Inflated Expectations: How government partisanship shapes monetary policy bureaucrats' inflation forecasts

Christopher Gandrud

Hertie School of Governance[*]

and

Cassandra Grafström

University of Michigan[†]

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Abstract

Governments' party identifications can indicate the types of economic policies they are likely to pursue. A common rule of thumb is that left-party governments are expected to pursue policies for lower unemployment, but which may cause inflation. Right-party governments are expected to pursue lower inflation policies. How do these expectations shape the inflation forecasts of monetary policy bureaucrats? If there is a mismatch between the policies bureaucrats *expect* governments to implement and those that they *actually* do, forecasts will be systematically biased. Using US Federal Reserve Staff's forecasts we test for executive partisan biases. We find that irrespective of actual policy and economic conditions forecasters systematically overestimate future inflation during left-party presidencies and underestimate future inflation during right-party ones. Our findings suggest that partisan heuristics play an important part in monetary policy bureaucrats' inflation expectations.

Keywords: forecast bias, Federal Reserve bureaucrats, rational partisan cycle, heuristics, inflation, monetary policy

[*]Postdoctoral Researcher. Friedrichstraßer 180. 10117 Berlin, Germany. Email: gandrud@hertie-school.org. Thank you to the Mark Hallerberg and the Fiscal Governance Centre at the Hertie School of Governance for comments and support. Thank you also to Leonardo Baccini, Vincent Arel-Bundock, Cheryl Schonhardt-Bailey, Tom Stark, and seminar participants at the Hertie School of Governance, London School of Economics, and Yonsei University. This paper was written using `knitr` (Xie, 2013). It can be entirely replicated from data, analysis source code, and markup files available at: https://github.com/christophergandrud/GreenBook.

[†]Ph.D Candidate. 5700 Haven Hall, 505 S. State Street Ann Arbor, MI 48109-1045. USA. Email: cgrafstr@umich.edu.

Monetary policy is an inherently forward looking enterprise. Beliefs about the economy's future course guide the setting of interest rates. Government policies significantly affect changes in growth, inflation, and unemployment. Further, a government's party identification can serve as a cue for the types of economic policies that it is likely to pursue during its tenure. A common rule of thumb or "heuristic" for the United States is that right-leaning Republicans are expected to pursue policies associated with lower inflation and left-leaning Democrats are expected to pursue policies associated with lower unemployment, but more inflation (see Samuelson, 1977; Hibbs, 1977). Recent evidence suggests, however, that the real differences in economic policies implemented by the two parties are quite minimal (Bartels, 2008). Pursuing monetary policy based on expectations of differences in partisan behavior, as opposed to their general similarities in reality, could lead to systematic mistakes in the setting of monetary policy. It is therefore important to ask how US Federal Reserve Staff incorporate the government's partisan composition when forming expectations of future inflation.

We provide strong evidence that Fed internal inflation forecasts–the forecasts on which monetary policy decisions are based–are heavily influenced by an inaccurate presidential partisan heuristic. These forecasts consistently predict that inflation will be lower than it turns out to be under Republican presidencies and that inflation will be higher than it turns out to be under Democratic administrations. Even accounting for changes in monetary policy and a variety of other economic and political factors, Federal Reserve economists over-shoot inflation forecasts for Democrats and under-shoot for Republicans. We find that previous literature on how partisanship may affect monetary policy–primarily work done on partisan preferences (Clark and Arel-Bundock, 2013; Hakes, 1988; Sieg, 1997; Tootell, 1996) and rational monetary policy expectations (Alesina, 1991; Hibbs, 1994)–is not as useful as a partisan heuristic approach for explaining these predictive failures.

In this paper we first briefly describe bureaucratic inflation forecasting at the US Federal Reserve, why it is important for monetary policy-making, and previous research on sources of bias in it. Academic scholarship on partisanship and Fed forecasting has largely been non-existent. So we introduce the presidential partisan heuristic approach to explaining prediction errors. We also derive major alternative hypotheses about how partisan control of the presidency might shape inflation forecasts by Federal Reserve Staff from the literature on partisanship and monetary policy-making. We then discuss how to measure inflation forecast errors. Using Fed Staff's "Greenbook" forecasts we demonstrate that there does appear to be a presidential partisan bias. To understand why these errors exist we test the theories of partisan bias with a series of regression models using both unmatched and matched data on inflation forecast errors from the 1970s through 2007.[1] Our findings suggest that even when controlling for a number of important economic and political factors, Greenbook forecasts show a distinct

[1] This is the most complete data set currently available to the public.

presidential partisan bias across presidential terms, not just in the run up to elections, as competing theories would suggest. Rather than being caused by electoral preferences or partisan monetary policy expectations–we find strong evidence supporting our hypothesis that the bias is caused by an incorrect partisan heuristic Fed Staff hold about administrations' likely effect on inflation. Our finding highlights psychological aspects of how bureaucrats deal with uncertainty that, though they have been researched extensively in the behavioral economics literature, have previously been ignored by researchers empirically examining monetary policy bureaucracies. In the conclusion we discuss the implications of these findings for monetary policy, election outcomes, and future research directions.

1 Bureaucratic Inflation Forecasting in the United States

The US Federal Reserve's Greenbook forecasts are an important example of bureaucratic inflation forecasting. Prior to every Federal Open Markets Committee (FOMC) meeting Federal Reserve Staff create a document called the "Current Economic and Financial Conditions"–Greenbook–that contains information on recent behavior and forecasts of various macroeconomic aggregates assuming no monetary policy change.[2] Federal Reserve Staff make forecasts of various elements of the US and global economies so that the FOMC can make policies appropriate to fulfill the Fed's dual mandate of maintaining maximum employment and price stability.

As Svensson (2005) notes, the accuracy of forecasts is essential to the effectiveness of monetary policy. The FOMC directly uses these forecasts to determine the appropriate monetary policy to pursue. Greenbook forecasts are given to FOMC members one week before each meeting. Staff also present the Greenbook forecasts during FOMC meetings. Expectations, directly influenced by Greenbook forecasts, play a very important part in FOMC decision-making. From FOMC minutes we know that members spend a considerable amount of time discussing prospective economic conditions. In fact much of the FOMC meeting time is used to discuss what economic conditions are likely to be rather than the relative desirability of various outcomes (Romer and Romer, 2008, 230). What members believe will happen in the future directly influences their policy choices. Higher inflationary expectations increase the likelihood of a member supporting tightening policy in order to slow inflation and an overheating economy; low inflationary expectations increase the likelihood of a preference for loosening monetary policy to bolster growth and employment, all else equal. Therefore, to act as useful baseline for FOMC decision-making it is important that Greenbook forecasts accurately predict future inflation.

The study of Fed inflation forecasts and their accuracy has been almost exclusively contained within

[2]Greenbook data can be found at http://www.phil.frb.org/research-and-data/real-time-center/greenbook-data/philadelphia-data-set.cfm (accessed March 2013). Greenbook forecasts are currently available to the public for each quarter from the fourth quarter of 1965 through the end of 2007. There is a five year lagged release schedule. Also, some forecasts are not available for the entire period.

economics with the main concern being the rationality of forecasts (e.g. Capistrán, 2008; Romer and Romer, 2000) and the performance of the Fed's forecasts relative to market forecasts (e.g. Faust and Wright, 2007; Gamber and Smith, 2009). While some studies in the economics literature have examined the biases of particular time periods (e.g. Capistrán, 2008) or bank presidents (e.g. Havrilesky and Gildea, 1995), in our search none considered how government partisanship affects expectations about future inflation at the Federal Reserve.

It is important to note that finalized Greenbook forecasts are "consensus" forecasts combining *both* econometric models and the professional opinions of forecasters about likely changes in the economy's trajectory not necessarily picked up in these models (Karamouzis and Lombra, 1989; Reifschneider, Stockton and Wilcox, 1997). Preferences and/or beliefs about government partisanship, rather than just econometric models based on explicit assumptions, could therefore directly shape Greenbook forecasts.

The idea that politicians of different partisan stripes might behave differently in office and that their behavior might have different effects on future economic output and inflation is largely uncontroversial for political scientists.[3] However, political scientists have largely not explored whether or how these differences affect Federal Reserve inflation forecasts. The closest attempt made to explore partisan biases in Fed forecasts that we know of was done by Frendreis and Tatalovich (2000). Using simple frequency tables and yearly data, they examined the accuracy of forecasts by the Congressional Budget Office (CBO), presidential administrations', and Federal Reserve Staff. Though they listed the accuracy of Fed inflation forecasts as measured by absolute mean error for the whole period 1979-1997,[4] they *did not examine partisan biases* or any other cause of inaccuracies in Fed forecasts. Their study of partisan biases was entirely confined to a comparison of CBO and administrations' forecasts.

2 Possible Explanations of Fed Inflation Forecast Inaccuracy

In this section we try to understand Fed bureaucrats' inflation forecast accuracy under different presidential administrations by developing theories derived from the political economy and political psychology literatures that provide possible explanations of how government partisanship may shape forecasts.

2.1 Partisan Biases

There is an extensive literature looking for partisan effects in monetary policy, but few studies examining the impact of presidential partisanship on predictions of inflation and none focusing on monetary policy bureaucrats. In this part we first introduce our presidential partisan heuristic approach to under-

[3] See Bartels (2008) for evidence on the similarities and differences of Democrats and Republicans in office.
[4] They found that absolute mean errors were similar to the CBO's and less than administrations'.

standing Fed Staff's inflation forecast errors. After introducing partisan heuristics, we draw on previous approaches to understanding the relationship between partisanship and monetary policy decisions that, when reformulated for the issue of bureaucratic inflation forecasting, directly compete with our heuristic theory.

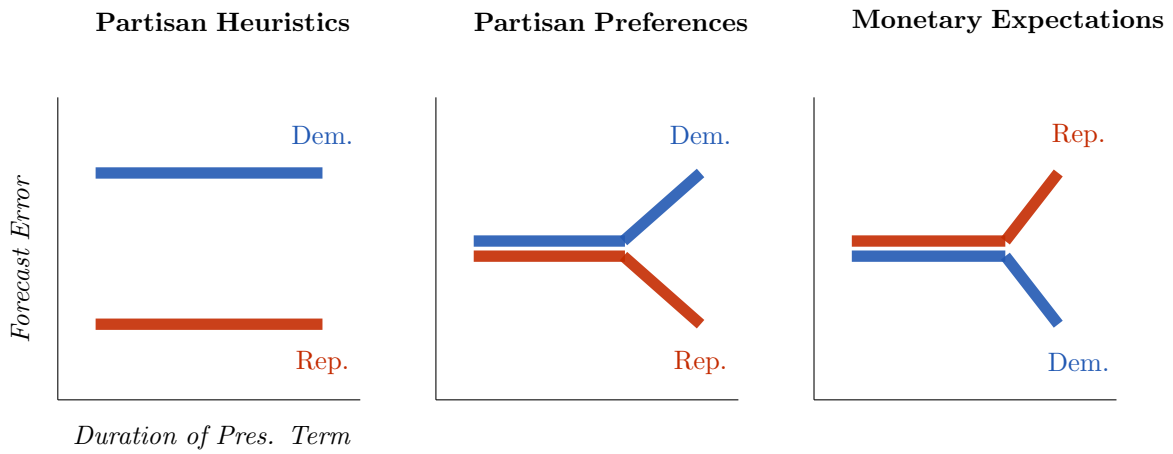
We propose a **presidential partisan heuristics** theory that Fed Staff forecasters incorporate a rule of thumb–heuristic–(see Kahneman and Tversky, 1973; Tversky and Kahneman, 1974; Kahneman, 2003) about the policy behaviors of presidents from different parties and the effects these different policies will have on the economy. Heuristics are intuitions that reduce the complexity associated with making predictions. Though they can be useful, "sometimes they lead to severe and systematic errors" (Tversky and Kahneman, 1974, 1124). In this theory, economists at the Fed have an intuition that Democrats and Republicans behave differently in government and so formulate inflation expectations with this in mind. If this intuition does not accurately correspond to how presidents act, or how their policies impact inflation, forecasts will be systematically biased: overestimates for Democratic presidents, underestimates for Republicans. Bartels (2008) finds evidence that Democratic and Republican presidents do not, in fact, differ significantly in their overall levels of spending, so any expectation that they would pursue policies that would differentially affect inflation in the medium-run would likely be inaccurate.[5] These biases should be constant *throughout a president's term*. As we will see, this prediction contrasts with the partisan preference and monetary expectation theories, which both assume an intensification of biased behavior as elections approach. Figure 1 shows an illustrated comparison of the three theories we set out.

Our model does not require that forecasters be conscious of the heuristic they're using. It can simply work its way subtly into forecasts, particularly in the subjective aspect of the "consensus forecast" component of the Greenbook. If the models do not conform with other expectations about the economy's current course, based in part on these subtle partisan heuristics, the consensus forecast will be modified accordingly. Further, because this bias would not need to be conscious, the systematic error could easily go unnoticed (as mistakes could occur for any number of idiosyncratic or economic reasons). If the bias goes unnoticed, then it will not be corrected in future inflation predictions.[6] This differs from the rational partisan expectations theory described below in two ways. First, because these beliefs are not updated to account for the lack of partisan differences in spending they are not "rational". Second, and relatedly, this theory is based on psychological instead of game theoretic reasoning, which allows for the persistence of suboptimal strategies in a way that would be less likely in a rational choice model of this

[5] Bartels (2008) does not discuss other policies that could affect inflation in the long run, such as changes to labor and financial market regulation. These policies too would be expected to differ by party, however their lags are likely to be quite long and out of the forecasted time frames used in this paper.

[6] This assumption is in contrast to Grauwe (2011), who assumes that actors actively observe their heuristics and adapt them through trial and error. He does not provide empirical evidence supporting this assumption, however.

Figure 1: Stylized Partisan Inflation Forecast Error Predictions



same process given the assumption that the goals of the actors are the same in the two models.

The usefulness of a theory is partially demonstrated by how well it explains events relative to its major competitors. Though no previous studies have examined partisan biases in inflation forecasts, competing theories can be derived from studies that have looked for evidence of partisan preferences manifesting themselves in the FOMC's monetary policy outcomes. Two key strains in this literature have looked for partisan effects as either resulting from a preference for one party over another by members of the FOMC or an expectation that once in office the parties will engage in systematically different policies that will influence inflation, leading the FOMC to support more preferred policies and attempt to inhibit less preferred ones.

The preference arguments about monetary policy-making assume that a conservative central banker will prefer the election of politicians who hold more similar inflationary preferences (i.e., those with a stronger preference for low inflation) and enact policies to bolster their preferred candidate's prospects of being elected. In the US this would mean that the FOMC would implement policies that supported the electoral prospects of Republican incumbents and harm the electoral prospects of Democratic incumbents (Clark and Arel-Bundock, 2013; Hakes, 1988; Sieg, 1997; Tootell, 1996).

Building on this approach, a **partisan preference theory** of inflation forecast errors assumes that Fed Staff have a preference for more inflation averse politicians to control the executive and so produce inflation forecasts that would justify the implementation of easy monetary policy under Republican administrations and tight money under Democratic administrations, particularly as presidential elections approach. The FOMC, choosing policy based on these forecasts would then implement monetary policies

to optimize its utility function, which would not need to depend upon presidential partisanship at the level of the FOMC. However, because Fed Staffers prefer low inflation to high, they would not necessarily want to produce too loose/tight monetary policy over an entire four year term. Instead, they would want to encourage an economic boost (contraction) near the end of a Republican (Democratic) presidency. This implies that realized inflation would be higher than forecasted during Republican presidencies and lower than forecasted for Democratic presidencies. These effects would be particularly pronounced in the *quarters running-up to elections* as Fed Staff attempt to help their favored political party (Beck, 1987; Grier, 1987). Further, accounting for actual changes in monetary policy ought to increase the magnitude of partisan effects. This is because predictions of inflation during Republican presidencies, for example, will be lower than what the staff actually expects. If looser monetary policy is implemented in response to these low inflation forecasts than would have been chosen under the staff's true inflationary expectations, inflation will actually be higher than the staff's true beliefs about inflation under no change in monetary policy.

The rational partisan expectations literature on monetary policy-making assumes that central bankers do not have an innate preference for one party over another, but instead expect Democrats and Republicans to behave differently in office (Alesina, 1991; Hibbs, 1994). It is these behavioral expectations that would lead to different monetary policies under Democratic and Republican presidencies, with the former expected to engage in more expansionary and inflationary policies than the latter. In order to stave off higher inflation under a Democrat the Fed would tighten monetary policy; because Republicans are expected to prefer lower inflation, they will pursue policies in support of that goal and so the FOMC can accommodate Republican presidents' policies without fear of stoking inflation. This argument is again based on the assumed preferences of partisans, but does not require the FOMC to be politically biased as the former does.

What we call the **monetary expectations theory** is based on an assumption of partisan bias in the FOMC rather than among the staff. It assumes that Federal Reserve economists believe members of the FOMC will engage in partisan monetary policy by lowering interest rates under right-leaning administrations and increasing them under left-leaning presidents, as Clark and Arel-Bundock (2013) found, and assumes that the FOMC is doing this to manipulate election outcomes. In this formulation, the Fed Staff has no preference for one party over another, but knows that the FOMC does and so formulates estimates in order to counter the FOMC's policies. If Fed economists believe that the FOMC will choose systematically higher-than-called-for interest rates during Democratic presidencies and vice versa for Republicans, then–assuming they are interested in the implementation of optimal monetary policies–they would produce forecasts that are higher than expected during Republican administrations and the lower for Democrats; the *opposite of what is expected in the partisan preference theory*. If the

FOMC fails to note the compensation made by the Fed Staff, then we would expect that after accounting for implemented policies inflation forecasts would be higher than or equal to realized inflation during Republican terms and lower than or equal to forecasts under Democratic administrations.[7] If, however, the FOMC anticipated these compensatory biases in staff forecasts, then the FOMC would discount the Greenbook estimates and continue to implement inflationary policies during Republican administrations and contractionary policies during Democratic ones. If the staff likewise know that they are not being listened to they may randomize their errors, producing an uninformative signal (Crawford and Sobel, 1982). This would result in approximately similar inflation forecast errors for both Republicans and Democrats. However, we largely did not observe this (see below). If the Fed Staff believes that the FOMC will engage in partisan pumping only when presidential elections are approaching, then we would expect no partisan differences in forecasts at the beginning of a presidency but increasing divergence as the term wanes.

2.2 Econometric Models & Accuracy

Before empirically digging into partisan explanations of forecast errors, which would largely be the result of Federal Reserve Staff judgement, it is worth examining the possibility that forecast inaccuracy is the result of systematic errors in the staff's predictive econometric models. Federal Reserve Staff have primarily used two sets of econometric models during the period for which Greenbook data is available.[8]

The first simultaneous equation model of the US and world economies were developed and adopted by the Federal Reserve between 1966 and 1975. This model was based on adaptive expectations and largely extrapolated future behavior of the economy from its recent past behavior. New models of the American and world economies' near-term trajectories were introduced in the 1990s, fully replacing the older model in 1996. The Federal Reserve Board US model (FRB/US) and its counterpart for the global economy (FRB/Global) explicitly consider the role of economic expectations in economic behavior. The foundational assumption of adaptive expectations in the old model was replaced with rational or model-consistent expectations. In these models prices are sticky and aggregate demand determines short-run output. Furthermore, monetary policy's effects on the economy are extensively modeled.

Presumably, the move to rational expectations would improve forecast accuracy relative to the earlier period. The goal of incorporating forward looking actors into the models was to account for an important source of endogeneity in earlier models that could lead to overestimates of important economic indicators under some circumstances and underestimates of those same indicators under others. None of these over or underestimates, however, ought to have been linked to the party of the president. We would, however,

[7] This is illustrated in the center panel of Figure 1.

[8] This subsection draws heavily on Brayton et al.'s 1997 detailed description of the changes to Federal Reserve forecasting models that took place in 1996.

expect that the *magnitude* of forecast errors shrank after 1996.

3 Federal Reserve Staff's Forecast Accuracy

How accurate are Fed Staff forecasts? We focus on Greenbook forecasts of the GNP/GDP price index forecasts. We choose this indicator of Federal Reserve forecast accuracy because there is a strong assumption that central bankers are primarily concerned with inflation (e.g. Cukierman, Webb and Neyapti, 1992; Mukherjee and Singer, 2008; Tillmann, 2008). It is also the dominant measure of forecast errors used in the economics literature (c.f. Romer and Romer, 2000).

We measure accuracy by calculating **forecast error** E as the difference between the Greenbook inflation forecast F for a given quarter q and actual inflation I as a proportion of actual inflation:

$$E_q = \frac{F_q - I_q}{I_q}. \tag{1}$$

This is different from the accuracy measure Frendreis and Tatalovich (2000) used in their preliminary examination of forecast errors. They averaged the absolute value of yearly inflation forecast errors over a 19 year period[9] to examine Federal Reserve accuracy. Their measure has a number of drawbacks. First, it does not give us any indication of the direction of the forecast error, which is crucial for examining possible partisan biases. In their comparison of CBO and administrations' forecasts they did use a simple dichotomous directional indicator of accuracy in a given year (i.e. a forecast greater than or less than the actual level). This does not give us a sense of the relative size of the errors and could easily amplify trivial results. Almost any forecast will be above or below the actual inflation level in all but the unusual cases where the forecasts exactly equal the actual inflation level.

Second, the average of the absolute errors values could be highly skewed by years of unusually large errors, which is more likely in years of higher inflation. This is not a trivial concern because the inflation level varies substantially overtime (see Figure 2).[10] So, we choose to focus on proportional rather than absolute errors by quarter to avoid focusing on a parameter that is highly vulnerable to absolute value outliers. Quarterly proportional errors are also more substantively meaningful for comparing errors across time periods.[11]

Third, using multi-year or even year-level indicators makes it difficult to examine biases in the run up to an election or any other process that may be observed through variations within years. Using

[9] i.e. $\frac{|F_y - I_y|}{19}$

[10] Frendreis and Tatalovich (2000) also do not include any other indication of the errors' distribution.

[11] Note that the direction and significance of our main findings do not change when we use absolute rather than proportional errors in our estimation models (discussed below). The magnitude does change, but this is to be expected because the range of the absolute inflation errors is much larger than proportional errors. These results are available from the authors upon request.

quarterly data–the smallest level available–gives us a much more detailed view of any processes that might influence accuracy.

If the forecasts are unbiased the mean error of the forecasts–using either Frendreis and Tatalovich (2000) or our measure–would be indistinguishable from zero. While Frendreis and Tatalovich (2000) found that Fed errors were low relative to presidential administrations' on average over a 19 year period and Romer and Romer (2000) found that the Fed's internal forecasts meet this requirement over the full history of Greenbook forecasts, such an amalgamation disguises long periods of over- or under-predicting inflation, as noted in Capistrán (2008) and illustrated in Figure 2. Within economics the Fed's forecasts have been examined for evidence of rationality. These studies generally find that the Fed rationally incorporates information into its forecasts, outperforming private forecasts (c.f. Gamber and Smith, 2009). These studies, however, have rarely incorporated Fed Staff member' political preferences, because Federal Reserve Staffers are assumed to be politically independent.

Our dataset has 169 forecast quarters,[12] spanning the fourth quarter of 1965 through the end of 2007. Greenbook forecasts correspond to those provided for the FOMC meeting closest to the middle of the quarter. We found actual inflation corresponding to each of these quarters[13] using data from the Federal Reserve's FRED website.[14] We examine errors made by forecasters in the current quarter and all quarters up to five quarters before.[15] The results are generally the same regardless of the forecast's age, e.g. the results were similar for predictions made $q-1$ quarters before the forecasted quarter q, $q-2$ quarters before, and so on. In particular the presidential partisan findings are robust regardless of forecast age (see Figure 5). For simplicity, the majority of results we show and discuss in detail are from models with forecasts made two quarters beforehand.[16] Figure 2 compares absolute actual inflation for each quarter and inflation forecasts made two quarters before.

3.1 Are There Partisan Forecast Errors?

Unbiased forecasts have a mean error of zero (Brück and Stephan, 2006, 5). Using this criteria, forecast errors should be the same–ideally with a mean of 0–regardless of the incumbent president's party identification. This is not the case. From the second quarter of 1969[17] through 2007 the mean standard-

[12] This is the maximum number of observations. Longer forecasts result in fewer forecasted quarters. Likewise, some forecast lengths are unavailable for the full time period.

[13] Inflation was calculated by comparing quarters year-on-year. The exact inflation measure that the Federal Reserve was forecasting changed a number of times, so the measure of actual inflation used to created the forecast error variable changes accordingly. The GNP deflator indicator is used from the beginning of our sample through the end of 1991. From the first quarter of 1992 through the first quarter of 1996 actual inflation is measured with the GDP deflator. From the second quarter of 1996 we use the chain-weighted GDP price index. For more details on how the forecasted quantity changed see the Greenbook data description file available at: http://www.phil.frb.org/research-and-data/real-time-center/greenbook-data/philadelphia-data-set.cfm. The Greenbook inflation forecast variable we used is called "PGDPdot".

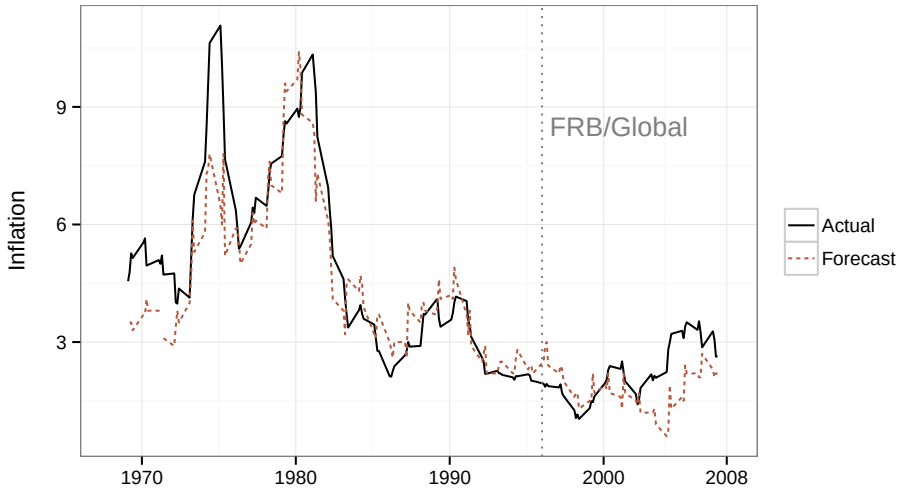
[14] See http://research.stlouisfed.org/fred2/. Accessed December 2011.

[15] The Greenbook contains very incomplete data for forecasts made over longer time spans.

[16] Using these two quarter forecasts restricts our observations because they are rarely available before the 1970s.

[17] Data availability for two quarter forecasts before 1969 is lacking.

Figure 2: Greenbook Inflation Forecasts Made 2 Qtr. Beforehand and Actual Quarterly Inflation



The vertical grey dotted line indicates when the Federal Reserve Board Global (FRB/Global) forecasting model was fully implemented.

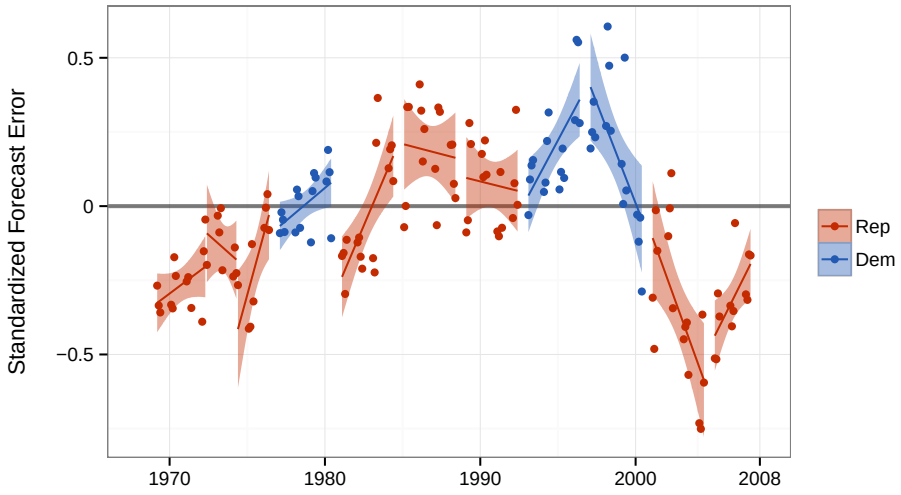
ized forecast error was -0.04, i.e. forecasters under-predicted inflation by about 4 percent. Our finding of relatively small average error over the entire 35 year period is in line with findings from previous studies. However, the mean errors are noticeably different across Republican compared to Democratic presidencies. Across Republican presidencies it was -11 percent and +13 percent across Democratic presidencies.[18] On average, inflation was underestimated in Republican presidencies and overestimated in Democratic ones.

Figure 3 plots forecast errors across our sample separated by presidential term and party. The first thing to note is that inflation was rarely underestimated during the three Democratic presidential terms in our sample. The underestimates that were made were relatively small. The largest overestimates we see were made during Bill Clinton's (Democratic) presidency. All of the major inflation underestimates were made during Republican presidencies, particularly during Richard Nixon's, Gerald Ford's, and George W. Bush's presidencies. Inflation was often overestimated during the second part of Reagan's first term, his second term, and George H.W. Bush's term. Over this period–often referred to as the Volcker Revolution (Bartels, 1985)–inflation was suddenly much lower than before (see Figure 2). It may have taken awhile for forecasters to adjust to this new lower level of inflation, particularly because the Fed's own models of the economy assumed that money had no real effects on the economy during this period, even while the FOMC was pursuing aggressive anti-inflation policies.

This summary examination of inflation forecast errors suggests that there may be a presidential

[18]These means are from estimates made two quarters beforehand. Both means are statistically significantly different from 0, the full observation mean, and each other at the 99% confidence level. For more details see http://bit.ly/WHsRYh.

Figure 3: Errors in Inflation Forecasts Made 2 Qtr. Beforehand (1969 - 2007)



Note: An error of 0 indicates that inflation was perfectly predicted.

partisan bias. Above we posited three different theories of how partisanship might affect inflation forecast errors. In the next section we describe how we go about testing these competing hypotheses.

4 Parametric Models & Variables

We used parametric models to examine the effects of presidential party ID and elections on the continuous inflation forecast error variable.[19] Our main model type was normal linear regression using maximum likelihood estimation of variance.[20] To examine if our estimates were dependent on this model type we also ran our analyses ordinary least squares[21] and Bayesian normal linear regression.[22] Bayesian normal linear regression is particularly useful for our limited sample as it makes "valid small sample inferences via draws from the exact posterior" (Imai, King and Lau, 2012, 38).[23]

As we show below the estimates from all three model types were very similar in direction, magnitude, and 'statistical significance'. Estimates from each parametric model type were substantively identical.

[19] Parametric models are estimated using the `R` package `Zelig` (Imai, King and Lau, 2012).
[20] In `Zelig` this is the `normal` model.
[21] In `Zelig`, this is the `ls` model). Because the results were virtually identical, we do not show them below. They are available upon request.
[22] In `Zelig` this is the `normal.bayes` model.
[23] Please see Goodrich and Lu (2007) for details about Bayesian normal linear regression.

4.1 Variables

In Section 3 we discussed our dependent variable–inflation forecast errors. To examine possible partisan biases we are interested in whether US presidents' partisan identities and/or the existence of an upcoming presidential elections affect these errors. To do this we created **president party identification** and **election period** variables. The president party ID variable is 1 when the president is a Democrat and 0 when he is a Republican. Since forecast error data is released on a quarterly basis, we consider a president to be sitting from the first quarter after the election.[24] We consider quarters to be in the election period either if the presidential election is held in that quarter or in the previous three quarters.[25] The economic voting literature indicates that it is economic performance in the 6-12 months preceding an American presidential election that seem to matter most for the election's outcome (c.f Gelman and King, 1993).

To further examine whether or not Federal Reserve Staff were taking into consideration an electoral business cycle either due to a partisan preference or the nearness of an election, we include a variable of the **quarters until the presidential election**. This simply counts down from the quarter after the previous election.[26] The quarters that included presidential elections are coded as 0. This is used only in models testing for a partisan effect.

The partisan preference and monetary expectations theories both posit that president's party ID and elections have a non-linear interactive relationship with forecast errors. To examine this possibility we include an **interaction** between the president party ID variable and the square of the quarters until election variable in the analyses.[27]

United States presidents do not set the level of government expenditure–a major non-monetary policy source of inflation–by themselves. Instead, presidents are constrained by the two houses of Congress. To examine whether or not Federal Reserve Staff are taking into consideration the partisan composition of Congress as well as presidents' party identifications, we include a variable measuring **Democratic legislators as a proportion of Republican legislators** in the House of Representatives and a similar variable for the composition of the Senate.[28]

Because each chamber of Congress acts as a veto player on the main fiscal expenditures, any Congressional effect on errors likely works through an **interaction** between the partisan IDs of Congress and the presidency. There are two types of interaction effects that can be derived from the literature. The first interaction possibility is that Federal Reserve Staff, using simple rational partisan expectations, presume

[24] Elections are held almost at the midpoint–early November–of an election year's fourth quarter. Presidents are sworn into office near the beginning–20 January–of the following year's first quarter.

[25] If q_e is a quarter with an election then we code quarters q_e, q_{e-1}, q_{e-2}, and q_{e-3} election quarters.

[26] There are 15 quarters before a United States presidential election quarter.

[27] An interaction with the non-squared quarters until election variable is also included, following (Brambor, Clark and Golder, 2006).

[28] Data on the number of legislators with Republican and Democratic party IDs was found at infoplease. See http://www.infoplease.com/ipa/A0774721.html. Accessed May 2012.

that a Democratic president would be able to get policies closer to their ideal point when there is a Congress with similar preferences. If a Democratic president faced chambers of Congress controlled by Democrats, presumably Federal Reserve Staff would expect even higher fiscal expenditures and therefore even higher inflation. Conversely, Republican presidents with a Republican-controlled Congress may be even better at cutting spending, leading to even lower inflation.[29]

The second possibility is based largely on Krause's (2000) work on the effect of partisan divisions on fiscal deficits in the United States. He finds partisan fragmentation can play a role in increasing federal deficits. Higher political conflict, he argues, "results in equilibrium fiscal outcomes that favor greater spending and/or a willingness to lower taxes since politicians will exhibit a greater proclivity in providing voters with program benefits and to delay its payment" (Krause, 2000, 542). Because of this Federal Reserve Staff may anticipate higher government borrowing when the presidency and houses of Congress are controlled by different parties. We are therefore agnostic about the theoretical direction of this interaction.

If prediction errors are largely the result of systematically biased economic forecasting models we would expect errors to change when the models changed. In particular, we would expect a decrease in the magnitude of errors around 1996 when the Federal Reserve Board's new US and Global Behavioral Equation Models were introduced. To examine this we include a **FRB/Global Model** dummy variable. It equals one for all quarters from the first quarter of 1996 onward. It is zero otherwise.

Greenbook forecasts are based on the assumption that monetary policy will not change between when the prediction is made and the time period it is predicting.[30] However, since these forecasts are used in the setting of interest rates, this assumption often does not hold and forecast errors may occur if monetary policy changes in the interim. If this is the case monetary policy changes would have a negative relationship with forecast errors. When the FOMC raises interest rates inflation may decline, causing the original forecast to have been too high and vice versa. To control for monetary policy changes we include a variable of **standardized changes to the discount rate** from the quarter the Greenbook prediction was made to the quarter it is predicting.[31] The discount rate is one of the Federal Reserve's main tools for influencing the interest rate, especially the Fed Funds rate.[32]

[29] The inflationary effect of these policies may be mitigated if they were offset by higher or lower taxes respectively.

[30] While the Fed Staff also produce forecasts under alternative monetary policies in the so-called "Bluebook," these data are not available in a readily usable format (i.e., not in a dataset but only in the original reports themselves) and thus are not used in the forecasting error literature.

[31] We averaged the discount rate over each quarter. Then we used the average discount rate D in each quarter q to create the variable ΔD_q using the simple formula: $\Delta D_q = \frac{D_q - D_{q-2}}{D_q}$. Note that the Federal Reserve changed how it used the discount rate and referred it at the beginning of 2003. To address this issue we primarily used data on the United States' discount rate recorded by the International Monetary Fund. Their data only goes back to the fourth quarter of 1982. So, before that we use the Federal Reserve's measure of the discount rate. Both of these variables are found in the FRED database at the St. Louis Federal Reserve (accessed July 2012).

[32] A similar **relative changes in the Fed Funds rate** variable was included in some preliminary analyses. However, it did not change the results substantially and was estimated to have a similar effect on errors as the discount rate variable.

We included a number of variables to examine if Federal Reserve inflation forecast errors are affected by incorrect assumptions about how levels of government expenditure impact inflation. These variables are the percentage of **current government expenditure to GDP**, **government debt to GDP**,[33] and **deficit to GDP**. Expenditure and debt are on a quarterly basis, while federal deficits are measured annually.[34]

To examine how broader economic factors may be related to forecast errors we include variables of the **GDP output gap**, **unemployment rate** and **recession**. The GDP output gap is the potential GDP as a percentage of real GDP. It is in nominal terms. The recession variable is a dummy for whether or not the United States was in a recession.[35]

Finally, we include a series of dummies for the sitting **Federal Reserve Board Chair**.[36]

Further variables used to examine omitted variable bias are discussed in the paper's Supplementary Materials.

5 Results

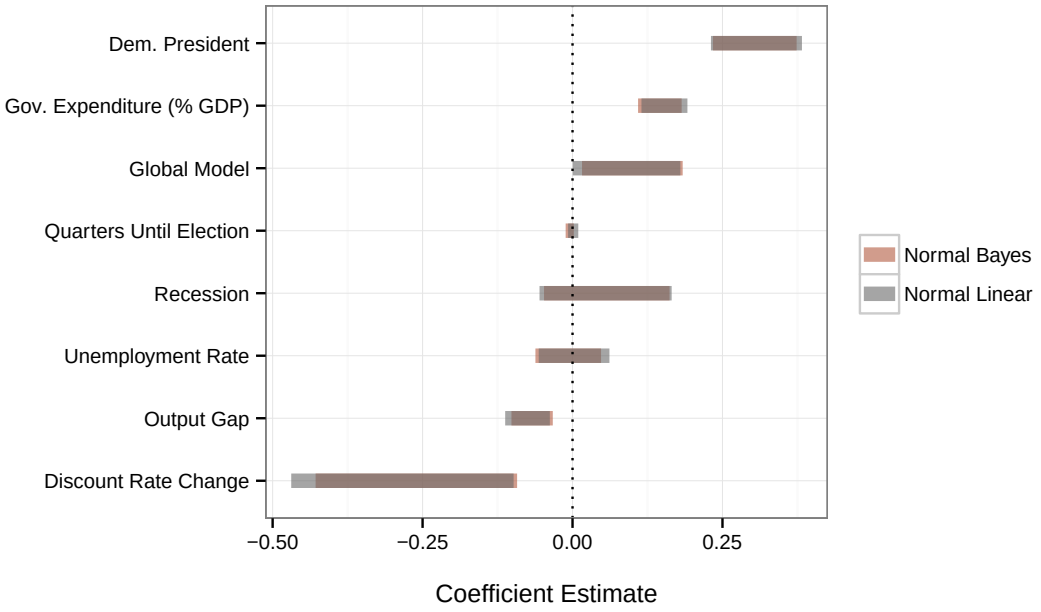
In this section we graphically present results from a number of parametric model specifications and discuss our findings. Full coefficient estimate tables can be found in tables 1 and 2. There is little difference between the coefficients estimated using normal linear and Bayesian linear regression models (see Figure 4).[37]

We remove quarters from the sample where forecasters would not have known who the president would be because the president had not yet been elected for that quarter. For models where the dependent variable is forecasts made two quarters beforehand this means removing the first two quarters of each presidential term.[38] Results from these restricted data sets are fairly similar to those from the full data set.

Presidential Party Identification Our main finding is that Democratic party identification had a strong positive association with Federal Reserve Staff inflation forecast errors. Inflation forecast errors are estimated to be higher during Democratic presidencies than Republican ones even when we control for the numerous economic and political variables discussed earlier. This finding is robust across virtually

[33] Results for debt to GDP are not shown because it was never statistically significant in any of the models.
[34] All three of these variables are from the FRED database, accessed October 2012 and January 2013.
[35] All three of these variables are from the FRED database, accessed June and October 2012.
[36] Chairs for the years in our analysis are William McChesney Martin, Jr., Arthur Burns, G. William Miller, Paul Volcker, Alan Greenspan, and Ben Bernanke.
[37] In all of the Bayesian regressions we use the `Zelig` default 1,000 MCMC burn-in iterations and 10,000 iterations after burn-in. We use the Heidelberger-Welch diagnostic to examine whether or not the Markov Chains converged to their stationary distributions.
[38] In this case 19 quarters are removed.

Figure 4: 95% Confidence Bands for Coefficients from a Multiple Parametric Model Specifications



Please see the full estimates tables in tables 1 and 2.

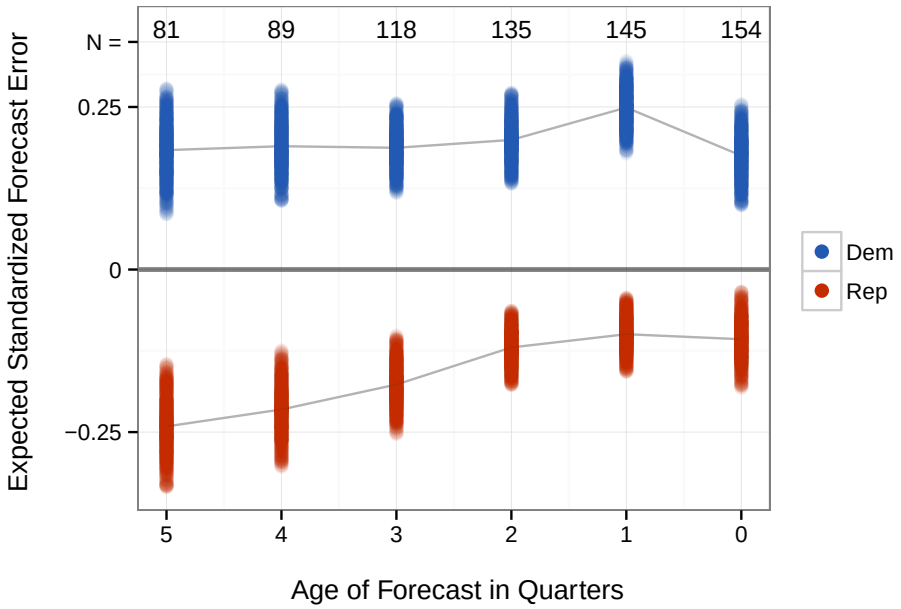
all model specifications. Notably, the estimated effect holds even when we control for actual government expenditure and government deficits. This suggests that Federal Reserve Staff are not simply incorrectly predicting spending–which may be correlated with presidential party ID–and its effect on inflation. Instead, they either additionally have a partisan preference or are using partisan heuristics.[39] We can further narrow down the likely causes of the bias by looking at an interaction between presidential party ID and election timing. The estimated presidential party ID effect remains constant across presidential terms, even as the election nears (see the left panel of Figure 6 and discussion below). This finding is what we would expect if Federal Reserve Staff have a presidential partisan heuristic, but not a partisan preference or an expectation that FOMC policy will change as elections near.

Following King, Tomz and Wittenberg (2000), we simulated expected standardized forecast errors for Democratic and Republican presidencies, holding the other covariates at their means, to get a sense of approximately how big the presidential partisan bias is when using different forecast lags. Results from these simulations are shown in Figure 5.[40] There is some variation in the predicted error magnitude depending on how many quarters ago the forecast was made. Nonetheless it is notable that inflation is always predicted to be higher than it really is in Democratic presidencies and lower in than it is in

[39] Note that the direction of the relationship–forecasts being overestimated during Democratic presidencies–is the opposite of that predicted by the Monetary Expectations theory.

[40] Figure 5. The graph uses visually-weighted regression techniques to communicate uncertainty (see Hsiang, 2012; Gandrud, 2013).

Figure 5: Simulated Expected Inflation Forecast Error for Republican and Democratic Presidencies



Simulated from a normal linear regression. Variables included are generally the same as those in Model A6 from Table 1. The discount rate change variable is adjusted to reflect the change in the discount rate from the quarter when the forecast was made. Discount rate change was not included for the model predicting forecasts made in the present quarter since it is always 0.
Each model excludes every quarter when the forecasters would not have known who the president was. Because of this, the number of observations used in each model is noted on the figure.
The figure shows 950 simulations per presidential party ID type. They are the middle 95% of 1000 simulations per presidential party ID type. The grey lines connect the groups' means.

Republican presidencies.

For forecasts made two quarters in advance, we expect that the Fed overestimates inflation by 20 percent during Democratic presidencies, all else equal. We expect the average inflation error during Republican presidencies to be approximately -12 percent. Given that the first quantile of the inflation errors is -22 and the third is 13, *these estimates indicate that partisan biases are on average a large contributor to the overall magnitude of inflation forecasting errors.* These results hold up even when we rerun the models on data where we dropped individual presidential terms (see Table 3) and Fed chairman terms.[41] This indicates that the results are not being driven by one outlier presidential or chairman term.

Clearly, at least from the 1970s through 2007, Fed Staff were overly pessimistic about Democratic presidents' effect on inflation and overly optimistic about Republican presidents' effect.

Presidential Elections Do Federal Reserve Staff also take into consideration election timing as the partisan preference and monetary expectations theories predict?

We do not find much, if any, evidence that inflation forecast errors were associated with elections

[41] These are available from the authors upon request.

either independent of presidential party ID or in interaction with it. Estimates of the relationship between the quarters until election variable and forecast errors[42] also fails to provide any evidence that inflation errors are related to elections.

We examined the monetary policy and partisan preference theories of forecast errors with an interaction between the president's party ID variable and the square of the time to election variable. We used the square of the time to election variable to try to capture the non-linear predicted effect of elections on errors made by the monetary and partisan preference theories (see left-hand and center panels of Figure 1). However, when we include the interactions coefficient on the president's party ID variable is robust whereas neither the election variables nor the interaction terms are statistically significant. This is also true when we use the non-squared version of the time to election variable (please see the Supplementary Material). Thus we do not find evidence for either the partisan preference or monetary expectations theories.

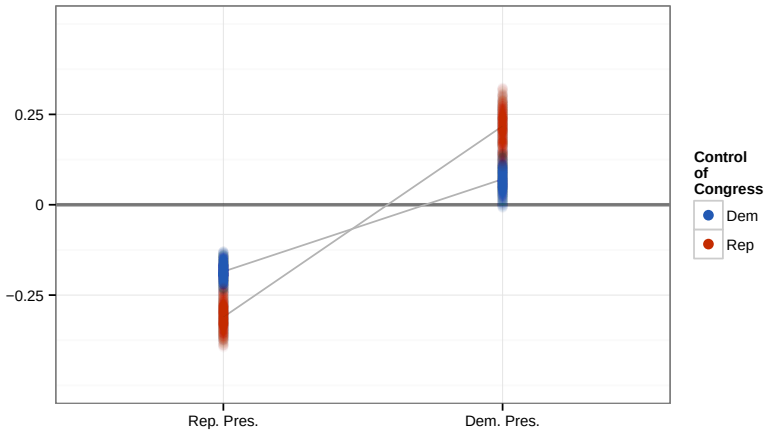
Fed Staff do not appear to be over-estimating inflation when a Democratic president is running for re-election in an attempt to influence the FOMC to raise interest rates and lower the president's chances of winning as hypothesized in the partisan preference theory prediction. These findings have clear implications for how we understand the potential causes of Greenbook partisan inflation forecast biases as well as FOMC interest rate decisions around elections. It seems that FOMC *members*, not their staff, are driving the increases in the Fed Funds Rate around elections when Democrats are in power that Clark and Arel-Bundock (2013) observe. Interestingly, staff also do not seem to compensate for FOMC partisan biases in an attempt to moderate FOMC-driven partisan electoral business cycles. Thus, we find no evidence in favor of the monetary expectations theory.

Partisan Control of Congress Might Federal Reserve Staff be taking into consideration not only the president's party identification, but also the partisan composition of Congress? We estimate parametric models with two-way and three-way interactions between presidential and congressional party identification to look for evidence in favor of either of the two ways we identified that presidential and congressional partisan ID might be related to forecast errors. All of the partisan interactions are generally statistically significant. To make substantive sense of these estimated interactions we again generate simulations to find expected inflation forecast errors at various levels of the presidential and congressional party identification variables. The right-panel of Figure 6 shows simulation results with highly contrasting fitted variable values: one party control of the executive and both legislative bodies compared to a situation where one party controls the presidency and the other controls both houses of Congress.[43]

[42] This variable is obviously omitted from the models with the election period variable because they are highly correlated.

[43] Both the House and Senate Democratic/Republican variables are set at 1.2 for Democratic congresses and 0.8 for Republican congresses.

Figure 6: Simulated Expected Inflation Forecast Error with Interactions Between President Party ID and Congressional Party Control (Qtr. 2 forecasts)



Simulated from normal linear regressions. Expected errors in the left-side graph are from Model A9 in Table 1 and the right-side estimates are from Model A13 from Table 7. The figure shows 950 simulations per fitted value. They are the middle 95% of 1000 simulations per fitted value. The gray lines connect the groups' means.
Both the House and Senate Democratic/Republican variables were set at 1.2 for Democratic congresses and 0.8 for Republican congresses.

The first thing we should notice in Figure 6 is how presidential partisan identification still seems to be driving the direction of the inflation forecast error: inflation is underestimated during Republican presidencies and overestimated during Democratic ones, regardless of what party controls Congress. The substantive effect of congressional control on forecast errors is in the magnitude of the over- or underestimates. In particular, Republican control of Congress seems to exacerbate the differences already noted between Democratic and Republican executives. Inflation is very underestimated for Republican presidencies with Republican congresses and more overestimated for Democratic presidents facing an opposition controlled legislature. There may be an expectation among Fed Staff that solidly Republican governments will cut expenditure much more than they actually do. Forecast errors are also slightly higher on average with Democratic presidencies and Republican congresses compared to when both are controlled by Democrats. This finding would fit with a story where Fed Staff believe spending will be higher with a divided government.

Despite some evidence for an interaction between congressional and presidential party identification, it is not clear at this time how these results can be consistently explained across Democratic and Republican presidencies.

Government Expenditure It seems that Federal Reserve Staff may also overestimate the effect of government expenditure on inflation. This is indicated by a consistently positive and significant

Table 1: Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14
Intercept	$3.5^{\dagger}$	$3.6^{\dagger}$	$3.6^{\dagger}$	4.9^{**}	4.3^{*}	4.1^{*}	2.1	2.1	1.3	2.0	3.9^{*}	$3.3^{\dagger}$	$3.4^{\dagger}$	-1.8^{***}
	(2.0)	(2.1)	(2.1)	(1.7)	(2.0)	(1.7)	(2.0)	(2.0)	(2.2)	(2.1)	(1.8)	(1.8)	(1.8)	(0.4)
Recession	0.0	0.0	0.0	$0.1^{\dagger}$	0.0	0.1	0.1	0.1	0.0	0.0	0.1^{*}	$0.1^{\dagger}$	0.1	
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.1)	
Expenditure/GDP	0.1^{***}	0.1^{***}	0.1^{***}	0.2^{***}		0.2^{***}	0.2^{***}	0.2^{***}	0.1^{***}	0.2^{***}	0.1^{***}	0.2^{***}	0.1^{***}	
	(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Output Gap	-0.1^{**}	-0.1^{**}	-0.1^{**}	-0.1^{***}	-0.0^{*}	-0.1^{***}	-0.1^{*}	-0.1^{*}	-0.0	-0.1^{*}	-0.1^{***}	-0.1^{***}	-0.1^{***}	
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Discount Rate Change	-0.1	-0.1	-0.1	-0.2^{*}	-0.3^{*}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.2^{*}	-0.2^{*}	-0.2^{*}	
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	
Unemployment Rate	-0.0	-0.0	-0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	0.0	
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Qtr. to Election		0.0				0.0	0.0	0.0	-0.0	0.0	0.0^{*}	0.0^{*}	0.0^{*}	
		(0.0)				(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Qrt. to Election2		-0.0							0.0					
		(0.0)							(0.0)					
Election Period			-0.0											
			(0.0)											
Pres. Party ID				0.3^{***}	0.4^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{*}	0.3^{***}	1.0^{***}	1.1^{***}	1.7^{*}	2.1^{**}
				(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.1)	(0.2)	(0.7)	(0.8)
Deficit/GDP					-0.1^{**}									
					(0.0)									
FRB/GlobalModel						$0.1^{\dagger}$			0.1					
						(0.0)			(0.1)					
Senate Dem/Rep							$-0.3^{\dagger}$	$-0.3^{\dagger}$	-0.3^{*}		-0.2	-0.1	0.6	0.8^{*}
							(0.1)	(0.1)	(0.2)		(0.1)	(0.1)	(0.4)	(0.3)
House Dem/Rep							0.3^{*}	0.3^{*}	0.3^{*}		0.5^{***}	0.4^{**}	1.1^{***}	1.6^{***}
							(0.1)	(0.1)	(0.1)		(0.1)	(0.1)	(0.3)	(0.3)
Pres*Qrt. Election									0.0					
									(0.0)					
Pres*Qrt. Election2									-0.0					
									(0.0)					
Burns										0.3^{***}				
										(0.1)				
Greenspan										0.2^{*}				
										(0.1)				
Martin										0.2				
										(0.1)				
Miller										$0.3^{\dagger}$				
										(0.1)				
Volcker										0.3^{**}				
										(0.1)				
Pres*House											-0.5^{***}		-1.4	-2.4^{**}
											(0.1)		(0.8)	(0.9)
Pres*Senate												-0.7^{***}	-0.2	-0.1
												(0.1)	(0.8)	(0.7)
House*Senate													-0.5^{*}	-0.9^{***}
													(0.2)	(0.2)
Pres*House*Senate													0.5	$0.9^{\dagger}$
													(0.5)	(0.5)
N	135	135	135	135	135	135	135	135	135	135	135	135	135	135
AIC	-4.1	-0.3	-2.2	-54.6	-7.7	-54.9	-56.0	-56.0	-52.4	-57.7	-83.3	-80.1	-85.0	-49.7
BIC	65.6	92.6	79.2	26.7	73.6	49.7	60.2	60.2	110.3	93.4	44.5	47.7	77.7	43.3
log L	26.1	32.2	29.1	55.3	31.9	63.4	68.0	68.0	82.2	80.8	85.7	84.1	98.5	56.8

Standard errors in parentheses
† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

coefficient for the government expenditure variable, even when controlling for president's party ID. Perhaps this is because Fed Staff not only have a presidential partisan heuristic, but also a similar government expenditure heuristic where expenditure is believed to have a larger impact on inflation than it really does. It is plausible that the mechanism for this could be either an informal heuristic that affects the judgemental part of the forecasts or an incorrect assumption built into the formal forecasting models.

Deficits We avoided including deficits and federal expenditures in the same models, because they are fairly highly correlated.[44] Deficits as a proportion of GDP had a negative relationship with inflation forecast errors. This is in the same direction as our finding for government expenditure, because a positive deficit to GDP value indicates a surplus, i.e. less spending relative to revenue. Note that this estimate was not robust across all models.

[44] In models where they were both included (not shown, but available upon request) the deficit variable's estimated coefficient was very unstable and regularly switched sign.

Table 2: Bayesian Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error

Variables	Mean	SD	2.5%	50%	97.5%
Intercept	3.62	1.56	0.54	3.63	6.73
Pres. Party ID	0.30	0.04	0.23	0.30	0.37
Recession	0.06	0.05	-0.05	0.06	0.16
Qtr. to Election	-0.00	0.00	-0.01	-0.00	0.00
Expenditure/GDP	0.15	0.02	0.11	0.15	0.18
Output Gap	-0.07	0.02	-0.10	-0.07	-0.03
Discount Rate Change	-0.26	0.09	-0.43	-0.26	-0.09
Unemployment Rate	-0.01	0.03	-0.06	-0.01	0.05
Global Model	0.10	0.04	0.02	0.10	0.18
sigma2	0.04	0.00	0.03	0.04	0.04

Table 3: Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error, Dropping Presidential Terms

	Nixon 1	Nixon 2	Ford	Carter	Reagan 1	Reagan 2	GHW Bush	Clinton 1	Clinton 2	GW Bush 1	GW Bush 2
Intercept	$3.9^{\dagger}$	4.3^{*}	4.0^{*}	6.2^{**}	4.2^{*}	3.0	3.8^{*}	2.6	4.4^{**}	4.6^{**}	3.7^{*}
	(2.1)	(1.8)	(1.7)	(2.0)	(1.8)	(1.9)	(1.9)	(2.0)	(1.6)	(1.6)	(1.7)
Recession	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Expenditure/GDP	0.2^{***}	0.2^{***}	0.2^{***}	0.1^{***}	0.2^{***}	0.1^{***}	0.2^{***}	0.2^{***}	0.2^{***}	0.1^{***}	0.2^{***}
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Output Gap	-0.1^{**}	-0.1^{***}	-0.1^{***}	-0.1^{***}	-0.1^{***}	-0.1^{**}	-0.1^{***}	-0.1^{**}	-0.1^{***}	-0.1^{***}	-0.1^{***}
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Discount Rate Change	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	-0.3^{**}	$-0.2^{\dagger}$	$-0.2^{\dagger}$
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Unemployment Rate	−0.0	0.0	−0.0	0.1	−0.0	−0.0	0.0	−0.0	0.0	0.0	−0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Qtr. to Election	0.0	−0.0	0.0	0.0	0.0	0.0	−0.0	0.0	−0.0	−0.0	0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Pres. Party ID	0.3^{***}	0.3^{***}	0.3^{***}	0.4^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.2^{***}	0.3^{***}	0.3^{***}
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
FRB/GlobalModel	0.1	$0.1^{\dagger}$	$0.1^{\dagger}$	0.1^{*}	$0.1^{\dagger}$	0.1	$0.1^{\dagger}$	0.2^{**}	0.1^{**}	0.0	0.0
	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)
N	123	129	126	121	121	121	121	121	121	121	125
AIC	−40.5	−48.9	−51.1	−45.7	−49.7	−44.0	−38.6	−54.4	−67.2	−71.9	−50.0
BIC	60.7	54.0	51.0	55.0	50.9	56.6	62.0	46.3	33.5	28.8	51.9
log *L*	56.3	60.5	61.5	58.8	60.9	58.0	55.3	63.2	69.6	71.9	61.0

Standard errors in parentheses
† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

FRB Global Forecasting Model The introduction of the FRB/Global behavioral equation forecasting model in 1996 does not seem to have begun a new era of reduced inflation forecasting error. In one model specification the estimate was statistical significance at the 10 percent level. However it was not robust across most model specifications. This suggests that forecasts made after the introduction of this approach were not more accurate than those made before it.

Changes to the Discount Rate As expected, relative changes to the discount rate are often found to be negatively associated with inflation forecast errors. Increasing the discount rate could result in lower inflation than expected and vice versa. Controlling for FOMC policy does not change the estimated relationship between presidential party ID and errors. It should be noted that the discount rate results are not robust across all of the models[45]

Further Robustness Checks The Supplementary Material's section of the paper includes further robustness checks that we used to test the strength of our key findings. In particular we explore other

[45]See in particular results from models using matched data in the Supplementary Materials.

specifications of the president party ID and time to election interaction, the key variable's relationships with an orthoganal variable–unemployment forecast errors–the inclusion of economic and political shocks, such as oil price and labor productivity changes as well as armed conflicts, as well as parametric models with pre-analysis data matched on presidential party ID and election period. Please see the Supplementary Materials for more information.

Discussion: Partisanship & bureaucratic inflation forecasts

Do Fed inflation forecasts have a partisan bias? According to the evidence from our research: yes. Federal Reserve Staff seem to have systematically overestimated inflation during Democratic presidencies and underestimated it during Republican ones for at least a 38 year period between 1969 and the end of 2007. This finding is robust across numerous model specifications where a variety of economic, bureaucratic, and other political factors were controlled for.

In the course of our research we also found that Fed Staff tend to overestimate the inflationary effect of government spending and perhaps deficits independent of the partisanship bias. Conceptually, the bias nonetheless runs in the same direction as the presidential partisanship bias. More spending, which Democrats are often expected to prefer, is anticipated to increase inflation more than it actually does.[46] It is unlikely that Greenbook forecasting models explicitly incorporate the president's party identification, so we can be reasonably certain that the partisan bias enters as a heuristic in the judgemental side of the forecasting process. Predicted inflationary effects for government spending could very well be incorporated into the formal forecasting models. So, the government expenditure bias that we found could be either the result of incorrect explicit model assumptions or heuristics.

Interestingly, in light of recent research on FOMC policy-making, we found no relationship between inflation forecast errors and elections either independent of presidential party identification or in interaction with it. This suggests that any relationship between monetary policy decisions and US presidential election timing is neither the result of partisan preferences that Fed Staff members may have, nor beliefs that Fed Staff may hold about the FOMC's presidential election preferences.

Given the consistency of the bias across presidents' terms, it appears that Fed Staff's partisan inflation forecast bias may be the result of a partisan heuristic. Like heuristics generally, the partisan heuristic may help Fed Staffers simplify very complex phenomenon, with the negative side effect that it creates systematic prediction errors. These errors may not have been noticed by staffers because, so far, few if anyone has been looking for them. Indeed, the only piece of research we found examining Fed

[46] Of course Fed Staff could be incorrectly forecasting government expenditure and deficits. This could then somehow contribute to biased inflation forecasts. However, we do not have access to complete Fed estimates of government expenditure and deficits to test this possibility.

forecasting errors and partisan forecasting biases (i.e. Frendreis and Tatalovich, 2000) did not actually look for partisan biases in Fed forecasts. We find that inflation forecasts are consistently underestimated when Republicans hold the White House and are consistently overestimated during Democratic administrations. This is a new finding that helps us better understand how monetary policy bureaucrats address uncertainty and complexity in the relationship between policy and the economy. It highlights psychological heuristics for dealing with uncertainty that, though they have been researched extensively in the behavioral economics literature (Kahneman and Tversky, 1973; Tversky and Kahneman, 1974; Kahneman, 2003), have previously been ignored by researchers empirically examining monetary policy. It also challenges previous assumptions in the literature (see in particular Grauwe, 2011) that actors adapt their heuristics based on new information. Hopefully our findings will give forecasters an impetus to do just that so that they can more accurately forecast inflation.

What has been the monetary policy and electoral impact of Federal Reserve Staff partisan bias? Our research so far cannot definitively answer this, but it does motivate future research and point in a clear direction. It may be that higher inflation forecasts during Democratic presidencies spur the FOMC to raise interest rates and dampen the money supply generally. The opposite could happen during Republican presidencies. If this is the case, the economy would be inadvertently stimulated during Republican presidencies and depressed during Democratic ones, with electoral implications. The economic voting literature has repeatedly found that poor economic performance results in less electoral support for incumbent presidents (e.g. Alvarez and Nagler, 1998; Bloom and Price, 1975; Lewis-Beck, 1988; Powell and Whitten, 1993). Thus, if these partisan biases in inflation forecasts are leading to more restrictive monetary policy during Democratic presidencies and more expansive monetary policy during Republican presidencies, the economic voting mechanism may run afoul of important normative concerns about democratic accountability. Determining the extent to which these biases are shaping monetary policy is therefore an important next step in understanding the linkage between Fed inflation forecasts and larger questions of democracy. This is a very important issue that needs further investigation.

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Supplementary Material for:

Inflated Expectations: How government partisanship shapes monetary policy bureaucrats' inflation forecasts

In this supplementary material we present further robustness checks to further test the strength of our main empirical findings.

President party ID and election timing linear interaction

In the body of the paper we present results from models with president party ID and the square of quarters to the election. The first model in table 4 shows results with an interaction between president party ID and the non-squared linear version of election timing. The results are substantively equivalent to those with the squared version.

Mid-term election timing

NEED TO DO

Economic and Violent Conflict Shocks

Following helpful reviewer suggestions, we examined if economic or violent conflict shocks may impact inflation forecast errors. First we examined if the underlying level of inflation could impact the standardized forecast errors. Perhaps if price changes are very volatile, e.g. inflation is very high, then there may be larger errors. We examined this possibility in two ways: (a) the **absolute inflation level in the quarter being forecasted** for and (b) **absolute inflation in the quarter prior** to when the forecast was made.[47] The second and third models in Table 4 show that including these variables did not substantively change the presidential partisan ID results. Absolute inflation in the quarter being forecasted for has a statistically significant negative relationship with forecast errors. Referring back to Figure 3 in the main paper, this makes sense as periods of high inflation in the 1970s were actually times when the standardized forecast error was relatively small. This finding persists even if we use absolute inflation forecast errors (i.e. $F_q - I_q$) as can be seen in Model S10 in Table 5.

Second, we consider other economic and political shocks. Perhaps oil price shocks, for example in the late 1970s, increased inflation forecast errors. To examine this possibility we gathered data from the FRED database[48] on the **change in the West Texas Crude price** from the quarter in the previous

[47] In Table 4 this is referred to as 'Lag 3 Abs. Inflation'.
[48] Accessed October 2013.

year. Similarly, maybe labor productivity increases, especially in the 1990s created unexpected economic conditions and therefore inflation forecasting errors. To examine this possibility we gathered data from the United States Bureau of Labor Statistics on non-farm business **labor productivity**.[49] The variable is in terms of the percent change from the previous quarter at the annual rate. Finally, perhaps violent conflict also created unexpected economic conditions. To examine this we created an indicator of the **total number of armed conflicts per year** using data from Uppsala Conflict Data Program/Peace Research Institute Oslo (Harbom and Wallensteen, 2012; Gleditsch et al., 2002).

As we see in tables 4 and 5 the productivity changes and the number of armed conflicts were not robustly associated with inflation forecasting errors. Oil price changes were found to be statistically significantly associated with errors. This association was negative so that high price increases are related to lower errors. This mirrors our finding for the absolute inflation level. High absolute inflation and high oil price increases are associated in time during our observation period. They were both particularly high during the mid to late 1970s. This was at the same time a period of relatively small inflation forecast errors.

This finding initially seems counter-intuitive. We might expect that inflation forecasting is easier when there is less inflation, lower oil price volatility, and so on. However, recent economic research has shown that inflation in the United States has became more difficult to forecast from the 1990s as the reduction in inflation variability has been largely due to a reduction in the 'predictable component' inflation (see Gamber and Smith, 2009).

Noticeably, the presidential partisan ID variable's effect does not change in magnitude, direction, or statistical significance when any of the shock variables are included.

Orthogonal dependent variable robustness check: Unemployment forecast errors

In a further attempt to determine if the results, especially for presidential party ID, are being driven by unobserved time period specific effects that are common to all Federal Reserve Staff forecasts we estimated our analyses with a dependent variable that is orthogonal to inflation forecast errors. The orthogonal variable we examined was **standardized unemployment rate forecast errors**.[50] The variable captures the errors Fed Staff make when forecasting the unemployment rate in the same way that the inflation forecast variable measures inflation forecast errors. Unemployment rate forecasts are also reported in the Greenbook. The actual unemployment rate was found using the Federal Reserve's

[49] The series ID was PR85006092. Accessed October 2013.

[50] Unemployment forecast errors are relatively weakly correlated with inflation forecast errors. The Pearson correlation coefficient for forecasts made two quarters beforehand is -0.15 with a p-value of 0.07.

Table 4: Normal Linear Regression Estimation with Standardized Inflation Forecasting Errors as the Dependent Variable and Additional Independent Variables (non-matched data set)

	S1	S2	S3	S4	S5	S6	S7
Intercept	2.0	2.3	1.3	2.3	2.2	2.3	2.5
	(2.0)	(1.9)	(2.1)	(1.9)	(2.0)	(2.0)	(2.0)
Recession	0.0	0.1*	0.1	0.1	0.0	0.0	0.1
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Expenditure/GDP	0.1***	0.1***	0.1***	0.1***	0.1**	0.1***	0.1**
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Output Gap	−0.0*	−0.0*	−0.0	−0.0*	−0.0*	−0.0*	−0.0*
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Discount Rate Change	−0.3**	−0.2†	−0.3**	−0.2*	−0.3**	−0.3**	−0.2†
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Unemployment Rate	−0.1	−0.0	−0.1	−0.1	−0.1	−0.1	−0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Pres. Party ID	0.3***	0.3***	0.3***	0.3***	0.3***	0.3***	0.3***
	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Qtr. to Election	0.0	0.0	0.0	−0.0	0.0	0.0	−0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
FRB/GlobalModel	0.1	0.1*	0.1†	0.1	0.1†	0.1	0.1
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Senate Dem/Rep	−0.3*	−0.3*	−0.4*	−0.3*	−0.3*	−0.4*	−0.3†
	(0.2)	(0.1)	(0.2)	(0.1)	(0.2)	(0.2)	(0.2)
House Dem/Rep	0.3*	0.4**	0.3*	0.3*	0.3†	0.3*	0.3†
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Pres*Qrt. Election	−0.0						
	(0.0)						
Abs Inflation		−0.0**					
		(0.0)					
Lag 3 Abs. Inflation			−0.0				
			(0.0)				
Oil Price Change				−0.0†			−0.0†
				(0.0)			(0.0)
Productivity Change					0.0		0.0
					(0.0)		(0.0)
No. Armed Conflicts						−0.0	−0.0
						(0.0)	(0.0)
N	135	135	132	135	135	135	135
AIC	−55.3	−64.8	−52.2	−59.0	−55.2	−55.5	−55.8
BIC	84.2	74.7	86.2	80.5	84.3	84.0	106.9
log *L*	75.6	80.4	74.1	77.5	75.6	75.7	83.9

Standard errors in parentheses
† significant at $p < .10$; *$p < .05$; **$p < .01$; ***$p < .001$

FRED database, as before.[51]

Most of the effects we found using inflation forecast errors were not present or were dramatically smaller in terms of statistical significance and magnitude when unemployment rate errors were the dependent variable.[52] The lack of a relationship between presidential party ID and unemployment forecast errors is reflected in Figure 7. Unlike in Figure 3 from the main paper, it is very difficult to find any partisan pattern to the errors. This provides more evidence that the presidential partisan ID effect is a real contributor to Federal Reserve Staff's *inflation* forecasting errors, rather than the observed partisan effect being driven by an unobserved time period specific factor.

Matching to Examine Model Dependence

To further examine if our results depend on model specification, rather than an underlying causal effect, we follow recommendations from Ho et al. (2007) to pre-process the data using matching. This data is then used in our parametric models to estimate the relationships between our potential causal variables and Fed Staff inflation forecast errors. Doing so allows us to more robustly determine the effects of two potential treatments that Fed Staffers are exposed to: a partisan treatment and an electoral treatment.

[51] We focused on 2 quarter forecasts.
[52] The analyses can be fully recreated using source code available at: http://bit.ly/S1nKyl.

Table 5: Normal Linear Regression Estimation with Absolute Inflation Forecasting Errors as the Dependent Variable and Additional Independent Variables (non-matched data set)

	S8	S9	S10	S11	S12	S13	S14	S15
Intercept	3.1	3.0	$3.3^{\dagger}$	2.3	$3.3^{\dagger}$	3.2	3.3	$3.5^{\dagger}$
	(2.0)	(2.0)	(1.9)	(2.1)	(1.9)	(2.0)	(2.0)	(2.0)
Recession	0.1	0.0	0.1^{*}	0.1	0.1	0.0	0.0	0.1
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Expenditure/GDP	0.1^{***}	0.1^{***}	0.1^{***}	0.1^{***}	0.1^{***}	0.1^{**}	0.1^{***}	0.1^{**}
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Output Gap	-0.0^{*}	-0.0^{*}	-0.0^{*}	-0.0	-0.0^{*}	-0.0^{*}	-0.0^{*}	-0.0^{*}
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Discount Rate Change	-0.3^{**}	-0.3^{**}	$-0.2^{\dagger}$	-0.3^{**}	-0.2^{*}	-0.3^{**}	-0.3^{**}	$-0.2^{\dagger}$
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Unemployment Rate	-0.1	-0.1	-0.0	-0.1	-0.1	-0.1	-0.1	-0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Pres. Party ID	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}	0.3^{***}
	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Qtr. to Election	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	-0.0
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
FRB/GlobalModel	$0.1^{\dagger}$	0.1	0.1^{*}	$0.1^{\dagger}$	0.1	$0.1^{\dagger}$	0.1	0.1
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Senate Dem/Rep	-0.4^{*}	-0.3^{*}	-0.3^{*}	-0.4^{*}	-0.3^{*}	-0.3^{*}	-0.4^{*}	$-0.3^{\dagger}$
	(0.1)	(0.2)	(0.1)	(0.2)	(0.1)	(0.2)	(0.2)	(0.2)
House Dem/Rep	0.3^{*}	0.3^{*}	0.4^{**}	0.3^{*}	0.3^{*}	$0.3^{\dagger}$	0.3^{*}	$0.3^{\dagger}$
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Pres*Qrt. Election		-0.0						
		(0.0)						
Abs Inflation			-0.0^{**}					
			(0.0)					
Lag 3 Abs. Inflation				-0.0				
				(0.0)				
Oil Price Change					$-0.0^{\dagger}$			$-0.0^{\dagger}$
					(0.0)			(0.0)
Productivity Change						0.0		0.0
						(0.0)		(0.0)
No. Armed Conflicts							-0.0	-0.0
							(0.0)	(0.0)
N	135	135	135	132	135	135	135	135
AIC	-57.0	-55.3	-64.8	-52.2	-59.0	-55.2	-55.5	-55.8
BIC	70.8	84.2	74.7	86.2	80.5	84.3	84.0	106.9
$\log L$	72.5	75.6	80.4	74.1	77.5	75.6	75.7	83.9

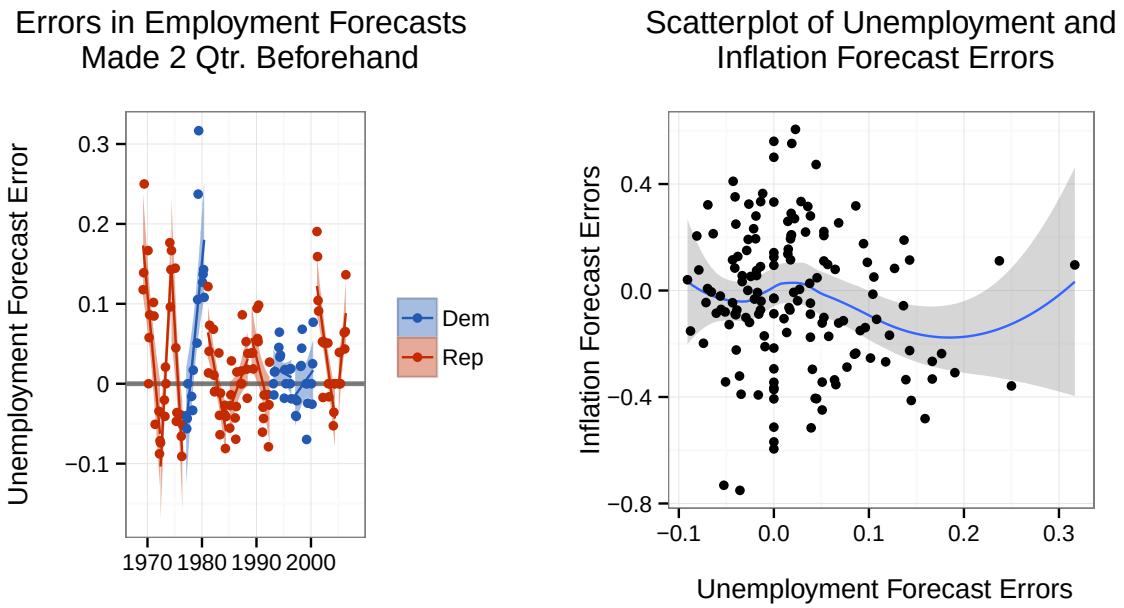
Standard errors in parentheses
† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Pre-analysis matching allows us to mimic the conditions of a randomized experiment. Imagine an ideal world where we could create a controlled experiment to examine the causal relationship between, for example, presidential partisan ID and inflation forecast errors. Following the Neyman-Rubin causal model (Sekhon, 2008) estimating causal effects is basically a comparison between potential outcomes for a hypothetical unit (Stuart, 2010). In our study the 'unit' is a quarter being forecasted for. The casual effect of presidential party ID on inflation errors is a comparison of the inflation error for the particular quarter when the president is a Democrat and a Republican. We could make this comparison in an experiment by randomly assigning presidents to quarters. In the language of experimental design the 'treatment' could be a Democratic president and the 'control' a Republican president. Note: in our analysis the determination of 'treatment' and 'control' group is arbitrary. This would allow us to have groups of quarters that were as similar as possible in all ways except for the president's party ID.

This is clearly impossible for us. Given that we are working with observational data, other variables that have an impact on forecast errors may have *different distributions* across the treatment and control groups (Cochran and Rubin, 1973; Diamond and Sekhon, 2012). It can be difficult to identify the relationships between presidential party ID, elections and errors from all of the confounding background variables.

Thus far we have attempted to address this issue statistically with models that allow us to estimate

Figure 7: Diagnostics of Unemployment Rate Forecast Error as Orthogonal to Inflation Rate Forecast Errors (1969 - 2007)



Note: Errors of 0 indicates that inflation/the unemployment rate was perfectly predicted.

the effect of presidential party ID and elections on forecast errors 'controlling for' a wide variety of other factors. However, it may be the case that our results are dependent on the model specifications Ho et al. (2007). To examine this possibility we aimed to further recreate randomized experimental conditions with pre-analysis matching. We use the `R` package `MatchIt` (Ho et al., 2011) to create two matched data sets where the non-treatment covariates in the control groups closely match those in the treatment groups.

Formally, each quarter q in the data set is 'assigned' to either the treatment group ($t_q = 1$) or the control group ($t_q = 0$). $y_q(1)$ is the potential outcome–in our case the inflation forecast error–for quarter q of being in the treatment group, regardless of whether or not it was observed to be in this group. $y_q(0)$ is the potential outcome if q was not in the treatment group, regardless of its observed assignment. It is impossible to observe both $y_q(1)$ and $y_q(0)$ at the same time. Instead we observe one version of $y_q = t_q y_q(1) - (1 - t_q)y_q(0)$. For each q there is a fixed vector of exogenous confounders X_q. Ideally t_q and X_q are independent. However, this is not necessarily the case. The point of matching is to reduce or eliminate the relationship between t_q and X_q by selecting, dropping, and/or duplicating data. Ideally this process matches one treated quarter with one controlled quarter that has the same values of X_q, i.e. the distribution of covariates is the same in the treated and control groups (Ho et al., 2011). This is known as "covariate balance" (Diamond and Sekhon, 2012, 1). Using matching to balance a data set

"break[s] the link between the treatment variables and the pre-treatment controls", effectively replicating the conditions of a randomized experiment with observational data (Ho et al., 2011, 2–3).

Balance is usually achieved in matching through propensity scores: the probabilities that units were assigned the treatment given their covariates. The propensity score model is generally unknown (Drake, 1993). To find the propensity score model we use Diamond and Sekhon's (2012) genetic matching method (GenMatch).[53] GenMatch is a multivariate method that uses an evolutionary search algorithm to automate the search for the propensity score model that creates maximum balance. This minimizes the difficulty of "manually and iteratively checking the propensity score" to determine covariate balance (Diamond and Sekhon, 2012, 2).

We created matched data for two sets of 'treatments' and 'controls' to examine the two primary sets of causal factors we examined. The first was president party ID and the second was whether or not a quarter was in an election period as defined in the main text. Once we created the matched data sets we then used them in in parametric models similar to those above. See results in tables 6, 7,and 8.

Before discussing the results, let's consider diagnostic tests we ran on the matching models. We primarily diagnosed the matching models with propensity score distributions–the probability of a quarter being in the 'treated' group given its covariates–as well as quantile-quantile plots to diagnose whether or not each covariate in the matched data sets is balanced (Ho et al., 2007).[54] We are unable to achieve covariate balance for the Congressional interaction terms[55] and the Federal Reserve Chair variable. Chairs in our data set in the pre-Volcker/Greenspan era as well as current Chair Ben Bernanke were in office for very few observed quarters, making it difficult to match them. As such, we were not able to test the robustness of findings for these variables with matched data.

Overall the results are similar when we used matched and non-matched data. Standard errors are larger in models using matched data than matched data. See Figure 10 for the implications of the larger standard errors. Larger variance is likely because the sample size in the matched data is smaller. For more details see: `http://bit.ly/U6edHt`.

Notably the both the point estimate and the uncertainty surrounding our key presidential partisan ID variable is very similar using both matched and non-matched data. We also did not find evidence that inflation forecast errors were associated with elections either independent of presidential party ID or in interaction with it in the matched models, including where we matched based on election period. This provides more evidence that our results are robustly estimating an actual causal effect and not model

[53] The method is implemented with `MatchIt`. The original source code for our exact matching models can be found at `http://bit.ly/OFdA4u`.

[54] Please see figures 8 and 9 for the propensity score distributions in our matched data sets. The quantile-quantile plots are not shown, but can easily be created by running the original matching models in our main analysis source code file. The file is available at: `http://bit.ly/OFdA4u`.

[55] The presidential party ID and election period interaction does balance.

dependent.

Table 6: Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error (Matched by Election Period Variable)

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
Intercept	−0.8	−0.7	−0.8	5.8†	9.1*	3.3	−2.1	−2.1	−4.7	0.2	−0.9	−0.4	−2.4***
	(4.0)	(4.0)	(4.0)	(3.3)	(4.0)	(3.7)	(4.1)	(4.1)	(4.7)	(3.6)	(3.7)	(3.4)	(0.7)
Expenditure/GDP	0.2***	0.2***	0.2***	0.2***		0.2***	0.2***	0.2***	0.2***	0.2***	0.2***	0.1***	
	(0.0)	(0.0)	(0.0)	(0.0)		(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Output Gap	−0.0	−0.0	−0.0	−0.1**	−0.1*	−0.1†	−0.0	−0.0	0.0	−0.0	−0.0	−0.1	
	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	
Discount Rate Change	−0.0	0.0	−0.0	−0.1	−0.5*	−0.1	−0.2	−0.2	−0.3	0.1	0.1	0.3	
	(0.2)	(0.3)	(0.3)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	
Unemployment Rate	−0.1	−0.0	−0.1	0.1	0.1	0.0	−0.1	−0.1	−0.2†	−0.1	−0.1	0.0	
	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	
Qtr. to Election		0.0				0.0	0.0	0.0	−0.0	0.0	0.0	0.0**	
		(0.0)				(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	
Qrt. to Election2		−0.0							0.0				
		(0.0)							(0.0)				
Election Period			−0.0										
			(0.1)										
Pres. Party ID				0.4***	0.5***	0.4***	0.3***	0.3***	0.2	1.1***	1.3***	11.4***	6.4*
				(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.2)	(0.3)	(2.7)	(2.8)
Deficit/GDP					−0.1*								
					(0.0)								
FRB/GlobalModel						0.1			0.0				
						(0.1)			(0.2)				
Senate Dem/Rep							−0.5*	−0.5*	−0.6*	−0.3	−0.2	1.4†	1.1†
							(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.8)	(0.7)
House Dem/Rep							0.7**	0.7**	0.7*	0.7**	0.6**	1.6***	2.1***
							(0.2)	(0.2)	(0.3)	(0.2)	(0.2)	(0.4)	(0.4)
Pres*Qrt. Election									0.1				
									(0.1)				
Pres*Qrt. Election2									−0.0				
									(0.0)				
Pres*House										−0.6***		−11.6***	−8.1*
										(0.1)		(2.7)	(3.0)
Pres*Senate											−0.8***	−7.0**	−2.0
											(0.2)	(2.2)	(2.1)
House*Senate												−0.9*	−1.1**
												(0.4)	(0.4)
Pres*House*Senate												7.6***	4.3*
												(1.9)	(2.1)
N	61	61	61	61	61	61	61	61	61	61	61	61	61
AIC	17.7	21.5	19.5	−10.1	12.2	−8.5	−14.2	−14.2	−9.3	−30.4	−27.2	−44.0	−20.4
BIC	59.9	80.6	70.2	40.6	62.9	59.1	61.7	61.7	100.5	54.0	57.2	65.7	47.1
log L	11.1	17.2	14.2	29.0	17.9	36.2	43.1	43.1	56.6	55.2	53.6	74.0	42.2

Standard errors in parentheses
† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$
The recession variable is omitted because there was almost no variation in the matched data set.
The reason that there was no variation is because there were only two quarters with both a recession and an election period in our data set.

Table 7: Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error (Matched by President's Party ID variable)

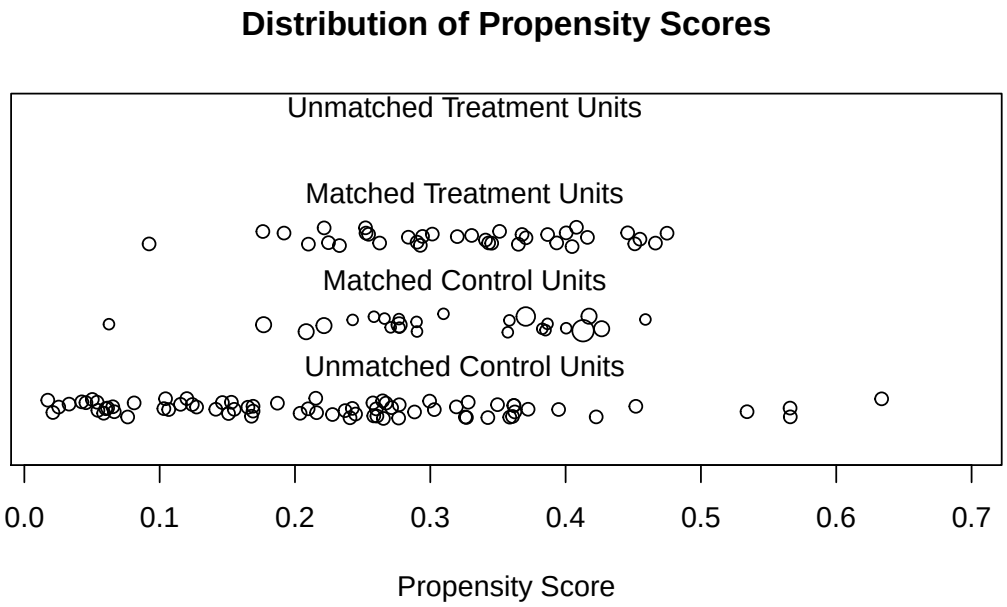
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13
Intercept	2.2	1.7	2.1	2.6	−2.5	2.2	−5.2	−5.2	−6.4	−4.2	−5.2	−2.0	1.9
	(4.2)	(4.3)	(4.2)	(3.5)	(3.5)	(3.6)	(4.3)	(4.3)	(4.9)	(4.0)	(4.1)	(4.3)	(1.8)
Recession	0.2	0.2	0.2	0.1	0.0	0.2	0.1	0.1	0.1	0.2	0.1	0.2	
	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.2)	(0.1)	(0.1)	(0.2)	
Expenditure/GDP	0.1*	0.1*	0.1*	0.2**		0.2**	0.2***	0.2***	0.2***	0.1*	0.2**	0.1	
	(0.1)	(0.1)	(0.1)	(0.0)		(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.0)	(0.1)	
Output Gap	−0.0	−0.0	−0.0	−0.1	0.0	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	
	(0.1)	(0.1)	(0.1)	(0.0)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	
Discount Rate Change	−0.5	−0.6†	−0.6†	−0.6*	−0.7*	−0.5†	−0.5†	−0.5†	−0.5†	−0.2	−0.2	−0.4	
	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.3)	(0.2)	(0.2)	(0.3)	(0.2)	(0.3)	(0.3)	
Unemployment Rate	−0.0	−0.0	−0.0	−0.0	−0.1	−0.0	−0.2*	−0.2*	−0.2	−0.1	−0.1	−0.2	
	(0.1)	(0.1)	(0.1)	(0.0)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	
Qtr. to Election		0.0				0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		(0.0)				(0.0)	(0.0)	(0.0)	(0.1)	(0.0)	(0.0)	(0.0)	
Qrt. to Election2		−0.0							−0.0				
		(0.0)							(0.0)				
Election Period			−0.1										
			(0.1)										
Pres. Party ID				0.3***	0.4***	0.3***	0.4***	0.4***	0.3	1.2***	1.2**	−1.3	−1.6
				(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.3)	(0.3)	(0.4)	(2.2)	(1.9)
Deficit/GDP					−0.1								
					(0.0)								
FRB/GlobalModel						−0.1			−0.1				
						(0.1)			(0.1)				
Senate Dem/Rep							−1.3**	−1.3**	−1.1*	−0.8*	−0.7†	−3.7	−3.8†
							(0.4)	(0.4)	(0.4)	(0.4)	(0.4)	(2.4)	(2.0)
House Dem/Rep							1.1**	1.1**	1.0*	1.2***	1.0**	−0.1	−0.9
							(0.3)	(0.3)	(0.4)	(0.3)	(0.3)	(1.5)	(1.4)
Pres*Qrt. Election									0.0				
									(0.1)				
Pres*Qrt. Election2									−0.0				
									(0.0)				
Pres*House										−0.7*		−0.3	0.1
										(0.2)		(1.7)	(1.6)
Pres*Senate											−0.8*	4.1	4.5*
											(0.4)	(2.9)	(2.1)
House*Senate												1.8	2.3
												(1.7)	(1.5)
Pres*House*Senate												−1.7	−2.2
												(1.8)	(1.5)
N	54	54	54	54	54	54	54	54	54	54	54	54	54
AIC	11.5	14.0	12.4	−7.2	3.6	−4.1	−14.4	−14.4	−10.0	−20.8	−18.2	−18.1	−18.4
BIC	59.2	77.7	68.1	48.5	59.3	67.5	65.1	65.1	101.4	66.7	69.3	93.3	45.3
log L	18.3	25.0	21.8	31.6	26.2	38.1	47.2	47.2	61.0	54.4	53.1	65.0	41.2

Standard errors in parentheses
† significant at $p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Table 8: Bayesian Normal Linear Regression Estimation of Covariate Effects on 2 Qtr. Inflation Forecast Error (Matched by President's Party ID variable)

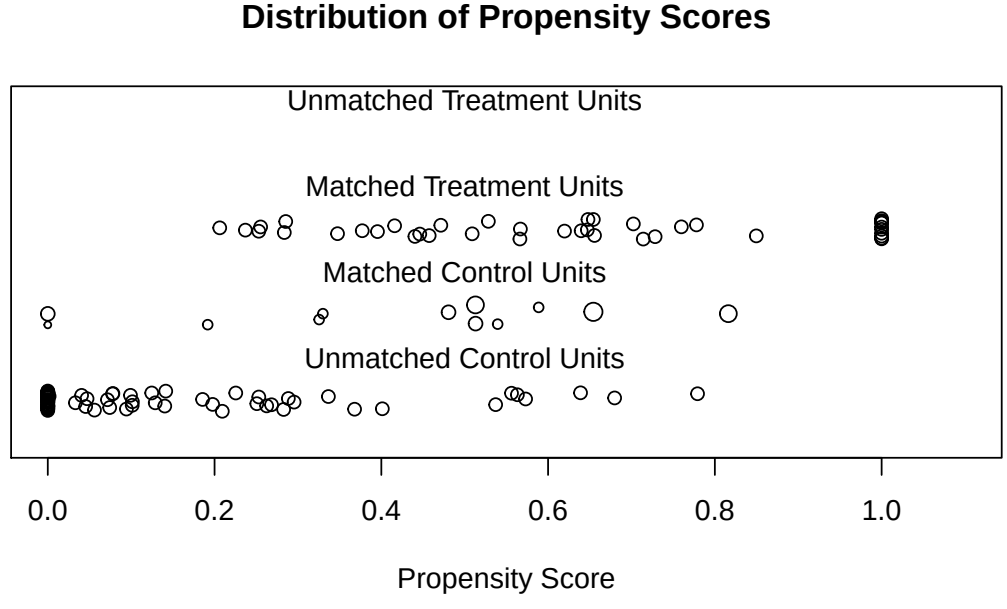
Variables	Mean	SD	2.5%	50%	97.5%
Intercept	2.17	3.64	-4.84	2.15	9.57
Pres. Party ID	0.33	0.07	0.19	0.33	0.48
Recession	0.16	0.17	-0.17	0.16	0.49
Qtr. to Election	0.00	0.01	-0.01	0.00	0.02
Expenditure/GDP	0.16	0.05	0.06	0.16	0.25
Output Gap	-0.06	0.04	-0.14	-0.05	0.03
Discount Rate Change	-0.54	0.29	-1.11	-0.54	0.02
Unemployment Rate	-0.00	0.06	-0.12	-0.00	0.11
Global Model	-0.07	0.10	-0.26	-0.07	0.11
sigma2	0.05	0.01	0.03	0.05	0.07

Figure 8: Matched on Election Period



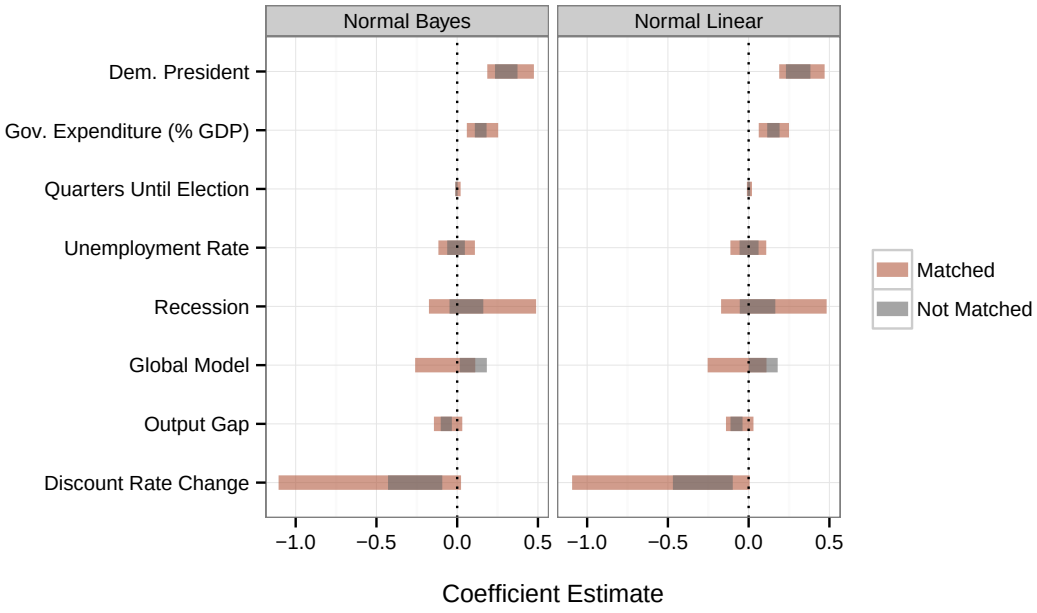
Pre- and Post-matching propensity scores, where the "Treated Units" are election quarters or the quarter before. "Control Units" are from all other quarters. The more similar the distribution of matched treated and control unit propensity scores, the more successful the matching model was (Hollyer and Rosendorff, 2012, 17).

Figure 9: Matched on Presidential Party Identification



Pre- and Post-matching propensity scores, where the "Treated Units" are quarters when the president was a Democrat. "Control Units" are quarters when with a Republican president. The more similar the distributions of matched treated and control unit propensity scores, the more successful the matching model was (Hollyer and Rosendorff, 2012, 17).

Figure 10: 95% Confidence Bands for Coefficients from a Variety of Matching and Parametric Model Specifications



Data matched by presidential party identification. Intercept values are not shown to maintain a reasonable scale for comparing covariate estimates.