakers' views (e.g., same-sex marriage, gun control, abortion rights).

Because the volume of digitized news varies over time and exhibits an increasing trend, I scaled the raw political polarization article count by the number of monthly articles in the same newspapers. To do this, I performed a search every month from January 1981 to April 2013 using the same filters described above, but containing the word "today."[2] I then scaled the political polarization count by this news intensity measure. Finally, I normalized the index to have an average of 100 over the sample period 1981-2013.

2.2 PPI over time

Figure 1 displays the political polarization index over time (solid line). The circles indicate months associated with presidential elections (either when the election is held or the previous month), while the vertical bars represent those in which Congress held midterm elections.

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[2]Using the word "the" to count the total number of articles instead causes no noticeable difference in the index.
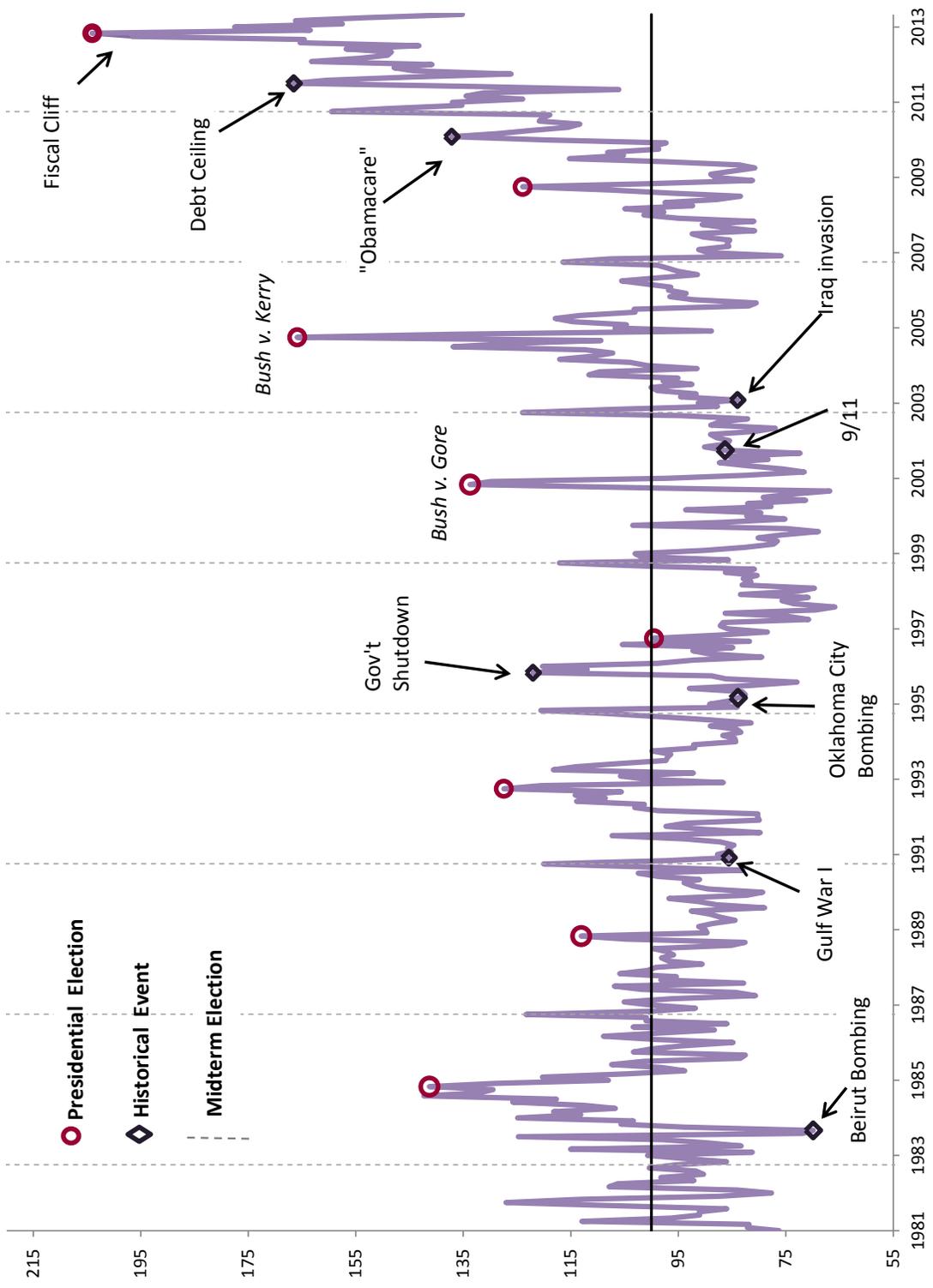
Figure 1: Political polarization, 1981-2013. Circles represent presidential elections (month of election or the month before); diamonds historical events and vertical lines are midterm elections.

There is a clear seasonality in the PPI, as it spikes around election dates. To test whether the differences are statistically significant, a two-sided t-test was performed with results summarized in Table 1.[3] The first row in the table displays the mean value of the PPI in off-election periods, while the second one shows the mean in election periods. An "election period" is defined by an indicator variable that takes a value of 1 in the month in which an election takes place or the month prior to an election, and zero otherwise. The rationale for including the month before an election takes place is that sometimes elections are held early in the month, implying that most of the news associated with the event is documented the month before. Average PPI is about 14% higher in periods when midterm elections occur, a statistically significant difference (the p-value testing the hypothesis that the difference is greater than zero is 0.0075). Average PPI is about 31% higher in months when presidential elections are held, with a p-value of 0.0009 indicating that this is also statistically significant at the 1% level.[4] Interestingly, the solid line in Figure 1 shows that some presidential elections are more polarized than others (for example, the PPI was much higher during the Bush/Kerry race than during Clinton's reelection).

Table 1: Means test, $H_o : \text{Diff} = 0$ and $H_a : \text{Diff} < 0$

Category	Midterm	Presidential	Obs
Off-election	99.6	98.9	372
Election	113.6	130.4	16
Diff	-14	-31.6	
	$Pr(T < t) = 0.0075$	$Pr(T < t) = 0.0009$	

Note: The first row displays the mean value of PPI in off-election periods, while the second row shows this average in election periods (e.g. the month when an election takes place and the month prior to an election). "Mid-term' refers to Congressional elections, while "Presidential" refers to presidential elections. The number of observations is identical for each type of election during this time period, covering January 1981 to April 2013. The last row documents the p-value associated with a two-sided t-test (unequal variances) for each mean.

The figure also displays other historical events (with diamonds) that resulted in deviations from trend. Most noticeable are the Government shutdown in 1995, the passage of "Obamacare," the debt ceiling debate, and the period surrounding the fiscal cliff. Interestingly, episodes related to national defense exhibit very little or no polarization. For example, the PPI is below average during both Gulf Wars, the Beirut and Oklahoma city bombings and, particularly, September 11th when it decreased dramatically from the spike associated with the Bush vs Gore election.

PPI and legislators' ideology: The PPI has fluctuated around a constant mean for most of the sample, but exhibited an increasing trend starting at the outset of the Great Recession (e.g., around 2007). The index reached its highest levels of our 30-year sample period in 2012. This is consistent

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[3]ANOVA tests were also conducted for robustness and the findings are consistent with the results in this table.

[4]For robustness, I also computed the two-sided t-test for actual election months (that is, not including the previous month). I find that the difference between off-election months and election months is statistically significant for presidential elections, but insignificant for midterm elections.

with the evidence provided by McCarty, Poole, and Rosenthal (2006) and Bonica and Rosenthal (2013a), who document that legislators' ideology has become more polarized, particularly in recent years.
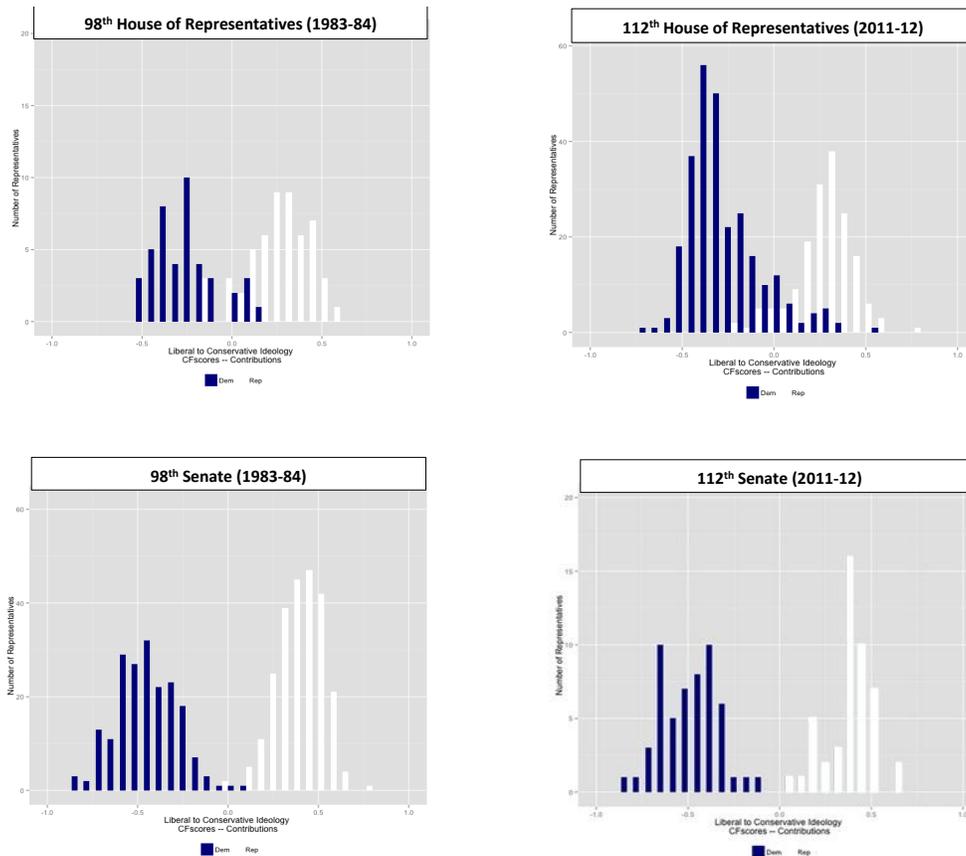
Figure 2: Legislators' ideology scores inferred from the patterns of contributions made by their supporters, constructed by Bonica and Rosenthal (2013b). The top panel shows the distribution of Republican and Democratic legislators' ideal points in the 98th (left) and 112th (right) House of Representatives, while the bottom panel shows the distribution in the 98th (left) and 112th (right) in the Senate.

Figure 2, constructed by Bonica and Rosenthal (2013b), shows the distribution of legislators' ideology scores inferred from the patterns of contributions made by their supporters. The top panel depicts the distribution of Republican and Democratic legislators' ideal points in the 98th (left) and 112th (right) House of Representatives, while the bottom panel shows the respective distributions in the Senate. In both houses, legislators' ideal points have become further apart. While there was some overlap between Republican and Democratic legislators' views in the 98th Congress (1983-84), these diverged dramatically in the 113th Congress (2011-12). This ideological division is captured and quantified by the PPI.
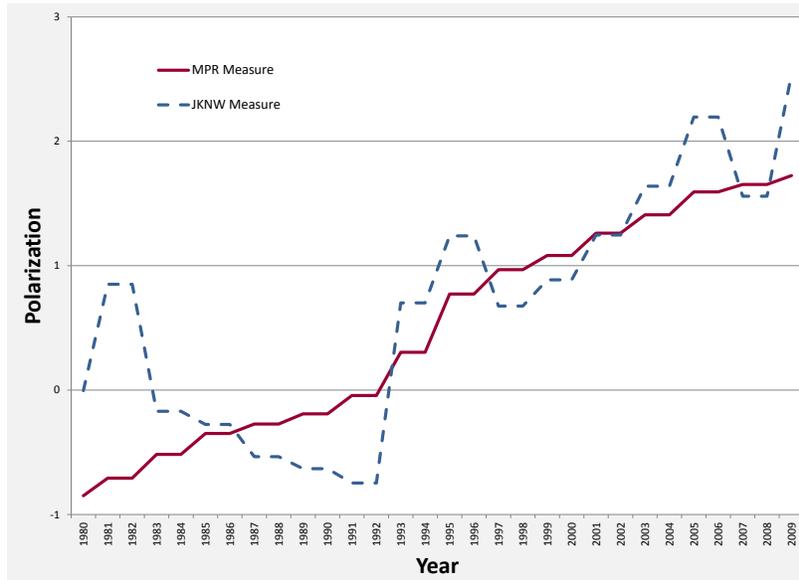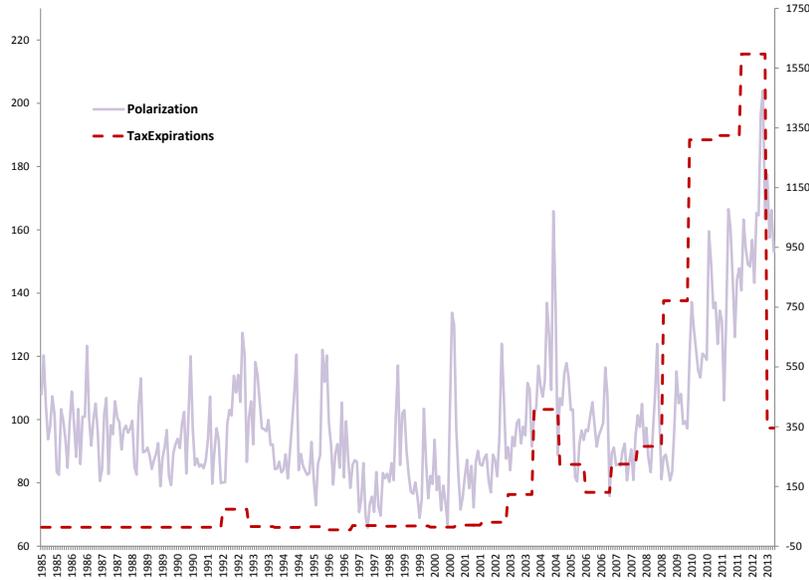
Figure 3: Political polarization measures from Congressional records: MPR measure (solid line) and JKNW measure (dashed line), between 1980 and 2009.

Figure 3 shows the evolution of the polarization measure developed by McCarty, Poole, and Rosenthal (2006, MPR measure), who use information on roll-call votes in Congress to compute legislators' ideal points at each Congress.[5] Inspection of their series also reveals an increase in polarization, although their upward trend is continuous (while the PPI shows a steep increase only in the more recent part of the sample). One potential reason for this is that the MPR measure is constructed only bi-annually rather than monthly. Another, perhaps more relevant reason, is that MPR restricts attention to Congressional polarization. The PPI, on the other hand, defines political polarization more broadly by also considering divisions arising from the President and the Congress, or among other branches of the federal government. Finally, independent evidence of the recent increase in polarization can be found in the work of Jensen, Kaplan, Naidu, and Wilse-Samson (2012). Their measure statistically identifies highly partisan phrases from the Congressional Record that are used to impute polarization in the Congressional political discourse. As seen in the dashed line of Figure 3, the JKNW measure of polarization declines during the 1980s, but shows an increasing trend in the 1990s. The trend seems to steepen at the end of the period, but their sample unfortunately ends in 2009 (before the PPI reaches its peak).[6]

PPI and economic policy uncertainty: The index's pattern is also highly influenced by the timing of tax-expirations. Figure 4 shows the PPI together with a series of tax expirations obtained from Becker et al. (2013). We can see that polarization tends to rise when Congress is forced to make a dated decision affecting the federal budget, triggered by one of these expirations. The monthly correlation between the two series is 0.7, a much larger value than that between the PPI

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[5]Data obtained from *http://voteview.com/downloads.asp.*

[6]Data obtained from *http://www.brookings.edu/about/projects/bpea/past-editions.*

Figure 4: Political Polarization and Tax Expirations.

and the news-based index of economic policy uncertainty developed by Becker et.al. (2013), which is slightly above 0.44.[7]

One reason for this difference lies in the fact that while the EPU is affected by financial shocks (such as Lehman's collapse or the series of defaults in Latin American countries) and monetary policy (such as interest rate cuts by the Federal Reserve), political polarization is completely non-responsive to these events. This is reasonable, as those events are unrelated to fiscal policy but do introduce economic uncertainty. Figure 5, which depicts the PPI (solid line) together with the news-based EPU index (dashed line), illustrates this point. Another important difference results from the behavior of the two variables in the presence of military conflict: While the EPU exhibits large increases in times of war or national security threats (for example, 9/11 or the Gulf Wars), polarization tends to remain relatively low or even decrease. Taken together, the evidence seems to suggest that American politics are highly polarized when it comes to fiscal policy decisions (such as the determination of the federal budget), but less divided regarding the government's response to national security threats. This claim is also consistent with the evidence provided by Gallup's Congressional disapproval ratings, as I will argue next.

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[7]This correlation is computed using only the news-based index of economic policy uncertainty and not the final EPU. The reason is that tax expirations account for about one-third of the EPU index, which I wanted to exclude to make the comparison. If I use the benchmark EPU measure, which includes tax expirations, the correlation between the two indexes is about 0.5.
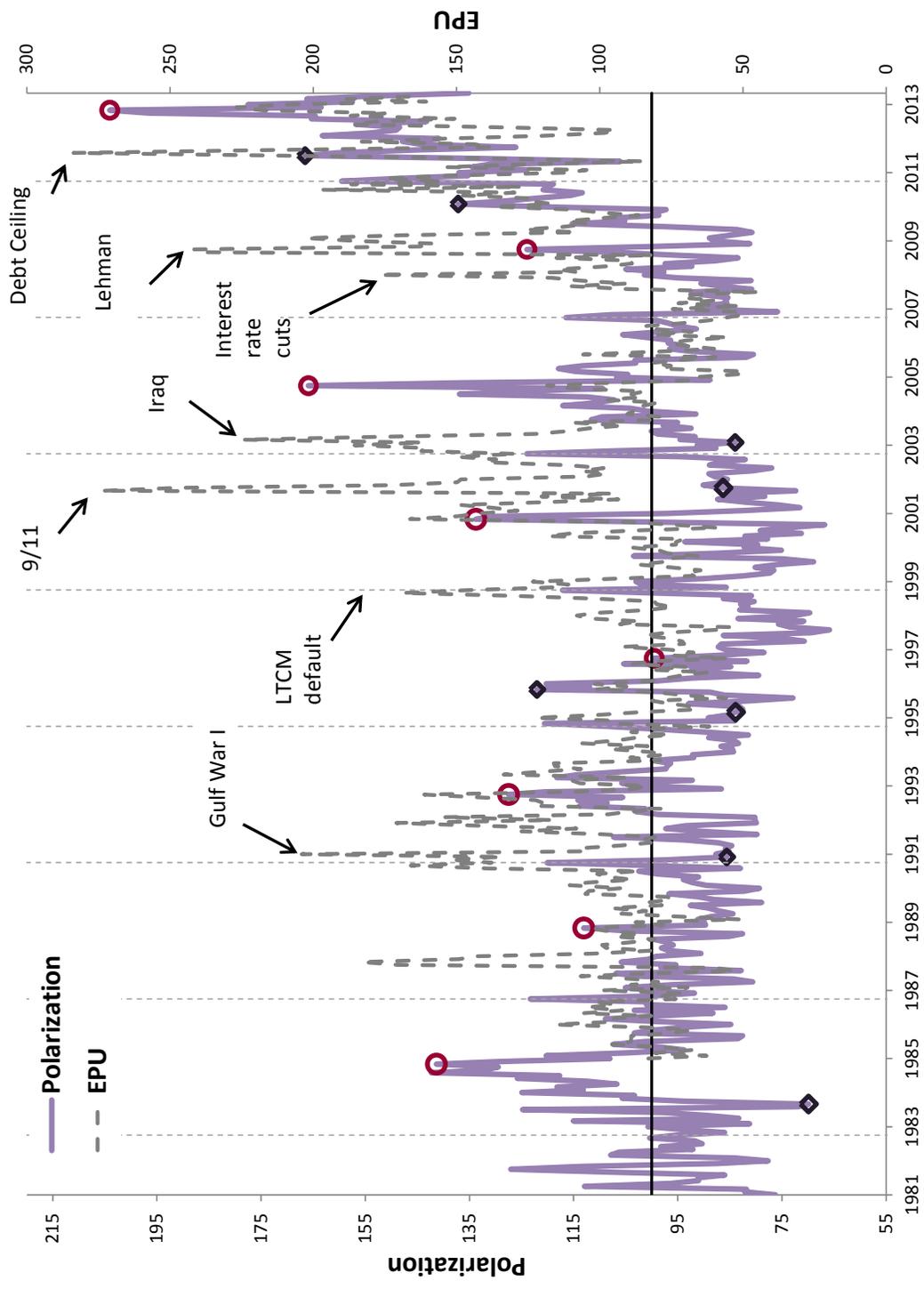
Figure 5: Political polarization (solid) and News-based economic policy uncertainty (dashed). Circles represent presidential elections (month of election or month before), diamonds historical events and vertical lines mid-term elections.

PPI and disapproval ratings: Figure 6 depicts the PPI (left axis) together with the disapproval ratings (right axis), a series collected by Gallup in which respondents are asked "Do you approve or disapprove of the way Congress is handling its job?" The shaded area represents the percentage of surveyed people that disapproves Congress' actions.[8] By comparing the evolution of these series, we can observe a few stylized facts. First, the recent trend in the PPI is also present in the disapproval ratings series, which increases toward the end of the sample. Second, the two series show a similar pattern, with the exception of periods when presidential elections are held (displayed with circles). During those months, the PPI spikes, while—as should be expected—the disapproval ratings remain fairly stable. Finally, the low levels of polarization observed during military conflicts or national security threats coincide with low disapproval rates (the clearest example is the period surrounding 9/11). This indicates that the American public is less divided on national defense issues than it is on fiscal policy or legislative reform.
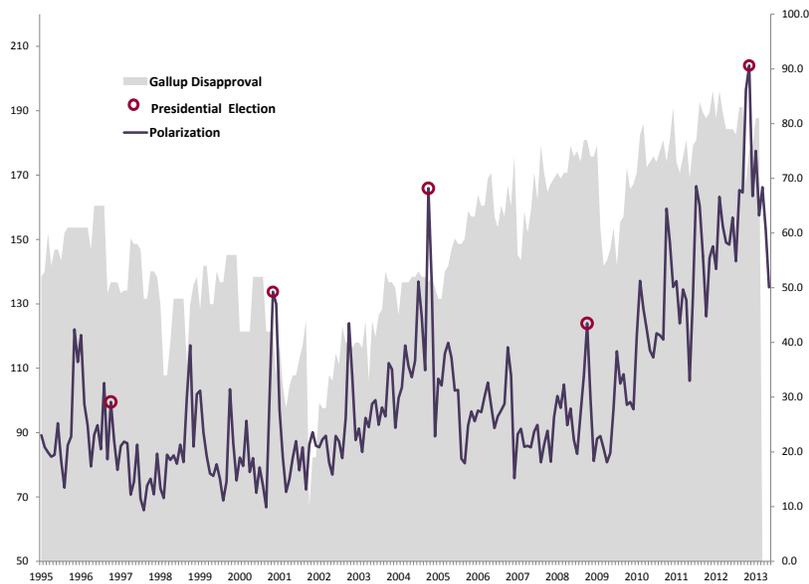
Figure 6: Political polarization and Congress disapproval atings (Gallup).

Further inspection of the figure reveals that the PPI tends to lead disapproval ratings. To test whether this is indeed the case, I run a monthly Cholesky Vector Auto Regression (VAR) of PPI and disapproval ratings for the period 1995-2013. I use this shorter sample period because ratings are measured quarterly starting in 1995, while they are reported only once a year before that time (they are reported monthly starting in 2001). Both the Akaike Information Criterion test and the Bayesian (Schwartz) Information Criterion test suggest that the optimal number of lags is three, and therefore I use that in the benchmark model.

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[8]Data can be found at http://www.gallup.com/poll/1600/congress-public.aspx#1.
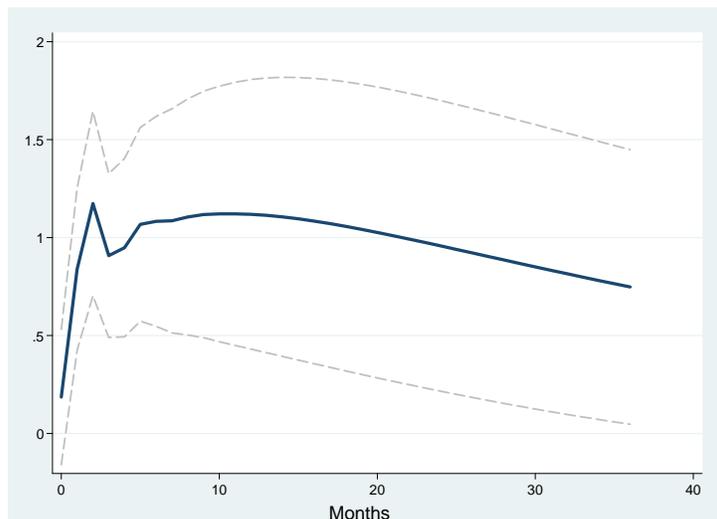
Figure 7: Impulse-response function of Congress disapproval ratings (Gallup) to a one-standard-deviation increase in the PPI. The central solid line is the mean estimate, while the dashed outer lines represent one-standard-error bands. These are estimated using a monthly Cholesky Vector Auto Regression (VAR) model with polarization (PPI) and disapproval ratings.

A Granger test indicates that the PPI Granger-causes disapproval ratings, while disapproval ratings do not Granger-cause polarization (that is, we cannot reject the null hypothesis even at the 10% level, as the p-value of the test is 0.2). This provides evidence that the public perception of whether Congress is properly handling its job is likely to be affected by the degree of polarization documented in the media, while political polarization is unlikely to be affected by public disapproval. Figure 7 depicts the (orthogonalized) impulse-response function of a one-standard-deviation increase in polarization. We can see that the change in disapproval ratings is statistically insignificant upon impact. After one month, the increase in disapproval ratings becomes sizable and statistically significant. Moreover, public disapproval of Congressional actions remains elevated for a large number of periods. This suggests that while individuals are willing to vote for candidates who disagree with their views, they tend to dislike the consequences of ideological divisions when these are very polarized and lead to gridlocks and government inaction. This is probably related to the increasing cost of making non reversible economic decisions (such as investment) in an uncertain environment. This idea is explored in detail in the next section.

2.3 Robustness

In this subsection I analyze whether the benchmark PPI is robust to expanding the set of keywords used in the search, and to seasonally adjusting the series by subtracting the average effects of elections.

Robustness to the set of words: Adding more specific terms related to fiscal policy or regulation did not change the index significantly. I considered the following additional terms as a robustness check: Tea Party, government spending, fiscal stimulus, government deficit, Medicare,

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Medicaid, health insurance, medical malpractice, medical reform, drug policy, Obamacare, deficit expenditures, 9/11, war, military conflict, military embargo, national security, military invasion, financial regulation, financial reform, bank supervision, bank regulation, Dodd-Frank, Glass-Steagall, collective bargaining, affirmative action, equal employment opportunity, closed shop, worker compensation, antitrust law, monopoly regulation, copyright regulation, patent regulation, environmental law, carbon tax, clean air act, clean water act, food stamp, disability insurance, tariff, import duty, import barrier, immigration.

Seasonally adjusted PPI: The spikes in the PPI around election dates described at the beginning of this section could be due to two factors: (i) polarization increases during elections or (ii) newspapers dedicate a larger share of coverage to discuss disagreements between candidates. To separate the first effect from the second one, I constructed a "seasonally adjusted" PPI measure. The raw measure of PPI is regressed against a constant term and an indicator variable for each type of election (midterm and presidential),

$$PPI_t = \alpha + \beta I_{M,t} + \gamma I_{P,t} + \epsilon,$$

where α is a constant, $I_M = 1$ if there is a midterm election and zero otherwise, and $I_P = 1$ if there is a presidential election; ϵ is an error term. The seasonally adjusted PPI is constructed as

$$PPI_{sa,t} = PPI_t - \hat{\beta} I_{M,t} + \hat{\gamma} I_{P,t},$$

where the hats denote estimated coefficient values. In other words, we subtract the average increase in the PPI during election dates from our benchmark measure. Comparison of the two series does not result in sizable differences and is therefore omitted (but available upon request). This indicates that the coverage effect is not the dominant force behind the polarization increases.

3   The effects of PPI on the economy

There exists a growing literature studying the effects of economic policy uncertainty on the aggregate economy (see for example Baker, Bloom, and Davis, 2013; Fernández-Villaverde and Rubio-Ramírez, 2010; or Fernández-Villaverde, Guerrón, Kuester, and Rubio-Ramírez, 2012). A common assumption is that fiscal policy follows an exogenous process whose volatility changes over time. In periods of high variability, economic agents delay hiring, investment, or production decisions, and this amplifies business cycles. Canes-Wrone and Park (2011) suggest that increases in fiscal uncertainty may be related to the behavior of rational agents over the electoral cycle. In particular, they argue that businesses and households have incentives to delay decisions that are subject to large reversibility costs right before elections, which are associated with high levels of economic policy uncertainty. This results in a pre-election decline in investment, a phenomenon that they refer to as "reverse electoral business cycle (REC)." In their model, uncertainty tends to be large when there is high electoral competitiveness and sufficient polarization between the major parties. Using an unbalanced sample of OECD data, they find evidence that gross capital formation tends to be lower in the quarter right before an election if this election is associated with a large degree of political polarization. Azzimonti and Talbert (2013) also propose a theory suggesting that political

polarization affects economic decisions and amplifies business cycles. They argue that economic fluctuations are caused not only by productivity shocks (as usually assumed in macroeconomics), but also by 'political shocks'. Using a standard partisan model of fiscal policy determination (a la Persson and Svensson, 1989) embedded in a neoclassical real business cycle model, they show that switches between left-wing and right-wing governments amplify the cycle. Moreover, they show that when political polarization increases, the volatility of fiscal and economic variables rises and long run output and investment decrease. In their model, polarization increases the variability of the political shock inducing economic policy uncertainty.

In this section I explore empirically the effects of political polarization in economic behavior. In particular, I test whether the implications of the models discussed above hold for the US using the PPI measure developed in this paper.

3.1 Economic variables

Economic variables are obtained at the quarterly level for the sample period 1981:q1 to 2012:q4 from the Bureau of Economic Analysis (BEA). Consumption, output, and investment are seasonally adjusted and expressed in billions of 2005 dollars. They correspond to Personal Consumption Expenditures, Gross Domestic Product, and Gross Private Domestic Investment, respectively, and are converted in real terms using the GDP deflator. Employment is expressed in thousands of employees in the nonfarming sector (seasonally adjusted series). Interest rates are proxied by quarterly averages of the federal funds (effective) rate, obtained from the Federal Reserve Board. Finally, I compute the Solow residual to proxy the contribution of technological progress to output growth in our estimations. This residual is constructed as follows:

$$S_t = \ln(Y_t) - 0.36 \ln(K_t) - 0.64 \ln(L_t),$$

where Y_t denotes output, K_t is the stock of capital, and L_t is private industries' employment in period t. The Solow residual represents the amount of output produced net of expenditures in the main factors of production: capital and labor. Detrended measures of the Solow residual capture productivity shocks, which are attributed to be the main factor causing fluctuations in the economy (i.e., real business cycles) in the macroeconomics literature. In this paper, I want to distinguish political shocks from technological shocks and will thus use the Solow residual to control for the latter in the VAR estimations.

The specification above assumes a capital share of 0.36 and a labor share of 0.64, close to the long-run empirical averages of the capital and labor income shares. The series for capital is constructed using the perpetual inventory method:

$$K_{t+1} = I_t + (1 - \delta)K_t,$$

where δ is a constant depreciation rate of capital (set to 0.012, implying an annual depreciation rate of about 5%) and I_t is real investment. The initial capital stock is chosen so that the capital-to-output ratio in the first period (1981:q1) equals the average capital-to-output ratio over our sample period 1981:q1 to 2012:q4,

$$\frac{K_{1981:q1}}{Y_{2012:q4}} = \frac{1}{131} \sum_{1981:q1}^{2012:q4} \frac{K_t}{Y_t}.$$

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The resulting series is then used to compute the Solow residual.

3.2 VAR estimation

To test the impact of political polarization on aggregate economic variables, I estimate a Vector Auto Regression (VAR) model and recover orthogonal shocks by using a Cholesky decomposition of the following: the political polarization index, the Solow residual, the federal funds rate (to control for interest rates), log employment, log investment, log consumption, and log GDP. In the baseline specification I use quarterly data with two-quarter lags, as suggested by both the Akaike Information Criterion test and the Bayesian (Schwartz) Information Criterion test. I check that the VAR is stable, so impulse-response functions can be constructed. The VAR methodology allows me to detect comovements between economic variables and the PPI, with some suggestive—though not definitive—evidence on causation.

The main experiment is to test the effects of a 64-point increase in the PPI, equivalent to the rise in the political polarization index between 2007 and 2012.
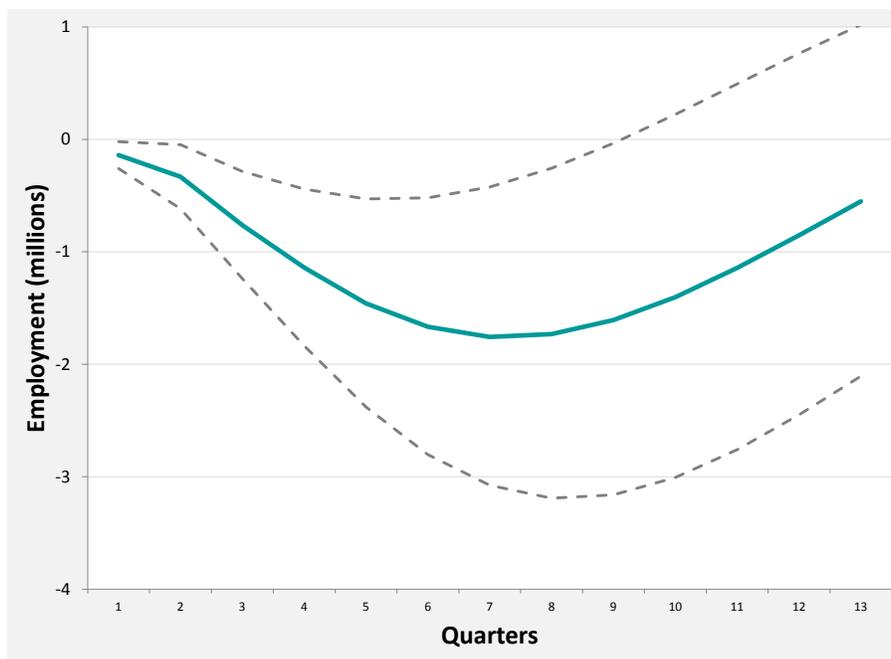
Figure 8: Impulse-response function of employment to a 64-point increase in political polarization (equivalent to the rise in the PPI between 2007 and 2012). The central solid line is the mean estimate, while the dashed outer lines represent one-standard-error bands. These are estimated using a monthly Cholesky Vector Auto Regression (VAR) model with the PPI, the Solow residual, the FF rate, log employment, log investment, log consumption, and log GDP (in that order).

Figure 8 shows that this innovation causes private employment in the nonfarming sector to decrease significantly (solid line), with a peak response of 1.75 million jobs after six quarters. The dashed lines in the figure represent one-standard-deviation error bands and suggest that the
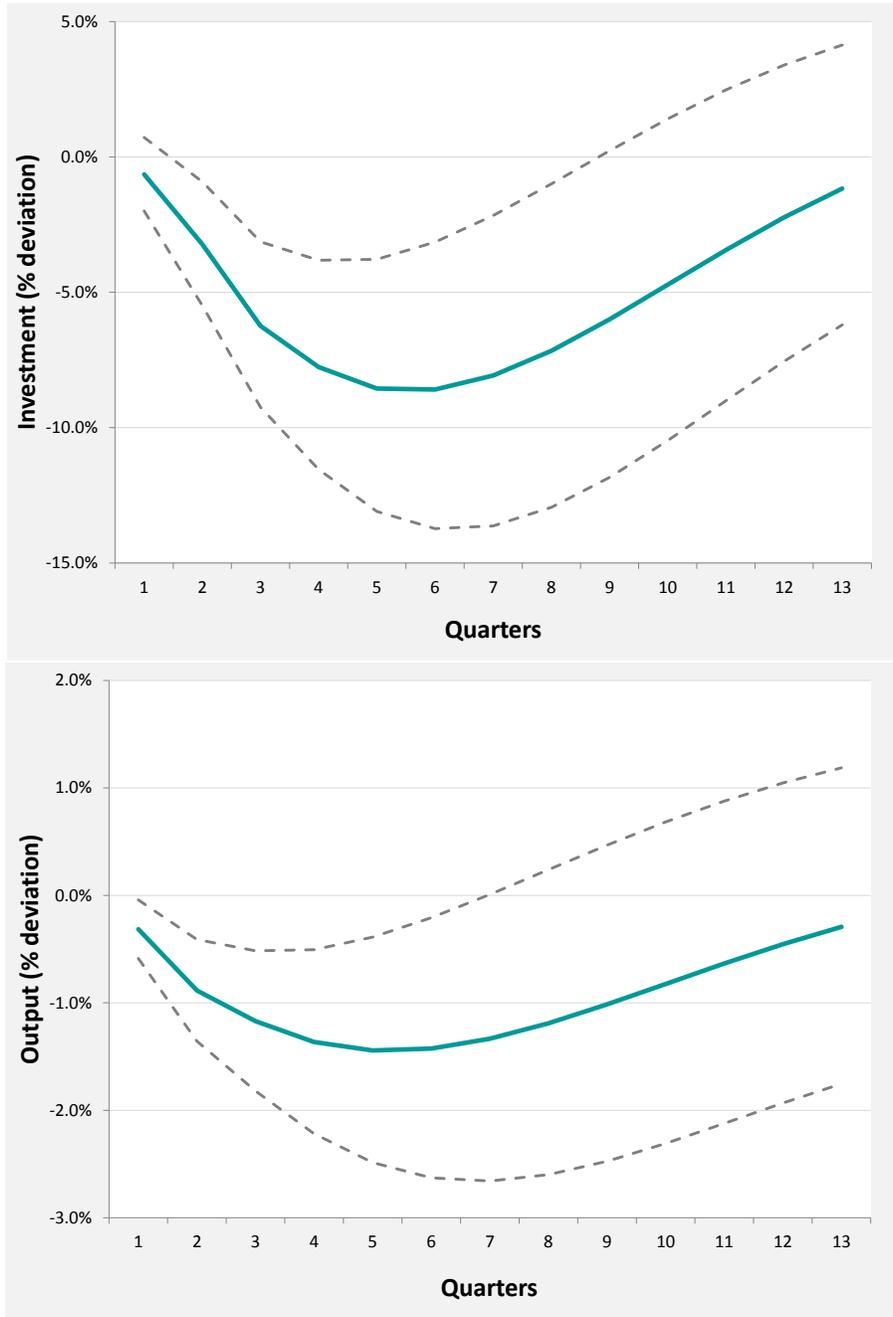
Figure 9: Impulse-response function of investment (top) and output (bottom) to a 64-point increase in political polarization (equivalent to the rise in the PPI between 2007 and 2012). The central solid line is the mean estimate, while the dashed outer lines represent one-standard-error bands. These are estimated using a monthly Cholesky Vector Auto Regression (VAR) model with the PPI, the Solow residual, the FF rate, log employment, log investment, log consumption, and log GDP (in that order).

decline in employment is statistically significant. The top panel of Figure 9 indicates that private investment also declines following the rise in polarization, with a peak impact of about 8.6% after five quarters. This decrease is persistent, with investment recovering only after 10 to 13 quarters. The negative response of output can be seen in the lower panel, which shows a decrease of more than 1% in aggregate production in response to the 64-point innovation in polarization levels. The degree of persistence is lower than for investment, but it is still considerable. The response of private consumption (not shown) is negative, but statistically insignificant.

Robustness: These results are robust to the ordering of the Cholesky decomposition and to the inclusion of a time trend. Figure 10 shows how the mean estimate of the output response is affected by the number of lags used in the VAR estimation. The baseline case uses the optimal lag structure (two lags), while the other two lines represent one-lag (dashed) and three-lag (solid with circles) specifications. I have also recomputed the VAR using quarterly averages of the seasonally adjusted PPI measure described in Section 2.2, but this does not change the results significantly, as seen from the fact that the response of output to PPI_{sa} is basically identical to the response to the benchmark PPI measure.
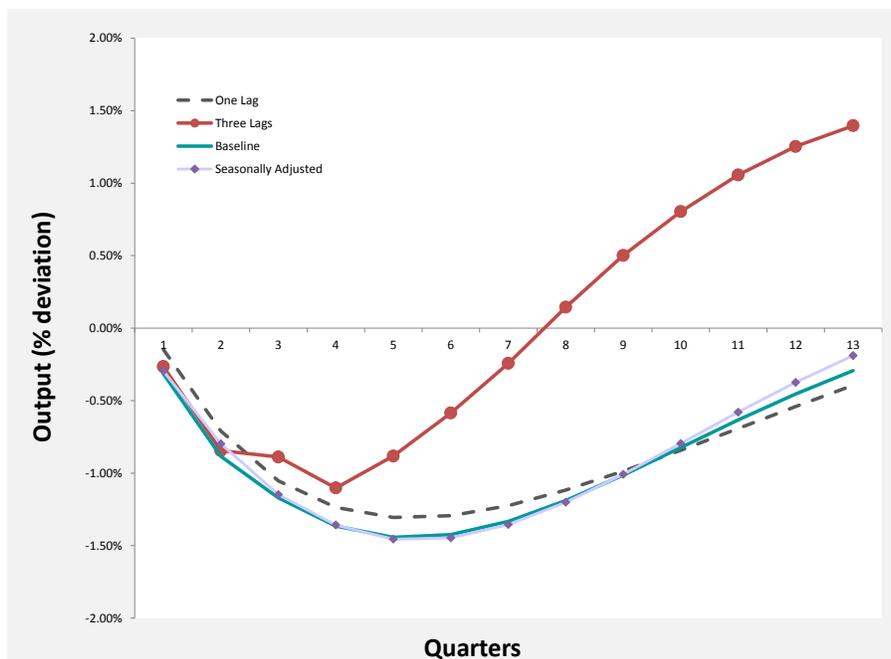
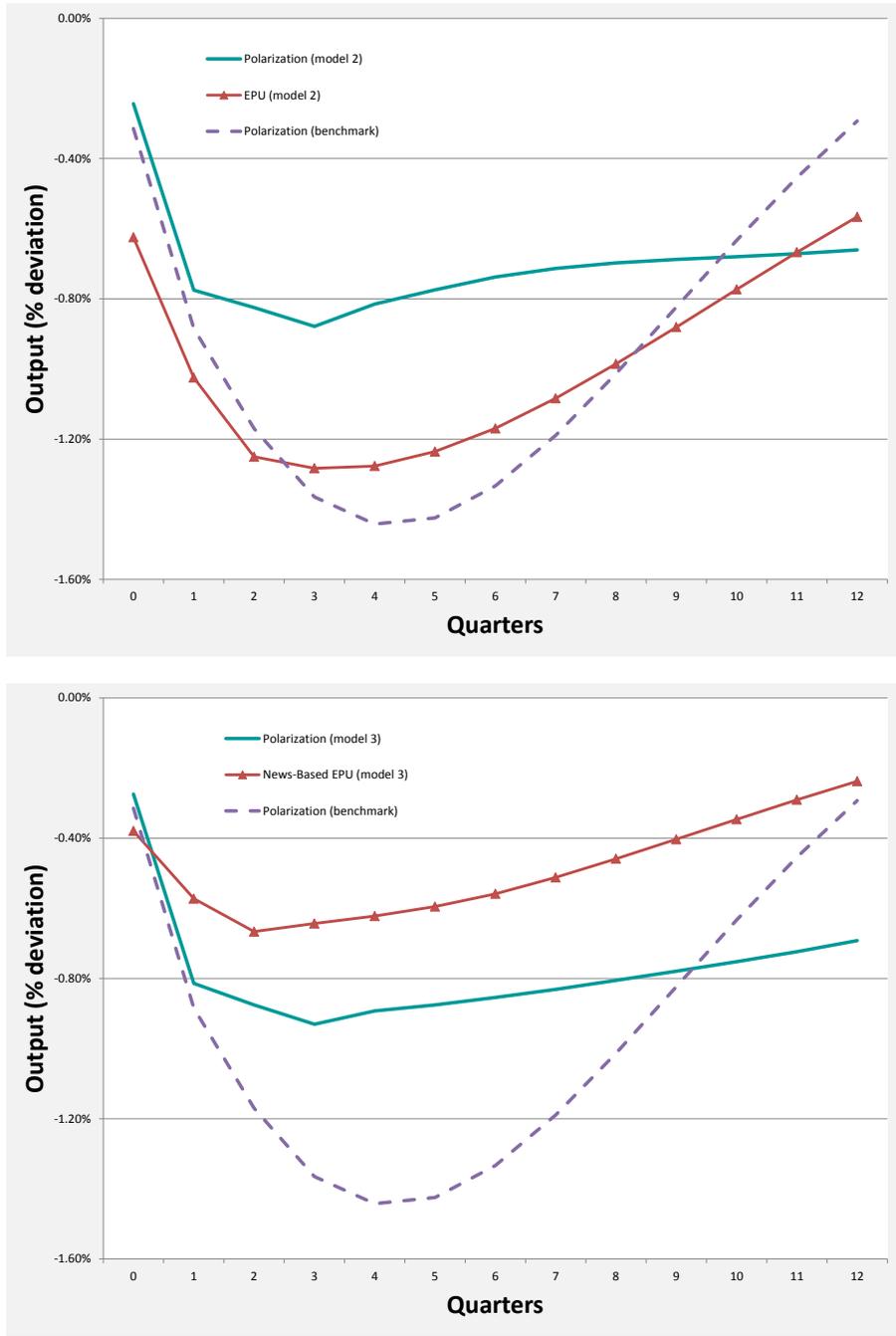
Figure 10: Impulse-response function of output to a 64-point increase in political polarization (equivalent to the rise in the PPI between 2007 and 2012) for different specifications. The central solid line is the mean estimate for the benchmark model (two lags), estimated using a monthly Cholesky Vector Auto Regression (VAR) model with the PPI, the Solow residual, the FF rate, log employment, log investment, log consumption, and log GDP (in that order). The figure also displays the response of output to the PPI under one lag and three lags, as well as the response of output to the PPI_{sa} (under the Seasonally Adjusted label).

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Figure 11: Impulse-response function of output to a 64-point increase in political polarization (equivalent to the rise in the PPI between 2007 and 2012) for different specifications. The solid line is the mean estimate for the benchmark model (two lags), estimated using a monthly Cholesky Vector Auto Regression (VAR) model with the PPI, the EPU, the Solow residual, the FF rate, log employment, log investment, log consumption, and log GDP (in that order). The figure also displays the response of output to the PPI under the benchmark model (which excludes EPU) and the response of output to a 64-point EPU shock. The top panel uses the baseline EPU measure, while the second one uses the News-Based Component measure.

Finally, I have also recomputed the VAR including alternative EPU measures. In Model 2, I estimate a VAR and recover orthogonal shocks by using a Cholesky decomposition of the following: the political polarization index, EPU, the Solow residual, the federal funds rate (to control for interest rates), log employment, log investment, log consumption, and log GDP. The only difference relative to the benchmark model is the inclusion of the baseline measure of EPU computed by Baker, Bloom, and Davis (2013). The top panel of Figure 11 shows that the response of output (in % deviations) to a 64-point polarization innovation is lower in Model 2 (dashed line) than in our benchmark model (solid line). For reference, I also include the response to a 64-point increase in EPU (solid line with triangles), which is stronger and more persistent than the response of polarization. Because the baseline EPU index in Baker, Bloom, and Davis (2013) includes tax expirations, which have been shown to be highly correlated with the PPI, collinearity may arise if the two variables are included in the VAR. This is also suggested by the fact that the error bands become wider (not shown in the plot). In order to reduce multicollinearity, I have re-run the VAR using the news-based component of EPU computed by Baker, Bloom and Davis (2013), in Model 3. Recall that both indexes have been constructed following a similar methodology. As shown in Figure 5, the PPI and the news-based EPU index share some characteristics, but they have very different reactions to financial shocks (internal and external), as well as to military events. The bottom panel of Figure 11 shows the impulse-response function of output to polarization (solid line) and to news-based EPU shocks (solid line with triangles). We can see that the response of output to a 64-point innovation in polarization is stronger than that of the news-based EPU measure (to a same-size shock). They are both, however, somewhat weaker than the one presented in the benchmark case, where only polarization is included.

This exercise suggests that political polarization negatively affects economic behavior. An increase in the PPI similar to the one observed between 2007 and 2012 results in a reduction of output, employment, and investment. Because the estimation controls for TFP (through the Solow residual) the results suggest that political disagreement exacerbated the detrimental effects of the last recession in the US. These effects are shown to be persistent and significant, providing additional support for theories relating political polarization to business cycles.

3.3 Investment and the electoral cycle

In this section I test the hypothesis that certain economic decisions involving costly reversibility are delayed immediately before an election if political polarization is elevated. To do this, I perform an exercise similar to the one in Canes-Wrone and Park (2011), who analyze how de-trended investment behaves in the quarter before an election takes place and polarization is high. Unlike in their paper, I focus only in the US and use the PPI developed here to measure polarization. The advantage of focusing exclusively on the US is that institutional conditions remain constant over time, whereas they would need to be controlled for if a panel of different countries is used. The PPI measure used in this analysis has the advantage of being computed at a high-frequency for the sample period 1981:q1 to 2012:q4, resulting in a large enough number of observations.

Dependent variables: Canes-Wrone and Park (2011) focused on investment as their variable of interest because it is the one with the highest reversibility costs. In this exercise, I also compute results using employment and output as dependent variables. The reason is that, in an environment

subject to search frictions, firms need to incur the costs of posting vacancies before observing the state of the economy in which production will take place. This cost increases when uncertainty is high, which may negatively affect the level of employment. Schaal (2012), for example, describes a theoretical model where increases in the volatility shocks faced by firms negatively affect aggregate output and labor market flows. Thus, the hypothesis in my paper is that increases in uncertainty about fiscal policy before election dates may induce firms to postpone not only investment but also hiring decisions until the uncertainty is resolved. This should, in turn, affect aggregate production. Investment, employment, and output are logged and HP-filtered (with parameter $w = 1600$ for quarterly data) to focus on business cycle frequencies.

Independent variables: The key independent variable is the political polarization index. To minimize collinearity between the interactions involving polarization and the pre-election quarter, I create an indicator variable reflecting high polarization levels. Above average PPI takes a value equal to 1 if the PPI is greater than its average value over the sample period, and zero otherwise. I consider pre-election periods for both presidential and Congressional elections. The interactions of pre-election and above average PPI are denoted by "$I_{P,t-1}$ x Above Avg. PPI" and "$I_{M,t-1}$ x Above Avg. PPI" respectively. Evidence for the reverse electoral cycle theory would be provided by a negative estimated coefficient to these variables.

I also include productivity shocks as an explanatory variable because the behavior of investment, employment, and output is highly affected by economic booms and recessions (above and beyond fluctuations caused by the electoral cycle). To the extent that the electoral cycle coincides with the business cycle, estimates could be biased if TFP were omitted. To construct a measure of TFP shocks, I HP-filter the Solow residual computed in Section 3.1 (using parameter $w = 1600$ for quarterly data).

Finally, I include a variable to control for the "partisan rational theory" which argues that left-wing governments tend to spend more and tax more while in power than right-wing governments. A switch from one type of government to the other should therefore affect investment levels (see Azzimonti and Talbert, 2013), but after the election takes place. An indicator variable labeled "Democrat Switch" is introduced, which takes a value of 1 in the quarter when a Democratic president takes power if the previous president was Republican. If the partisan theory holds, we should expect a negative coefficient.

I perform a linear regression of one of the three dependent variables described above (HP-filtered investment, employment, and output) on "$I_{P,t-1}$ x Above Avg. PPI," "$I_{M,t-1}$ x Above Avg. PPI," TFP, and "Democrat Switch,"

$$Y_t = \alpha_0 + \alpha_1 I_{P,t-1} \times \text{Above Avg. PPI}_t + \alpha_2 I_{M,t-1} \times \text{Above Avg. PPI}$$

$$+\alpha_3 \text{Democrat Switch}_t + \alpha_4 TFP + \epsilon_t,$$

where ϵ_t denotes the error term. The results are summarized in Table 2, where robust standard errors are shown in parentheses.[9]

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[9]I tried an alternative specification that included additional lags, but they turned out to be statistically insignificant and did not improve the fit of the model.

Table 2: PPI, economic behavior, and the electoral cycle

Variable	(1) Investment	(2) Employment	(3) Output
TFP	5.1***	0.2	1.1***
	(0.77)	(0.16)	(0.13)
$I_{M,t-1}$ x Above Avg. PPI	-0.073***	-0.022***	-0.018***
	(0.0076)	(0.0018)	(0.0015)
$I_{P,t-1}$ x Above Avg. PPI	0.004	-0.005	-0.004
	(0.036)	(0.006)	(0.005)
Democrat Switch	-0.039***	-0.009	-0.007
	(0.014)	(0.006)	(0.005)
Observations	128	128	128
R-squared	0.33	0.05	0.42

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: The dependent variables are investment (first column), employment (second column), and output (third column), all expressed in real terms, logged, and HP-filtered (with parameter w=1600). The sample period is 1981:q1 to 2012:q4. The independent variables are TFP (computed as HP-filtered Solow residual with w=1600), an interaction term indicating pre-(midterm) election quarters, $I_{M,t-1}$, with higher than average PPI, an interaction term indicating pre-(presidential)election quarters, $I_{P,t-1}$, with higher than average PPI, and a dummy variable indicating a change in presidential ideology (=1 if there is a switch from a Republican to a Democratic president).

We can see that midterm elections negatively affect investment, hiring and production decisions in pre-election quarters if these are highly polarized. The coefficient of "Pre-mid-elect quarter x Above Avg. PPI" is negative and statistically significant at the 5% level in the three specifications. There is no evidence, however, that presidential elections have the same effects for this sample period. The coefficients are very small and are all statistically insignificant. The partisan theory finds some support, as "Democrat Switch" is shown to reduce de-trended investment. In other words, agents reduce investment levels when power switches from a Republican to a Democratic president right after an election. The effect on de-trended employment and output is negative, but statistically insignificant. Finally, TFP has the expected effect: A positive productivity shock encourages investment, employment, and output.

4   Conclusion

Political polarization has increased substantially in the United States between the 1980s and today. Commentators and researchers suggest that the deep ideological division between the two main parties may have been an important factor affecting the aggregate economy, in particular by slowing the recovery from the 2007-09 recession. This paper investigates whether these claims are supported by the data. Because testing the hypothesis requires polarization to be measured at high frequencies,

I first develop a novel index of political polarization based on news search. Using a simple VAR, I test how an innovation to the estimated index (similar in size to the one observed between 2007 and 2012) impacts employment, investment, and output. I find evidence that polarization does cause these variables to decline significantly and persistently. Intuitively, political polarization increases the volatility of fiscal policy, raising the degree of uncertainty faced by businesses and firms, which has been shown to negatively affect the economy. The effects of polarization are more pronounced in periods preceding an election, as agents may choose to delay decisions that involve large reversibility costs. I find evidence of this behavior by documenting that investment tends to be lower in pre-(midterm)election periods when polarization is high.

In the future, I plan to study the effects of polarization on the US budget cycle (following Alt and Lassen, 2006); in particular, whether taxes, spending, and deficits are sensitive to the degree of political polarization. I also plan to extend the coverage of the political polarization index to a larger set of countries. Analyzing whether polarization tends to have larger effects in presidential than in parliamentary economies could be an interesting extension. A comparison between countries with different political accountability measures would help us further understand the impact of political uncertainty in the economy under different institutional environments, but that topic is also one for future research.

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5 Appendix

Table 3: Newspaper coverage in Factiva

News Source	Start Date	News Source	Start Date
The Arizona Republic	Jan-1999	The New York Times	Jun-1980
The Arkansas Democrat Gazette	Oct-1994	Newsday	Jul-1985
The Atlanta Journal Constitution	Jan-1986	The News-Gazette	Mar-2000
The Baltimore Sun	Sept-1990	The Oklahoman	Nov-1981
Boston Herald	Jul-1991	Omaha World-Herald	Aug-1983
Buffalo News	Feb-1992	The Orange County Register	Nov-1986
Charlotte Observer	Jan-1994	The Oregonian	Jul-1989
Chicago Sun-Times	Jul-1985	Orlando Sentinel	Oct-1987
Chicago Tribune	Jan-1985	The Philadelphia Inquirer	Oct-1994
The Christian Science Monitor	Sept-1988	Pittsburgh Post-Gazette	Jul-1990
The Cincinnati Enquirer	Jan-2002	The Plain Dealer	Mar-1989
The Columbus Dispatch	Dec-1991	The Sacramento Bee	Jan-2003
The Boston Globe	Jan-1987	San Antonio Express-News	Feb-1994
The Courier Journal	Jan-2002	The San Francisco Chronicle	Apr-2012
The Dallas Morning News	Aug-1984	San Jose Mercury News	Jan-1994
The Denver Post	Aug-1988	The Seattle Times	Dec-2008
Detroit Free Press	Jan-1994	South Florida Sun-Sentinel	Jan-1990
The Detroit News	Jan-2002	St. Louis Post-Dispatch	Jan-1992
The Fort Worth Star-Telegram	Jun-2001	St. Paul Pioneer Press	Jan-1994
The Hartford Courant	May-1991	The Star-Ledger	Jan-1991
Houston Chronicle	Apr-2012	Star-Tribune	Jan-1986
Indianapolis Star	Jan-2002	Tampa Bay Times	Nov-1986
Investor's Business Daily	Jan-2002	Tampa Tribune	Jul-2011
The Kansas City Star	Jan-1991	The Times-Picayune	Apr-1992
Los Angeles Times	Jan-1985	USA Today	Apr-1987
The Miami Herald	Oct-1994	U-T San Diego	Jan-2000
The Milwaukee Journal Sentinel	Jan-2000	The Wall Street Journal	Jun-1979
New York Daily News	Dec-1992	The Washington Post	Jan-1984
New York Post	Sept-1997	Washington Post.com	Oct-2007

Note: This table contains the names of the main US newspapers used in constructing the political polarization index (PPI), together with the coverage start month in Factiva's database.