Do Deficits Cause Inflation? A High Frequency Narrative Approach

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Do fiscal deficits cause inflation? We study high frequency movements in inflation expectations around the 2021 Georgia Senate election runoffs—which, according to narrative evidence, raised expected deficits. Using event studies and instrumental variables, we estimate that Democrat victory caused the market's expected price level over ten years to increase by 0.76%. Our estimate suggests that overall, higher deficits in late 2020 and early 2021 increased the price level by 7.1%. Turning to mechanisms, nominal interest rates did not change at short horizons but rose at long horizons. We calibrate a three-equation New Keynesian model with bonds-in-utility to standard parameters, including the pre-2020 slope of the Phillips Curve. Feeding in the fiscal shock and the estimated response of interest rates, the model quantitatively accounts for the size and dynamics of expected inflation after Georgia—suggesting an important determinant of inflation has been the combination of loose fiscal and monetary policy.

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1 Introduction

Do rising government deficits increase inflation? This classic question dates back to Sargent and Wallace (1981) and earlier. However the question has received renewed attention in the aftermath of the 2020 Pandemic Recession. Government spending and and transfers, financed by borrowing, rose significantly—for instance, the combined stimulus in December 2020 and March 2021 was 2.8 trillion dollars, or 13% of 2020 US GDP; alongside an additional $2.2 trillion dollars of stimulus in April 2020. Before the passage of the late 2020 and 2021 stimulus, inflation had been low and stable. During and after the stimulus, inflation rapidly and persistently rose. Prompted by this observation, many scholars argue that deficit spending caused the higher inflation (Barro, 2022; Cochrane, 2022; Bianchi, Faccini, and Melosi, 2023; Barro and Bianchi, 2023).

However assessing whether deficits cause inflation is difficult, because there are many other omitted variables that might also cause inflation. For instance, a supply shock from oil prices, labor market reallocation, or supply bottlenecks might comove with deficits but be the primary cause of inflation. Many of these shocks have been volatile in the aftermath of the Pandemic (Guerrieri, Marcussen, Reichlin, and Tenreyro, 2023; Bagga, Mann, Sahin, and Violante, 2023; Gagliardone and Gertler, 2023; Bai, Fernández-Villaverde, Li, and Zanetti, 2023; di Giovanni, Kalemli-Özcan, Silva, and Yildirim, 2023).

Furthermore, standard theories predict that the response of the monetary authority affects whether deficits should cause inflation. For instance a monetary authority that "takes away the punchbowl", by increasing interest rates after a deficit shock, could prevent inflation. A monetary authority that is "late to the party", by failing to raise interest rates, might allow inflation to rise. Therefore estimates about the response of inflation to deficits must condition on the monetary regime. Perhaps for this reason, time series estimates of the response of inflation to fiscal shocks—which might not be able to hold the monetary regime fixed—have mixed findings (e.g. Jorgenson & Ravn, 2022).

This paper introduces a high frequency narrative approach. We identify an event during which expected deficits exogenously increased, in the spirit of Friedman and Schwartz (1967) and Romer and Romer (1989). Then, we study high frequency movements in expected inflation from financial markets around this event, in the spirit of Gürkaynak, Sack, and Swanson (2004), Gertler and Karadi (2015) and Nakamura and Steinsson (2018). Last, we evaluate which mechanisms can account for the response of inflation to news about deficits.

We study a specific event during which a great deal of news about deficits was released, independently from other information about the economy. The event is the 2021 Georgia Senate Election runoffs. In November 2020, Democrats won the presidency, and held 48 seats in the

Senate. Both Senate election seats in Georgia were to be decided in a runoff on January 5th, 2021. If Democrats were to win both Senate seats, they would have a majority in the Senate and the chance to pass fiscal stimulus. Conversely, if Republicans were to win at least one seat, then Democrats would be unlikely to pass stimulus. In the event, Democrats won both seats, and subsequently passed fiscal stimulus via the American Rescue Plan of March 2021.

We use the historical narrative for two purposes: first, to show that the shock to expected deficits was large, and second to argue that there were no other shocks to expected deficits in a narrow window around the Democrat victory. Towards this goal, we study rarely-used reports from investment bank macroeconomic research departments. These reports contain detailed quantitative information about investment banks' expectations of deficits under various electoral scenarios, as well as the likelihood of these scenarios. The reports are widely distributed via email, being a primary source of information to market participations. Therefore we can use the reports to measure markets' deficit expectations. Moreover the reports are time-stamped, meaning one can assess when markets' information set changes.

We then size the shock to expected deficits using our narrative information. We find that on the eve of the election, markets expected Democrats to win with 50% probability, which closely matches probabilities from political betting markets. Markets expected a Democrat win to lead to roughly $300 billion of transfers, via "stimulus checks", and $300 billion of additional government spending, without any immediate plans to finance this spending with taxes. A Republican win was expected to lead to no more spending. We conclude that the Democrat victory represented a $300 billion shock to expected deficits in the immediate aftermath.[1] Turning to other shocks to expected deficits, we find that markets believed the Georgia shock to be the most important determinant of asset prices in the two days after the Georgia election.

Then we study high frequency movements in inflation expectations from swaps, in order to assess the causal effect of the deficit shock on inflation. We use two identification strategies: first, a single event study in a narrow window around the Georgia election; and second, an instrumental variables strategy using changing beliefs about the probability of Democrat victory between the November presidential election and the January Senate runoff.

Turning to the first identification strategy, we study intraday inflation swaps at various tenors, in a window starting from the morning of the election on January 5th, and finishing at the end of January 7th. We choose the initial date to start shortly before election news arrives. The final date allows news to be incorporated into the swap market with a lag, consistent with prior research (Bahaj, Czech, Ding, and Reis, 2023); and ends before the next information that nar-

[1] Markets also expected small increases in distortionary taxes due to Democrat victory—through the lens of the model to come, these effects on inflation are quantitatively minor. Democrats did not gain the ability to pass major legislation other than fiscal policy, which requires a 60 vote "supermajority" and therefore significant Republican support.

rative reports suggest moved markets. The causal effect is inflation expectations at the end of the window, minus what markets' expectations would have been absent the news. Following the standard practice of single event studies in corporate finance, we flexibly model markets' expectations as an ARIMA process (MacKinlay, 1997). The identification assumption is that the distribution of other shocks to swaps did not change during this window—that is, no atypically large shocks other than the Georgia runoff occurred at the same time. We find that the Georgia shock caused the expected price level to rise by 0.2% over 1 year (SE = 0.05) and by 0.76% over 10 years (SE = 0.18).

One potential confounder is the January 6th Capitol Hill riots. This shock is not discussed by market participants in any of the narrative accounts to which we have access. Nevertheless it is potentially important. Therefore we also consider a shorter event study window, that ends on 2 PM on January 6th. At this point, news about the Capitol Hill riots had not yet broken; while both betting markets and financial markets had concluded that Democrats had won the Senate runoffs. We find similar, though smaller results when restricting to the narrower window.

Turning to the second approach, we instrument for markets' beliefs about the likelihood of fiscal stimulus using betting markets' probability of a Democrat victory, between November and January. This instrument is motivated by the great deal of attention that markets seemed to pay to the Georgia election over this period, according to narrative information. The identification assumption is that news about inflation did not cause changing political fortunes for Democrats. The identification strategy yields similar estimates of the causal effect to the event study—including when we restrict to only data from before the election, or instrument for betting markets' probabilities with polling data.

Our estimates imply that overall, the causal effect of deficits on inflation was large during late 2020 and early 2021. We arrive at this conclusion with a simple back-of-the-envelope exercise. In total, there was $2.8 trillion of stimulus, via the Consolidated Appropriations Act of December 2020 and the American Rescue Plan Act of March 2021. We suppose that the marginal effect of the total stimulus on inflation was the same as the marginal effect of the Georgia deficit shock on inflation expectations. If so, the overall stimulus increased the price level by 7.1% over ten years. This calculation is conservative, in that we do not consider the April 2020 CARES act, which added an additional $2.2 trillion of stimulus.

Our approach studies inflation expectations, as opposed to actual inflation. This approach has benefits, by ruling out omitted variables that affect inflation at lower frequencies. However one concern is that inflation expectations systematically deviate from actual inflation, in a way that could bias our results. Two observations weigh against this concern. First, in the time series, expectations from inflation swaps track actual inflation relatively closely over this period. Second, inflation swaps tend to underreact relative to actual inflation over this period, consistent with a literature finding underreaction of expectations (Coibion and Gorodnichenko, 2015). As such, our estimate is likely to be conservative.

The second half of our paper asks what mechanisms can quantitatively account for our estimates. In standard theory, one key determinant of whether deficits are inflationary is the response of monetary policy. Therefore we estimate the high frequency response of interest rates to the Georgia election. We find that short term interest rates, at the 1 year horizon, are unchanged. However, medium term interest rates, such as the 5 year 5 year forward, rise sharply. These estimates suggest that the Fed was "late to the party", in failing to tighten after the deficit shock. However, ultimately markets did expect the Fed to "take away the punchbowl".

We combine our estimates with a standard and parsimonious New Keynesian model. The supply side of the model features a standard Phillips Curve. The demand side of the model features a representative consumer with bonds in their utility function, which breaks Ricardian equivalence, and allows debt financed fiscal transfers to affect consumer spending. Additionally, this model can quantitatively match consumption dynamics in a variety of settings, including in the aftermath of the Pandemic (Auclert, Rognlie, and Straub, 2023a,b).[2] We model the 2021 fiscal stimulus as a rise in transfers from the government to households, financed by bonds, which is paid back only gradually according to a standard fiscal rule. We calibrate the consumer behavior as in Auclert, Rognlie, and Straub (2023a). We calibrate the slope of the Phillips Curve to the low, but positive value estimated by Hazell, Herreno, Nakamura, and Steinsson (2022) using pre-2020 data. We then feed the path of interest rate changes and expected deficit changes after the Georgia election into the model.

Our model quantitatively matches both the size and the persistence of the estimated inflation response—despite being parsimonious, calibrated entirely to standard pre-pandemic parameters, taking monetary and fiscal behavior straight from the data, and not directly targeting any variables related to inflation. Then, we study a simple counterfactual in which monetary policy follows its historical reaction function, instead of the actual path of interest rates taken from the data. In this counterfactual, the rise in inflation is significantly smaller.

We take two lessons from our model. First, standard and parsimonious ingredients, informed by data from before the Pandemic, are sufficient to explain the rise in inflation. Second, a key source of the rise in inflation was the interaction between loose fiscal and loose monetary policy. The result was a large and persistent demand shock, which was sufficient to raise inflation despite a flat but positively sloped Phillips Curve.

Related literature. This paper contributes to three literatures. First, we contribute to an empirical macroeconomics literature that seeks to estimate the causal effect of various shocks. One

[2]Following Auclert, Rognlie, and Straub (2023a) we consider a model extension with a share of "hand to mouth" agents that consume their income, i.e. a "TABU" model.

strand of this literature uses narrative methods to study the response of macroeconomic variables to various shocks (Friedman and Schwartz, 1967; Romer and Romer, 1989, 2010; Ramey, 2011; Coglianese, Olsson, and Patterson, 2023). A second strand of this literature studies high frequency responses of asset prices in order to infer the effect of shocks (Gürkaynak, Sack, and Swanson, 2004; Krishnamurthy and Vissing-Jorgensen, 2011; Gertler and Karadi, 2015; Nakamura and Steinsson, 2018; Känzig, 2021, 2023). We argue that high frequency and narrative methods can be fruitfully combined in order to assess the causal impact of macroeconomic shocks. In particular, the combination of high frequency and narrative information around electoral events is a useful way of measuring fiscal shocks.

Second, there is an empirical literature assessing the time series response of inflation to fiscal shocks with various methods. As Jorgenson & Ravn (2022) summarize, the findings are rather mixed, including both positive and negative effects. The interpretation of the time series evidence is challenging because of the risk of omitted variables affecting inflation, because the inflation response to fiscal shocks depends on monetary policy, and because the effect of the shock depends on how it is financed—for instance via borrowing or taxes. Our high frequency narrative evidence provides sharp evidence which explicitly accounts for both the monetary regime and the nature of deficit financing.

Third, our paper contributes to the rapidly growing literature studying the increase in inflation after the Pandemic. A debate has emerged about the sources of inflation. One set of papers emphasize supply shocks of various kinds coming from oil prices, supply chain disruptions, and other factors (Bai, Fernández-Villaverde, Li, and Zanetti, 2023; Bernanke and Blanchard, 2023; Gagliardone and Gertler, 2023; Guerrieri, Marcussen, Reichlin, and Tenreyro, 2023; di Giovanni, Kalemli-Özcan, Silva, and Yildirim, 2023). A second set of papers emphasizes the role of deficits in raising inflation (Cochrane, 2022; Barro and Bianchi, 2023; Bianchi, Faccini, and Melosi, 2023). A third set of papers argues that the slope of the Phillips Curve has increased, meaning both demand and supply shocks have particularly large effects (Cerrato and Gitti, 2022; Benigno and Eggertsson, 2023; Gitti, 2024).

This debate has typically used lower frequency time series information. Lower frequency variation raises the challenge of omitted variables, and may not be able to discern subtle factors such as the interplay between monetary and fiscal policy. We make three contributions. First, arguably our high frequency narrative evidence is particularly well suited to isolating causes of inflation, given the difficulties at lower frequency. Second, though our evidence does not rule out supply shocks, we do establish that both fiscal shocks and a loose monetary response were important contributors to inflation. Our emphasis on the role of loose monetary policy is shared, in particular, by Gagliardone and Gertler (2023). Third, we find some evidence suggesting that the Phillips Curve was flat but positively sloped at this time, as before 2020.

In the rest of the paper, Section 2 describes our data, Section 3 describes the setting and provides narrative information about the Georgia shock, Section 4 estimates causal effects on inflation using high frequency data, Section 5 studies the response of nominal interest rates, Section 6 presents our model, and Section 7 concludes.

2 Data

This section describes the three main datasets used in the paper, namely narrative information from investment bank macroeconomic research reports, high frequency daily and intradaily asset prices, and perceived odds of Democrat victory from betting markets.

2.1 Investment Bank Research Reports

We study narrative information from investment bank reports. In the United States, as elsewhere, large investment banks have macroeconomic research departments, which distribute news about macroeconomic events to market participants. Most investment banks distribute a range of reports, including: regular weekly commentary summarizing views about recent and prospective moves in asset prices, comments in the aftermath of data releases, daily reports summarizing important events in the day to come, and extended discussion before and after major events such as central bank meetings or elections. Our primary source will be Goldman Sachs, although we will also use additional information from JPMorgan, Morgan Stanley, Deutsche Bank and UBS.

There are three notable features of these reports. First, the reports are widely distributed, since they are available to be sent by email, for free, to any financial market participant who trades with an investment bank. Moreover many investment banks distribute these reports to journalists, who in turn discuss the contents of the reports. Since the reports are available widely, they are a reasonable proxy for financial markets' expectations about fiscal news.

The second important feature of the reports is that, because they are distributed by email, they are time stamped. Therefore one can use these reports to gauge roughly when information has been revealed to markets. For instance, emailed reports discussing major data releases, such as non-farm payroll employment, are discussed in the immediate aftermath of the release.

Finally, the reports contain extensive, quantitative, information about important macroeconomic events. The informativeness is unsurprising—after all, macroeconomic research departments have strong incentives to be as informative as possible to market participants. In general, concerning electoral events, macroeconomic research reports include both quantitative probabilities assigned to various electoral scenarios, as well as spending plans after each scenario.

2.2 High Frequency Asset Prices

Our second data source is high frequency asset prices. We will primarily use inflation swaps. Inflation swaps are contracts that are used by financial market participants to either insure against inflation risk, or bet on inflation outcomes. Therefore the price of inflation swaps reflects markets' risk-neutral inflation expectations. Inflation swaps are traded at various tenors; we will study inflation swaps at the 1, 2, 5 and 10 year tenors. Inflation swaps give us information about how much markets expect the price level to increase over a given time horizon—for instance, a 1 basis point annualized increase in the 10 year inflation swap implies that the market expects the price level to increase by a further 10 basis points over ten years. Fleming & Sporn (2013) and Bahaj, Czech, Ding, and Reis (2023) provide detailed information on the market structure of inflation swaps in the United States and the United Kingdom.

We study intradaily inflation swap data from Bloomberg. Every 10 minutes, Bloomberg collects zero coupon inflation swap price quotes from all broker-dealers that have been active in the last 10 minutes, and reports the median. Price quotes are typically unavailable overnight, during weekends and public holidays, and when no broker-dealers have been active in the previous ten 10 minutes. Quoted prices tend to closely track transacted prices at the level of individual dealers (Fleming & Sporn, 2013).

One important question is the extent to which risk neutral inflation expectations from swaps truly measure inflation expectations, as opposed to liquidity and other financial market specific factors. Bahaj et al find that inflation swaps include variation in both market liquidity and fundamental news about inflation. However as we shall discuss, by studying a particular identified shock, our exercise isolates fundamental news about inflation.

We also study daily nominal interest rates on government debt. We study end-of-day interest rates from Bloomberg. Bloomberg reports the spot curve for 1, 2, 5 and 10 year yields, from which we also construct forward interest rates.

2.3 Election Odds From PredictIt

Our third and final data source is election odds from PredictIt. PredictIt is an online exchange that allows traders to place bets on public events. Traders can place bets of up to 500 dollars on the likelihood that a given event will take place. The market clears at a price such that the number of traders betting in either direction is equal.

Traders pay a great deal of attention to certain important political events, leading to high trading volumes and prices that update rapidly in response to political news. For instance, during the final hours of the Georgia Senate election on January 5th, several hundred thousand bets were placed on the outcome, namely, whether Democrats would control the Senate.

End-of-day probabilities associated with the Georgia Senate election runoff are available in public. PredictIt makes additional data available to researchers. This paper makes use of tick-by-tick information on all trades that took place about whether Democrats would win the Senate election runoff. As such, we can exploit high frequency information about the when election news is perceived to have arrived, according to betting markets.

3 The Narrative of the Georgia Shock

This section describes the narrative of the fiscal shock associated with the 2021 Georgia senate election runoffs. Then we use narrative evidence to assess the size of the shock to markets' expectations about deficits, in the aftermath of the Democrat victory.

3.1 Setting: the 2021 Georgia Senate Election Runoffs

In November 2020, Joe Biden was elected President of the United States. During the concurrent Senate election, Democrats ended with 48 seats, and Republicans ended with 50. However, quirks of Georgia election law meant that neither of their two Senate election seats were decided in November. The two Senate races were between Democrat Jon Ossoff and Republican David Perdue, and between Democrat Raphael Warnock and Republican Kelly Loeffler. In November, no candidate won an outright majority in their race, due to the presence of third party candidates. As a result, Georgia election law required both races to have a second round, involving a head-to-head contest between the respective candidates.

The Georgia Senate election was pivotal for US deficits. If both Democrats were to win in Georgia, then Democrats would hold 50 Senate seats. In the case of a 50/50 split, the party with the presidency, i.e. the Democrats, would hold the majority in the Senate. A Senate majority would allow Democrats to pass fiscal legislation, broadly related to taxes and spending, without Republican support. In November 2020, as well as prior to the Georgia runoffs, Democrats campaigned for significantly greater fiscal stimulus. Republicans, on the other hand did not advance the case for more stimulus. To the contrary, an attempt to pass a round of "stimulus checks", that is, transfers to households, was blocked by then-Senate majority leader Republican Mitch McConnell at the end of December 2020. McConnell pointed to the 900 billion dollars of fiscal stimulus that had already been passed in December 2020, via the Consolidated Appropriations Act, and argued it was sufficient. Importantly, the stakes of the Georgia election largely related to fiscal matters and not other legislative affairs. The reason is that due to Senate voting procedures, legislation that is not related to fiscal matters would require a 60 vote "supermajority", and hence would require Republican support regardless of the Georgia outcome.

Immediately after the November presidential election, a Democrat victory in both Senate races had seemed unlikely. However, gradually the perceived probability of a Democrat victory increased, particularly in the days immediately before the election. Appendix Figure 1 plots daily probabilities of the Democrat victory from betting markets.

The election took place on 5th January. In the event, Democrats won both seats in the Senate election runoff. The Democrat majority led to the possibility of passing major new fiscal stimulus. As a result, in March 2020, President Biden signed the American Rescue Plan into law. This plan led to a fiscal stimulus of 1.8 trillion dollars, or 9% of 2020 nominal GDP in the United States. The plan had three main components: first "stimulus checks" or transfers to households; second a continuation of the unusually generous unemployment insurance that had been implemented during the Pandemic; and third transfers to state governments to allow greater spending at the state level.

The passage of stimulus coincided with a rise in both realized inflation and inflation expectations, as Figure 1 shows. The figure plots annualized quarterly personal consumption expenditures (PCE) inflation and core inflation, as well as quarterly inflation expectations from one year swaps, from 2019Q1 to 2023Q4. We shade December 2020 to March 2021, during which the fiscal stimulus of the Consolidated Appropriations and the American Rescue Plan Acts were passed. Notably, inflation was relatively low and stable, within the range of 2%, prior to the passage of the acts. During and after the acts were passed, inflation and inflation expectations persistently increased to a much higher level.

3.2 Sizing the Georgia Shock

We now use the extensive narrative information from macroeconomic research reports in order to assess the size of shock to expected fiscal deficits around the Democrat victory in the Georgia Senate election. This narrative information is constructed through a search of five investment banks' research, for all reports mentioning the Georgia senate election runoffs between November 2020 and January 2021. We discuss all reports that provide enough quantitative information to inform the size of the shock.

We need three pieces of information in order to calculate the size of the Georgia shock: the probability of Democrat victory, the expected stimulus conditional on a Democrat victory, and the expected stimulus in the event that Republicans were to win at least one seat. The macroeconomic research reports provide information about all three variables.

First, we assign Democrats a 50% probability of victory. We reach this conclusion based on

Goldman Sachs' report *"The Georgia Senate Runoffs: Nearly a Toss-Up"*, released on 4th January, directly before the 5th January election. That report states that *"the race looks close to a toss-up, albeit with a slight Republican lean"*. The 50% probability is also consistent with betting markets, which had a 50% probability of Democrat victory immediately beforehand (see Appendix Figure 1). Likewise, in both Senate races, polls suggested a tossup, with each Democrat leading in roughly half of the polls taken between November and January.

We assume that if Democrats were to win, markets expected a fiscal stimulus of $600 billion, of which $300 billion were transfers and the rest was government spending. Government spending is evenly split between unemployment benefits and aid to state governments. The spending is expected to be financed by borrowing and not taxes, at least in the short term. We reach these conclusions based on the Goldman Sachs report of 4th January, which provides the forecast of Democrat stimulus in the event of their win. Other investment banks provide similar estimates of fiscal stimulus in the event of a Democrat win, but they are all released in the aftermath of the victory. For instance, UBS forecast a Democratic stimulus of $500 billion on 8th January; JPMorgan forecast $900 billion on 8th January; Morgan Stanley forecast "as much as US$1 trillion" on 7th January; Deutsche Bank forecast "approximately $900 billion"; and Goldman Sachs provided a second report on 11th January forecasting $750 billion of deficits. We opt for the numbers provided by the first Goldman Sachs report because they are near the centre of the estimates and provided before the election. However it is important to note that there is some uncertainty about the precise magnitude of the fiscal shock. None of these reports mention any possibility that Democrats would raise taxes to finance this stimulus, at least in the short run. Therefore there is a shock not only to government spending but also to deficits.

Meanwhile, we assume markets expect no fiscal stimulus from a Republican majority. The Goldman Sachs report of 4th January also writes that in the event of a Republican win

> *"we would not expect much further fiscal stimulus. President Trump recently proposed $2000/person stimulus payments, but these are unlikely to move forward under a Republican controlled Senate, we believe, as it would cost around $450bn, Republican leaders and many Republican senators don't support it, and there is likely to be less momentum behind it once individuals start receiving the smaller payments that Congress recently passed ... under a divided government, our base case is that those enhanced benefits will expire, including the extra $300/week UI benefit just passed."*

Here, "enhanced benefits" refers to the larger unemployment benefits passed under prior fiscal stimulus. An earlier report on 25th November, by UBS, arrives at the same conclusion. This report writes

> *"Split government means little cooperation and downside risk. Our fiscal assump-*

tion with a split government is for a slimmed-down version of the Republican Senate Covid relief proposal to be enacted in Q1 ... [i]ndeed we highlight the substantial risk that, as in 2011, a divided government could result in contractionary fiscal policy."

Here, split government refers to the possibility of Republicans winning the Georgia senate election runoff, and the *"Republican Senate Covid relief proposal"* refers to the Consolidated Appropriations Act, which was passed in December 2020 before the Georgia Senate Election runoffs. Therefore the report implies a view of no subsequent stimulus should the Republicans win Georgia.

Overall, the investment bank reports give us enough information to approximately size the Georgia shock. There was a 50% probability of Democrat victory, a likelihood of $600 billion of stimulus under Democrats, and zero stimulus under Republicans. The result is $300 billion of fiscal news after the Democrats won.

Ultimately, the Democratic stimulus ended up being significantly larger than any of the estimates provided by investment banks in January. This increase seems to have been due to a surprisingly large proposed stimulus by the Biden administration in late January, and an unexpectedly successful effort to convince pivotal Democratic senators to support the stimulus.

The investment bank reports also provide quantitative narrative information about other, potentially inflationary policies that markets expected the Biden administration might enact. These policies seem to have been unimportant relative to the fiscal stimulus. As we have discussed, even after winning the Georgia senate election, Democrats did not have a greater ability to pass major legislation other than fiscal policy. Regarding fiscal policy, on 11th January, a Goldman Sachs report suggested that the administration would (i) likely increase some personal income taxes and lower others, with no net change; (ii) with low probability increase the corporation tax rate to 24%; (iii) spend the tax revenue raised on infrastructure; and (iv) defer any tax or infrastructure changes until 2022. The net inflationary impact of these policies is unclear, moreover they are are quantitatively small and delayed compared with the large and immediate fiscal stimulus that was expected to be enacted. In our model, we incorporate these additional policies and find that they do not affect our conclusions about the sources of higher inflation.

4 Causal Effect of the Georgia Shock from High Frequency Data

This section estimates the causal effect of the Georgia shock on inflation expectations, at high frequency. We introduce our two identification strategies: an event study around the election window, and an instrumental variable using probabilities of Democrat victory from betting markets.

4.1 Event Study—Identification Strategy

Now, we introduce our first, event study methodology. We study movements in price level expectations in a narrow window around the Georgia senate runoff. Suppose that an asset price y_t follows a process

$$y_t = \begin{cases} \varepsilon_t & \text{if } t < T \\ \varepsilon_t + \alpha_t & \text{if } t > T. \end{cases}$$

Here, α_t is the causal effect of a policy, which starts at time T, on the asset price y_t. ε_t is an ARIMA process capturing the typical distribution of other shocks to asset prices. For instance ε_t could include noise or liquidity shocks to assets, which do not represent fundamental movements in inflation expectations (Bahaj et al 2023). The event study is designed to extract the effects of the policy α_t, these non-fundamental shocks notwithstanding.

Following the standard practice of event studies in corporate finance (e.g. MacKinlay, 1997), we can define an estimate of the causal effect of the policy on asset prices at time $T+j$, as

$$\hat{\alpha}_{T+j} = y_{T+j} - E_T\left[y_{t+j} | \alpha_{t+k} = 0\right],$$

for all k. That is, the estimate of the causal effect, j periods after the policy has taken place, is the difference between the actual asset price y_{t+J}, and the expected asset price had the policy not taken place. In practice, one constructs the conditional expectation $E_T\left[y_{t+j} | \alpha_{t+k} = 0\right]$ by estimating an ARIMA process on data before T, and constructing a forecast of y_{t+j} after the policy, using only information from time T or earlier.[3]

Then the identification assumption is that the distribution of other shocks to asset prices, ε_t, did not change between T and $T+j$, compared with the pre-period. Equivalently, there should be no other atypical shocks affecting inflation expectations at the same time as the Senate election.

As such a key choice is the width of the event window, which must exclude other atypical shocks to asset prices. We start the event window at the beginning of election day, January 5th, in order to capture all news associated with the election. In our baseline, we end the event window at the end of January 7th, for two reasons. First, existing evidence suggests that inflation swaps take 2-3 days to incorporate new information (Bahaj, Czech, Ding, and Reis, 2023). Second, narrative evidence suggests that the Georgia shock was the main event affecting asset prices until January 7th, after which an additional event affected asset prices. On January 8th, Goldman Sachs released its weekly publication *"Global Rates Trader"* which summarizes

[3] The ARIMA estimation also has the advantage of transparently dealing with missing data overnight and during weekends and public holidays, via the standard Kalman filter. We choose the best fitting ARIMA model using the Bayesian Information Criterion.

the most important events affecting asset prices over the previous week. This report leads with the sentences *"[t]win wins in Georgia revive reflation themes. The Georgia senate runoff results remain the key event of the week for rates, notwithstanding the pandemic-driven drop in December payrolls."* The latter event was the release on 8th January of an unexpectedly poor non-farm payroll employment report. Therefore a window spanning 5th-7th January includes information on the Georgia shock, not contaminated by the other major shock supposedly affecting asset prices during the week.

Appealingly, this window seems to be wide enough to capture the revelation of information about the Georgia Shock. Figure 2 plots tick by tick probabilities that Democrats win the Georgia election, in the days before and after the election. Most uncertainty is resolved by the early morning of January 6th—that is, shortly after the end of the election on the evening of January 5th. Consistent with the figure, Goldman Sachs issued a report at 2:01 AM on January 6th entitled *"Democratic Senate Control Looks Likely".*

One important potential confounding event was the January 6th Capitol Hill riots. On the afternoon of January 6th, an erstwhile peaceful protest contesting the results of the presidential election became violent, as protestors forcibly entered Capitol buildings. This event is not mentioned by any market research as an important shifter of asset prices; nor do the riots obviously bias estimates in a particular direction. Nevertheless we consider robustness to this event, by considering a second event window that ends on 2PM of January 6th. At 2 PM, the first demonstrators forcibly entered Capitol buildings. By this time, as we have seen, Democrats were already known to have won the election.

4.2 Event Study—Causal Effects on Inflation

We now study the causal effect of the Georgia Senate election runoffs on inflation. Figure 3 plots the growth of the price level over two years expected by market, at intraday frequency, for two weeks before and after the Senate election runoff. Price level growth is normalized to equal zero at the first observation on 5th January. The thick green line plots the expected value of price level expectations absent the Georgia shock, using an ARIMA estimated on the pre January 5th data. The shaded area is the 95% confidence interval associated with the forecast. The difference between the forecast and the actual value of expected price level growth is the treatment effect of the Georgia shock, under our identification assumptions. This treatment effect is 0.34% by the end of January 7th, with a standard error of 0.04%; and 0.16% at 2 PM on January 6th, with a standard error of 0.03%.

There is no evidence of mean reversion—rather, price level growth remains at a persistently higher level for the subsequent two weeks. There is a slight increase in inflation expectations directly before the election. This increase is consistent with the rising probability of a Democrat win immediately before the election, as Figure 2 has already shown.

We apply the same method in order to estimate the causal effect of the Georgia shock on expected price level growth after 1 year, 5 years and 10 years. In Figure 4 we plot the estimates and 95% confidence intervals associated with the causal effect of the Georgia shock on inflation at each horizon. After 1 year, the price level is expected to increase by 0.21%, and after ten years by 0.76%.[4] Table 1, column (1) reports the estimates associated with the figure at each horizon.

We consider some robustness tests of our results in Table 1. In the second column, we report estimates from the narrower window, which ends on January 6th at 2 PM. The estimates are smaller in magnitude, but always of the same direction and statistically significant at the 10% or 5% level. In the third column, we consider a different inference procedure. We simply calculate the treatment effect as the change in the outcome between the start of January 5th and the end of January 7th. We calculate the standard error from the distribution of all changes of a similar length in the pre period. In column (4) we estimate the ARIMA model but constrain the distribution of other shocks, ε_t, to be stationary, which further shrinks the standard errors. Our baseline ARIMA procedure handles missing values overnight and from weekends and holidays via a Kalman filter. Instead, in the final column we drop missing values when estimating the ARIMA model. The results change little.

These robustness tests notwithstanding, a drawback of the event study approach is that it relies on a single, high powered observation. Therefore our estimate will be biased if there is a single other atypically large shock taking place during the event window, despite our previous narrative evidence to the contrary. We therefore supplement our results with a second identification strategy.

4.3 Instrumental Variables—Identification Strategy

Our second instrumental variables strategy is motivated by two observations. First, there was significant variation in the perceived probability that Democrats would win the Georgia election. For instance, on 25th November, UBS wrote that *"President Biden will most likely face a split Congress"*. Betting markets' probability of a Democrat win increased from around 20% in November to 50% on the eve of the election (Appendix Figure 1). Second, markets closely followed the evolution of the Georgia race because of its implications for fiscal policy.

Therefore we propose to use the daily evolution of the probability of Democrat victory, from betting markets, as an instrument for beliefs about the likelihood of fiscal stimulus. In particu-

[4] Appendix Figures 2-4 report the analogues of Figure 3 over the other horizons.

lar, we estimate a regression

$$y_t = \alpha + \beta \text{probability}_{t-1} + \varepsilon_t,$$

where y_t is a daily measure of expected price level growth, and probability$_{t-1}$ is the lagged probability of a Democrat victory from betting markets. The sample starts a week after the November presidential election, and ends a week after the Georgia senate election runoff. β is the coefficient of interest: measuring the effect of an increase in the probability of a Democrat victory on expected price level growth. The identification assumption is that changes in news of the macroeconomic outlook do not cause changes in the perceived probability that Democrats win the election.

4.4 Instrumental Variables—Causal Effects on Inflation

We now present our estimates of the causal effect of deficit news on inflation expectations, according to our instrumental variables strategy. Figure 5 shows that the probability of a Democratic victory, on the x axis; is strongly correlated with increases in the expected growth of the price level over two years, on the y axis. The correlation is strong with the full dataset (blue and orange dots), and even stronger excluding data from after the election (orange dots only). For the full sample, a 50 percentage point increase in the probability of a Democrat victory raises the expected price level growth by 0.65 percent.

We present the causal effect at various horizons in Figure 6. The figure plots the point IV estimate at horizons of 1, 2, 5 and 10 years, as well as the 95% confidence interval. The dynamics of the response are similar to the event study. In Table 2 we report the estimates and standard errors, in column (1). After 1 year, a 50 percentage point increase in the probability of a Democrat victory raises expected price level growth by 0.35 percent. After 10 years, the increase is 1.46 percent.[5]

We also pursue various robustness tests in Table 2. The second column reports the estimates when excluding data from after the election, with larger estimates. In the third column we address the concern that movements in betting market probabilities could reflect partisan beliefs, unanchored from reality. Therefore we instrument for the probability with the daily average of polls of the Georgia senate election runoff, sourced from FiveThirtyEight.com. The results are unchanged with this instrument, which also has a reasonably high robust F statistic above 20. In the fourth column we drop dates that could potentially constitute outliers. One set of dates is 2nd-4th December, which experienced relatively large movements in inflation expectations. These movements could have been associated with news about the $900 billion December stimulus, which achieved a breakthrough in negotiations at this time. We also drop

[5]Appendix Figures 5-7 report the analogue of Figure 5 for the other horizons.

the 6th and 7th of January, which includes the Capitol Hill riots. Dropping neither affects our results. In the final column we difference the data. This step is important because of the risk of slow moving trends correlated with both inflation and electoral probabilities. After differencing, the results fall in magnitude but remain large and statistically significant at the 5% or 10% level, albeit noisier than the estimates in levels.

4.5 Discussion

Comparing identification strategies. Our two identification strategies suggest somewhat similar effects of the Georgia shock on inflation. For instance, the instrumental variable approach suggests that an increase in the probability of Democrat victory from 0.5 to 1 causes expected price level growth to increase by 0.6 percent over two years. This increase is somewhat larger than the estimate from the event study, which finds that an increase in the probability of Democrat victory from 0.5 to 1 caused expected price level growth to increase by 0.34 percent over two years. The discrepancy could be explained by the fact that between November and January, not only probabilities of the Democrat victory are changing, but also beliefs about the size of the stimulus conditional on a victory. Given this complication, we prefer the more conservative numbers from the event study.

Back of the envelope. We now use our estimates to assess the effect of the total fiscal stimulus in December 2020 and March 2021 on inflation. One simple assumption is that the marginal effect of news about fiscal stimulus on price level expectations, during the Georgia election; is the same as the marginal effect of the overall fiscal stimulus on the price level. Then, we can "scale up" our estimate of the causal effect of the Georgia shock on expected price level growth, by the ratio of total fiscal stimulus to the size of the Georgia shock, in order to arrive at the total effect of the fiscal stimulus on inflation. This exercise implies that the overall fiscal stimulus increased the price level by 7.1% over ten years—since we calculate that the Georgia shock represents $300 billion of stimulus, whereas the overall stimulus was $2.8 trillion. Therefore the overall effect of fiscal stimulus on inflation is fairly large. For comparison, Figure 1 shows that core PCE inflation was roughly 5% in 2021 and 2022. In addition, our exercise does not consider the additional $2.2 trillion associated with the CARES act.

Realized versus expected inflation. One important caveat to our results is that we study high frequency movements in inflation expectations, and not lower frequency movements in realized inflation. This approach has a distinct advantage: at high frequency one can remove many potential confounding shocks to inflation. The disadvantage is that inflation expectations and realized inflation may differ, because markets have incorrect beliefs about inflation. Two considerations weigh against this concern. First, as Figure 1 shows, inflation expectations rise sharply at the same time as inflation. The figure plots annualized quarterly core and headline PCE, as well as quarterly 1 year inflation expectations from swaps, and shows similar dynamics. Indeed, the gap between expected and realized inflation shrinks directly after the stimulus is passed. Second, in the graph, inflation expectations seem to move more slowly than actual inflation during this period, consistent with time series evidence from elsewhere (Coibion and Gorodnichenko, 2015). If there is similar underreaction at high frequency, then our estimates may be conservative, because they understate the causal effect of the Georgia shock on inflation expectations.

5 Response of Nominal Interest Rates to Georgia Shock

The second half of this paper asks what mechanisms can account for causal effect of deficits on inflation revealed by the Georgia shock. Standard theory emphasizes the role of monetary policy. If monetary policy "takes away the punchbowl" by raising interest rates, then deficit shocks need not raise inflation. To the contrary, if monetary policy is "late to the party", then deficits may cause inflation to rise.

This section estimates the monetary response to the deficit shock from Georgia, as perceived by financial markets. We find that shorter term nominal interest rates did not rise—meaning the Fed was late to the party. However, long term interest rates do rise, suggesting that markets expected the Fed to ultimately take away the punchbowl.

We estimate the response of nominal interest rates using our two identification strategies. Figure 7 plots an event study, at daily frequency using end-of-day information. Specifically, we calculate the 1 year nominal rate on US government bonds, the 1 year rate after 1 year, the 3 year rate after 2 years, and the 5 year rate after 5 years. We subtract from each rate series its value at the end of January 4th, shortly before the election, and plot the results. The treatment effect is simply the difference between the value at the end of January 7th versus the end of January 4th.

The results show that shorter term nominal interest rates failed to rise, but longer term nominal interest rates rose strongly. For instance, the 1 year bond rate is essentially unchanged. However, the 5 year 5 year forward rate rises by 0.16 percentage points.

We find similar results using our instrumental variables strategy. Figure 8 plots the 1 year bond rate against the probability that Democrats win the senate. The two series are virtually uncorrelated, suggesting no causal effect of the Georgia shock on the short term monetary response. Figure 9 plots the relationship between the 5 year 5 year forward nominal interest rate and the Democrat win probability. The two series are quite strongly correlated. For instance, on the full sample, an increase in the Democrat win probability of 0.5 causes an increase in interest rates of 0.25 percentage points.

Table 3 reports the coefficients associated with the instrumental variable estimates. Column (1) is the baseline. Column (2) drops data after January 6th. Column (3) instruments for the win probability with polling data. Column (4) drops outliers. Column (5) differences the estimates. In all cases the results are unchanged—nominal interest rates do not response to the Georgia shock at short horizons, but do rise strongly at long horizons. We caution that the differenced estimate for the 5 year 5 year forward is somewhat noisy.

Our results imply that real interest rates also rose significantly at long horizons. For instance, the 5 year 5 year nominal forward rate rises by 0.16 percentage points. The annualized 5 year 5 year forward inflation rate increases by 0.036 percentage points according to our event study estimates. Therefore real interest rates rise substantially at longer horizons.

6 A Standard Model of Inflation

This section studies a standard and parsimonious New Keynesian model, featuring a consumer with bonds-in-utility and a Phillips Curve. We investigate two questions: first, whether a standard calibration of this model can quantitatively account for dynamics of inflation due to the fiscal stimulus; and second what mechanisms allow deficits to increase inflation. Importantly, we do not directly calibrate any part of our model to target the inflation response itself.

6.1 Model Setup

We study a simple New Keynesian model with a households that enjoy bonds in their utility function.

Households. There is a representative and infinitely lived household, who chooses consumption C_t, labor N_t and holdings of one period nominal bonds with real value A_{t+1}. Following Auclert, Rognlie, and Straub (2023a,b), the real value of bonds enters households' utility function. Therefore households maximize expected utility, which is isoelastic in consumption, labor and the real value of bonds, according to

$$\max_{\{C_{t+s},A_{t+s+1},N_{t+s}\}} \mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \left[\frac{C_{t+s}^{1-\frac{1}{\sigma}}-1}{1-\frac{1}{\sigma}} - \frac{N_{t+s}^{1+\frac{1}{\varphi}}}{1+\frac{1}{\varphi}} + \zeta \frac{A_{t+s+1}^{1-\eta}-1}{1-\eta} \right] \tag{1}$$

subject to a budget constraint

$$C_t + A_{t+1} = W_t N_t + D_t - T_t + \frac{I_{t-1}}{P_t/P_{t-1}} A_t. \tag{2}$$

The budget constraint requires that the sum of consumption and the real value of government bonds equals real income. Real income is the sum of real labor income $W_t N_t$ given a real wage W_t, dividends from firms D_t, lump sum taxes T_t, and real income from the past holdings of bonds, which evaluates to $\frac{I_{t-1}}{P_t/P_{t-1}} A_t$ given the gross nominal interest rate I_{t-1}.

Firms. The firms in this model behave identically to the standard New Keynesian model, as in for instance Gali (2006). Therefore we briefly summarize the model of firms, without details. There is monopolistic competition in the product market and perfect competition in the labor market. Technology is linear in labor. Firm profits are paid out lump sum as dividends to households. Firms have Calvo sticky prices, with a Poisson probability of being able to re-optimize their price. Firms discount future profits at the real interest rate. These assumptions deliver a standard New Keynesian Phillips Curve

$$\pi_t = R^{-1} \mathbb{E}_t \pi_{t+1} + \kappa y_t,$$

where π_t is the inflation rate and y_t is the output gap.

Policy. Fiscal policy consists of a rule for lump sum taxes T_t, with two components: first, an exogenous component S_t that does not vary with the aggregate state; and second, an endogenous component $\tau_y Y_t$ that varies with aggregate output Y_t, for $\tau_y \in [0,1]$. Together, these components imply a rule for real lump sum taxes $T_t = S_t + \tau_y Y_t$. The fiscal rule pins down the real market value of debt V_t, which evolves as

$$\begin{aligned} V_t &= R_{t-1} \frac{\mathbb{E}_t [\Pi_t]}{\Pi_t} V_{t-1} - T_t \\ &= R_{t-1} \frac{\mathbb{E}_t [\Pi_t]}{\Pi_t} V_{t-1} - \left(S_t + \tau_y Y_t\right), \end{aligned}$$

where $\Pi_t \equiv P_t / P_{t-1}$ is gross inflation. That is, real government debt evolves according to the interest rate paid on the debt, net of lump sum taxes.

Sufficiently negative values of S_t imply a deficit financed transfer to households. We model the 2021 fiscal stimulus as a rise in transfers from the government to households, financed by bonds, which is paid back only gradually according to the fiscal rule. This rise in transfers is captured as a shock to S_t, which we will measure from data on the 2021 fiscal stimulus and the Georgia shock.[6]

Regarding monetary policy, in the baseline model we feed in a sequence of nominal interest rates taken directly from the data, and focus on the minimum state variable solution of the model.

[6] In a model extension, we consider the case in which there is an increase in government spending as well as transfers.

Equilibrium. The equilibrium of the model is standard, in that the goods, labor and bond markets clear. Amongst other conditions, equilibrium requires that the real market value of government debt V_t, equals the real market value of bonds held by households A_{t+1}.

Discussion of the model. The consumption side of this model is appealing because of two features. First, the model is quantitatively consistent with certain dynamics of consumption, because household consumption increases after a rise in the real value of bonds, evoking a notion of "spending down excess savings" (Auclert, Rognlie, and Straub, 2023b). More generally, this model is consistent with the magnitude and persistence of the consumption response to transfers (Auclert, Rognlie, and Straub, 2023a). As such, the model allows a departure from Ricardian Equivalence, which is necessary for fiscal transfers to have effects on aggregate demand. Second, the model features "excess discounting" relative to standard consumer behavior without bonds-in-utility. Without excess discounting, near and far off interest rate changes have the same marginal effect on consumption, leading to the well known "forward guidance puzzle" that is thought to be empirically unrealistic. Following Auclert, Rognlie, and Straub (2023a), we will also consider an extension with a share of "hand to mouth" agents who consume their income, that is, a "TABU" model.

To see these the two features of the consumption function analytically, observe that in a neighborhood of the non-stochastic steady state, the Euler equation solving problem (1) is

$$c_t = \beta R \mathbb{E}_t c_{t+1} - \beta R \sigma \left(i_t - \mathbb{E}_t \pi_{t+1}\right) + \left[1 - \beta R\right] \sigma \eta \frac{a_{t+1}}{A}, \tag{3}$$

where c_t is log consumption, R is the steady state real interest rate, i_t is the net nominal interest rate, and $a_t \equiv (A_t - A)/Y$, where values without time subscripts denote steady state values. Steady state requires $\beta R < 1$. There is excess discounting: relative to the standard Euler equation, the βR term multiplies future expected consumption $\mathbb{E}_t c_{t+1}$. Moreover transfers affect consumption, due to the final $\left[1 - \beta R\right] \sigma \eta \frac{a_{t+1}}{A}$ term. When the value of bonds a_{t+1} is relatively high due to deficit financed transfers, then consumption increases. Intuitively, higher wealth raises the marginal value of consumption.

In focussing on the minimum state variable solution of the model, we do not pursue an explanation for the causal effect of deficits on inflation based on the Fiscal Theory of the Price Level (FTPL). The FTPL is arguably inconsistent with the behavior of long term real interest rates, which increase sharply after the fiscal shock. If off equilibrium, long term real interest rates respond to inflation the same way as they do on equilibrium, then the minimum state variable solution is selected, as opposed to the FTPL equilibrium of the economy.

6.2 A Standard Calibration

The goal of our calibration is to evaluate whether a standard and parsimonious model can account for the dynamics of inflation after the fiscal shock. We calibrate all aspects of consumer behavior to standard values as in Auclert, Rognlie, and Straub (2023a). We calibrate the slope of the Phillips Curve to the low, but positive value estimated by Hazell, Herreno, Nakamura, and Steinsson (2022) using pre-2020 data. Table 4 reports our calibration. Importantly, we do not directly calibrate any part of our model to target the inflation response itself.

Regarding monetary policy, we feed the path of interest rate changes after the Georgia election into the model, as estimated at high frequency in Figure 7. Regarding fiscal policy, we feed the deficit shock from the Georgia election into the model, as measured in the narrative reports of Section 3. We discipline the expected dynamics of the Georgia shock by using the overall expected dynamics of the March 2021 fiscal stimulus, as forecast by the Congressional Budget Office (CBO). The CBO projections do not take into account how interest rates and tax payments might affect the real value of debt. Therefore we calibrate how taxes affect the evolution of debt, by choosing a value of τ_y, the average labor tax, similar to Angeletos, Lian & Wolf (2023). Finally, we simulate the model assuming that all variables return to steady state after 10 years.

6.3 Accounting for the Inflation Response in the Model

We then ask whether, given the fiscal and monetary behavior taken from the data, our standard model can quantitatively account for the inflation response to the Georgia shock. We find that our model quantitatively matches both the size and the persistence of the estimated inflation response. We believe this success is noteworthy because the model is parsimonious, calibrated entirely to pre-pandemic parameters, takes monetary and fiscal behavior directly from the data, and does not directly target the behavior of inflation.

Figure 10 shows this result. In the bottom left panel, we show parameters relating to policy. In blue is the change in interest rates after the Georgia shock, which is fed in directly from the data. We also plot the path of government debt expected after the Georgia shock, which remains high for several years. As a result, the output gap significantly increases, as shown in the top right panel, and remains persistently high. The multiplier is quite high, as the bottom right panel shows. The reason is that loose monetary policy, combined with a large expansion in government debt leads to a prolonged period in which consumers raise consumption due to their higher debt holdings. Finally, in the top left panel, we plot the inflation response implied by the model. The results are remarkably in line with the data, in terms of both size and dynamics.

In robustness exercises contained in Appendix Figure 8, we consider various extensions of our baseline model. We add a share of hand-to-mouth agents, in order to better match the response of consumption to transfers. We also allow the fiscal stimulus to be in part from government spending, as well as transfers. Finally, we combine both ingredients. In all cases, our quantitative results change little.

Our model suggests an important lesson. Standard and parsimonious ingredients, informed by data from before the Pandemic, are sufficient to explain the rise in inflation. Moreover, a key source of the rise in inflation seems to be the interaction between loose fiscal and loose monetary policy. The model shows that the large fiscal shock leads to the response of inflation, given the initial lack of response by the monetary authority. The result is a large and persistent demand shock, which was sufficient to raise inflation despite a flat but positively sloped Phillips Curve.

7 Conclusion

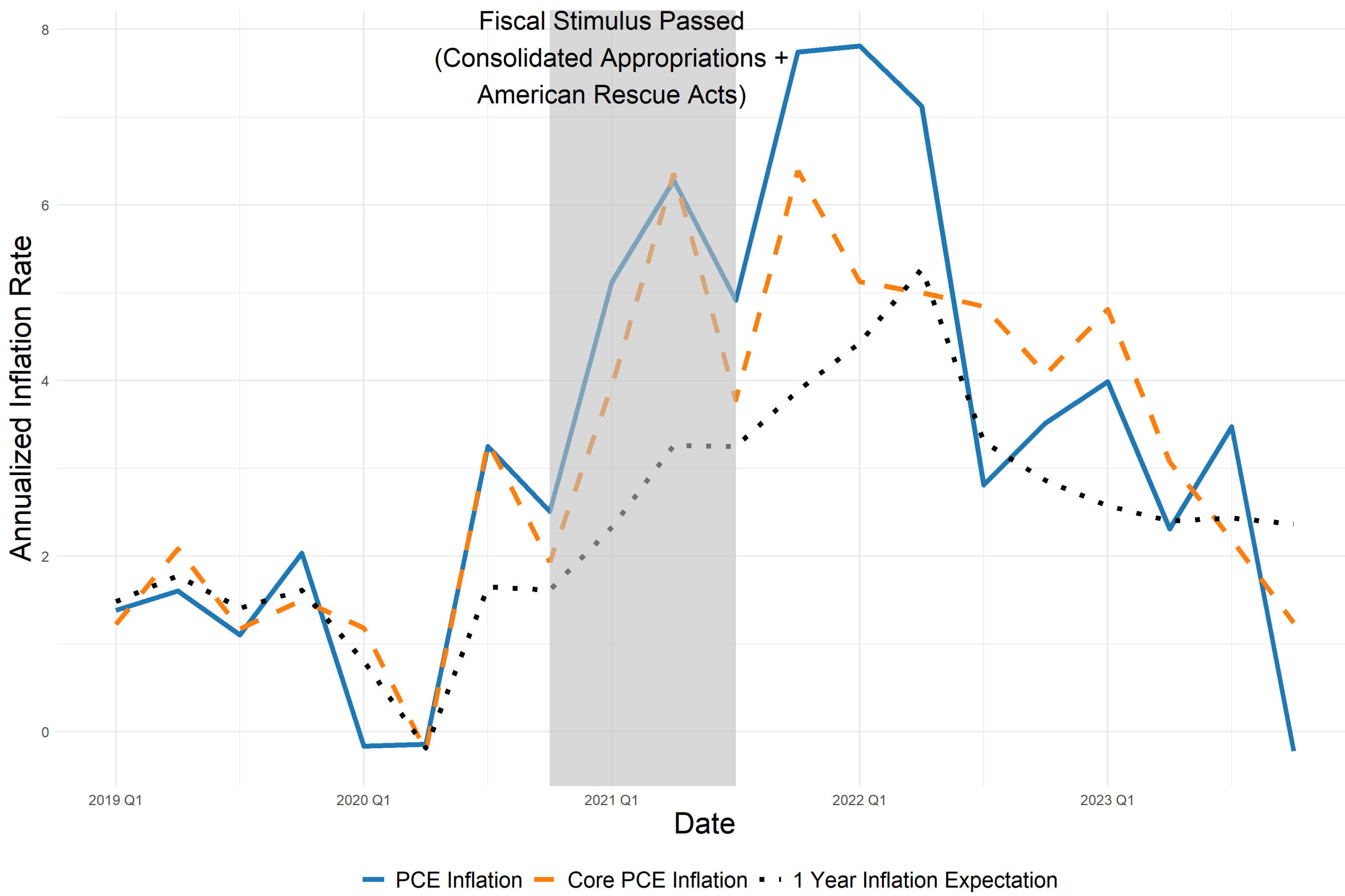
This paper asks whether deficits cause inflation. The question is particularly relevant in the current environment, given the recent episode of high inflation alongside large deficits. However the answer is elusive, because many shocks affect inflation in the time series.

We propose a high frequency narrative approach to estimate the causal effect of deficits. We narratively identify an event that constituted an exogenous shock to inflation expectations, namely the Georgia senate election runoff of 2021. Then, we study the high frequency response of inflation expectations from asset prices. Our two identification strategies—from event studies and instrumental variables—both suggest that the effect of deficits on inflation is large. A back of the envelope, combining our estimates with the size of the 2021 and late 2020 stimulus, suggests that the stimulus can account for a 7% increase in the price level over ten years.

Turning to mechanisms, we document that nominal interest rates did not change at the 1 year horizon after the Georgia shock, but rose strongly at longer horizons. This finding suggests that the Fed was "late to the party". We calibrate a standard New Keynesian model with bonds in the utility function, and a flat but positively sloped Phillips Curve; and feed the monetary and fiscal response from the data into the model. The model quantitatively accounts for the estimated response of inflation, and suggests that the combination of loose monetary and fiscal policy was key for explaining inflation dynamics.

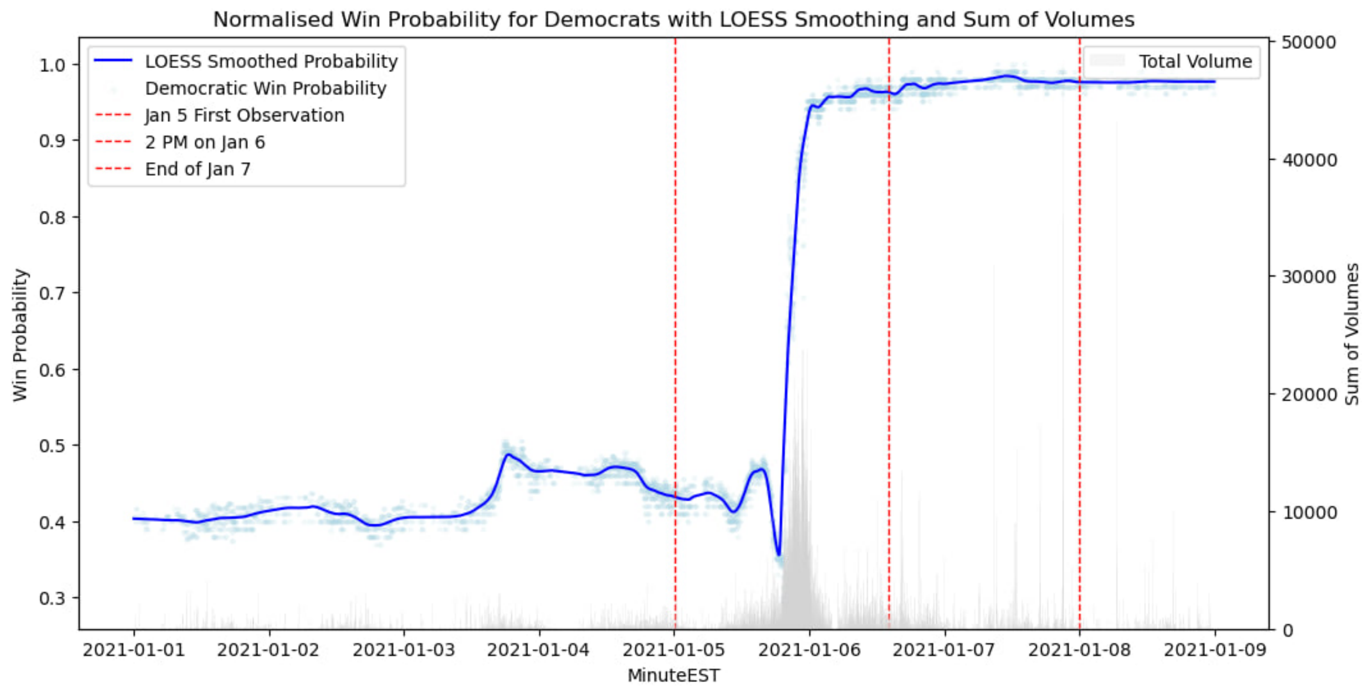
8 Figures

Figure 1: Time Series Evolution of Inflation and Inflation Expectations



Notes: this graph plots annualized quarterly personal consumer expenditures (PCE) inflation, and core PCE inflation, from 2019Q1 to 2023Q4. We also plot 1 year inflation expectations from inflation swaps, at quarterly frequency, sourced from Bloomberg's zero coupon inflation swaps. In grey we shade the area in which the fiscal stimulus of the Consolidated Appropriations Act and the American Rescue Plan Act were passed.

Figure 2: Intraday Probability that Democrats Win Senate Election

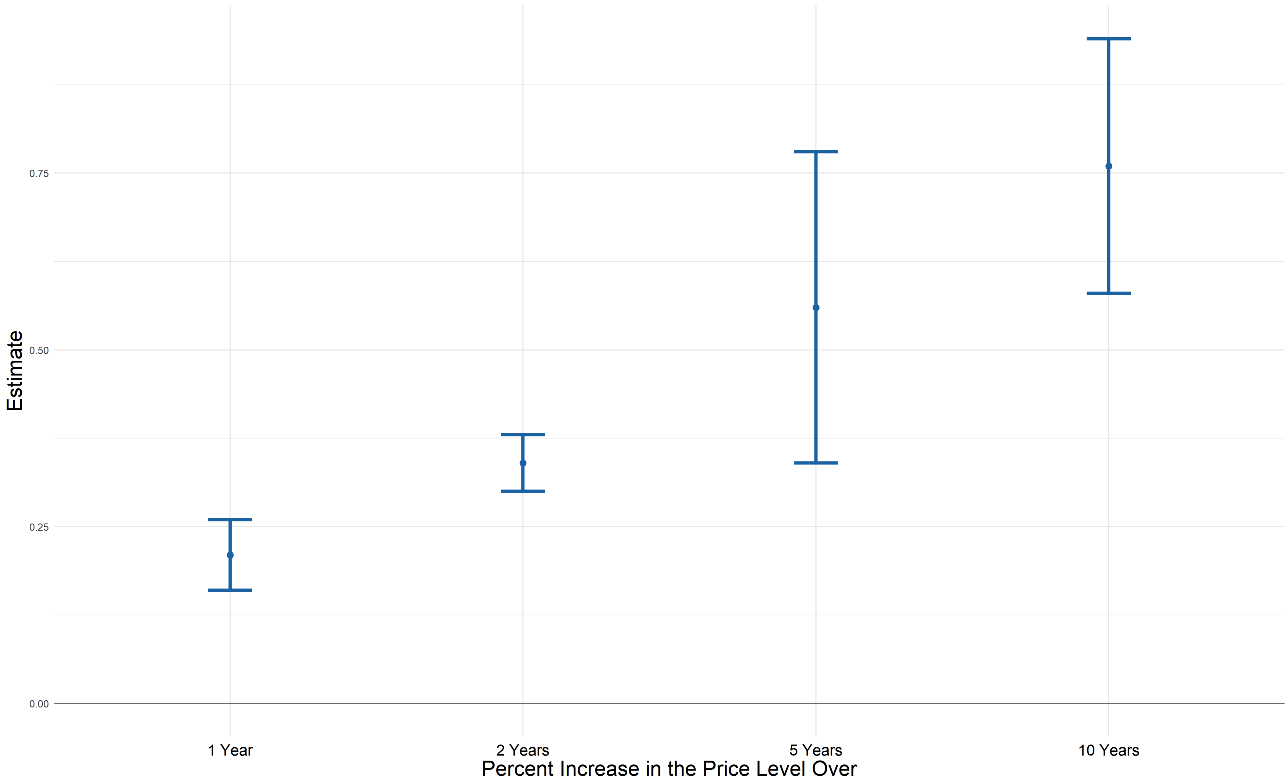


Notes: this graph plots the intraday perceived probability that Democrats will win both Georgia senate election seats, and hence gain the overall senate majority; using tick-by-tick data from PredictIt. The gray lines and right axis report the sum of trading volumes at a point in time, the blue dots, line and left axis report the Democrats' win probability. The red lines denote the first observation on January 5th, 2 PM on January 6th, and the last observation on January 7th.

Figure 3: Expected Price Level Growth Over 2 Years from Intraday Inflation Swaps

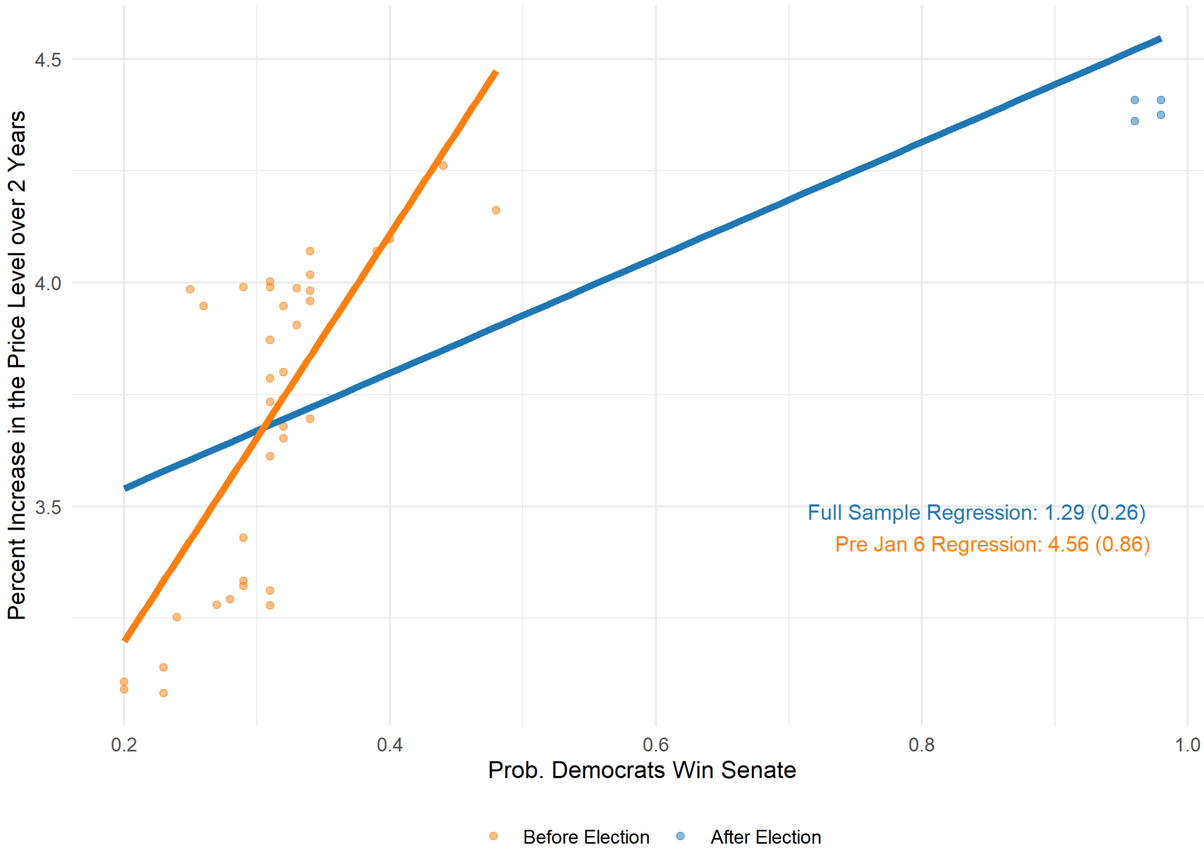
Notes: this graph plots the expected increase in the price level over two years, according to zero coupon inflation swaps from Bloomberg. The data are normalized so that the first observation on January 5th has a value of zero. The first vertical orange line denotes the first value on January 5th, the second vertical orange line denotes the value at 2 PM on January 6th, and the final vertical orange line denotes the last value on January 7th. The solid green line indicates the forecast of inflation swaps according to an ARIMA model estimated on the prior data only, the shaded area is the uncertainty associated with this forecast. The estimates and standard errors are calculated from the difference between actual data and the ARIMA forecast. The data is from December 18th to January 20th, reported at 10 minute frequency. Dashed lines indicate missing data due to weekends or public holidays.

Figure 4: Expected Price Level Growth from Intraday Inflation Swaps, Event Study



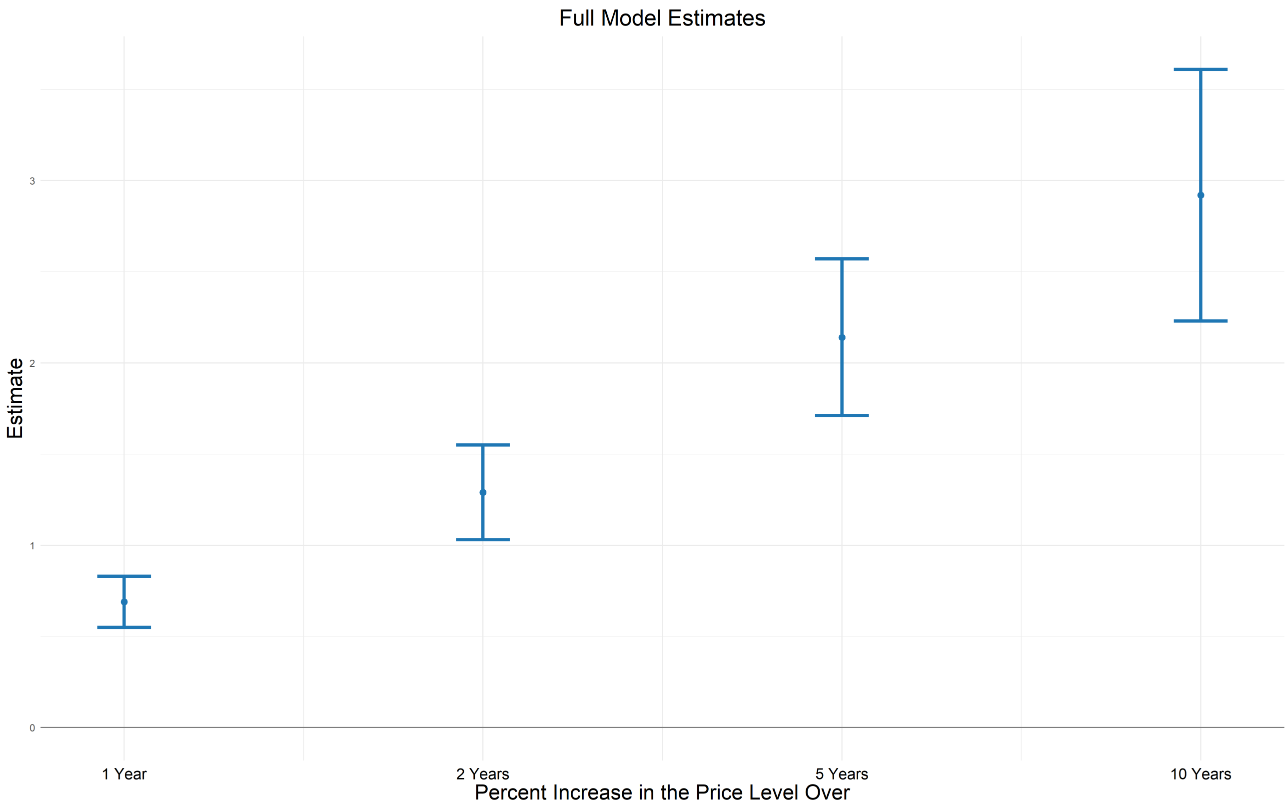
Notes: this graph plots the causal effect of the Georgia shock on the expected price level at various horizons years, according to zero coupon inflation swaps at various horizons from Bloomberg. The data is from December 18th to January 20th, reported at 10 minute frequency. At each inflation swap horizon, we estimate an ARIMA model using data before January 5th. We then calculate the causal effect as the difference between the realized value of the expected price level increase at the end of January 7th, and the value forecast by the ARIMA model. We also use the ARIMA model to calculate 95% confidence intervals. We plot the expected price level increase using inflation swaps with tenors of 1, 2, 5 and 10 years.

Figure 5: Expected Price Level Growth over 2 Years and Probability of Democrat Senate Win



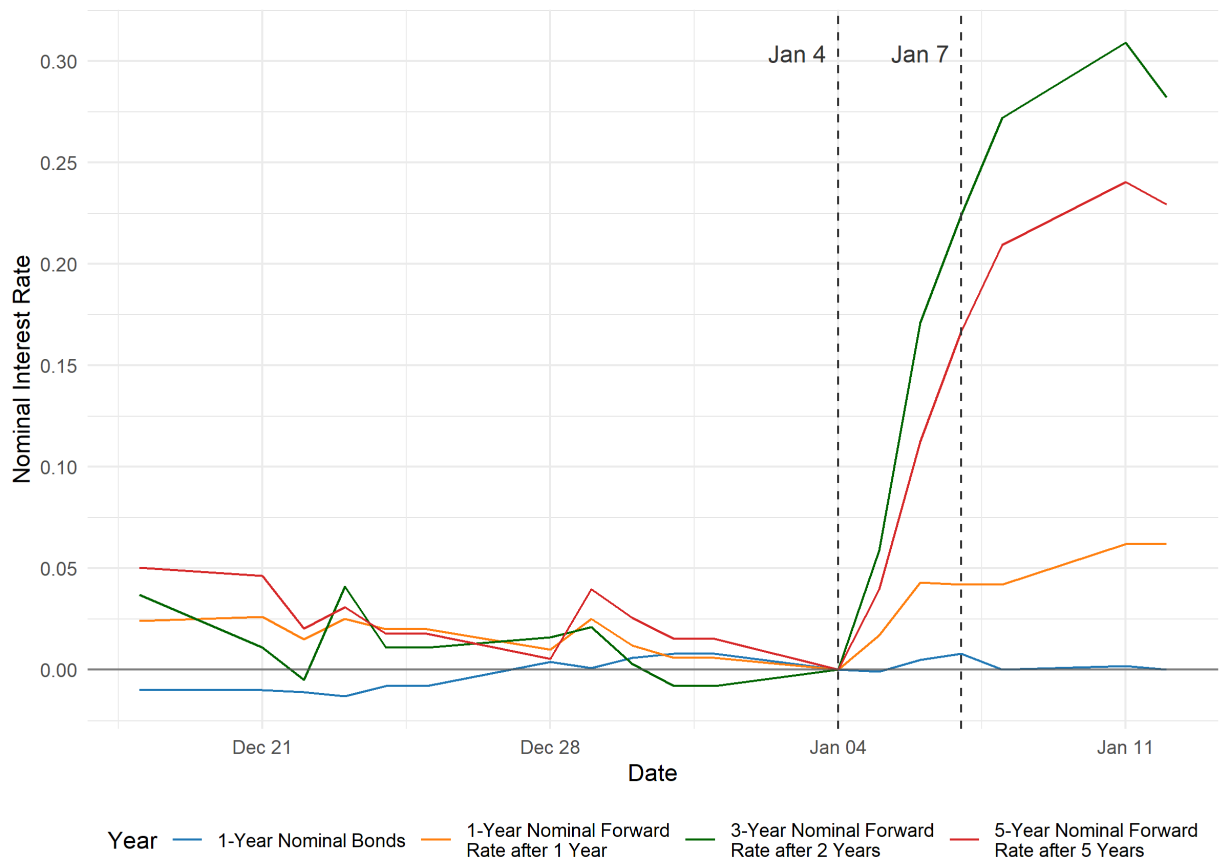
Notes: this graph relates the expected price level increase over two years to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon inflation swaps data from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 6: Expected Price Level Growth from Intraday Inflation Swaps, Instrumental Variables



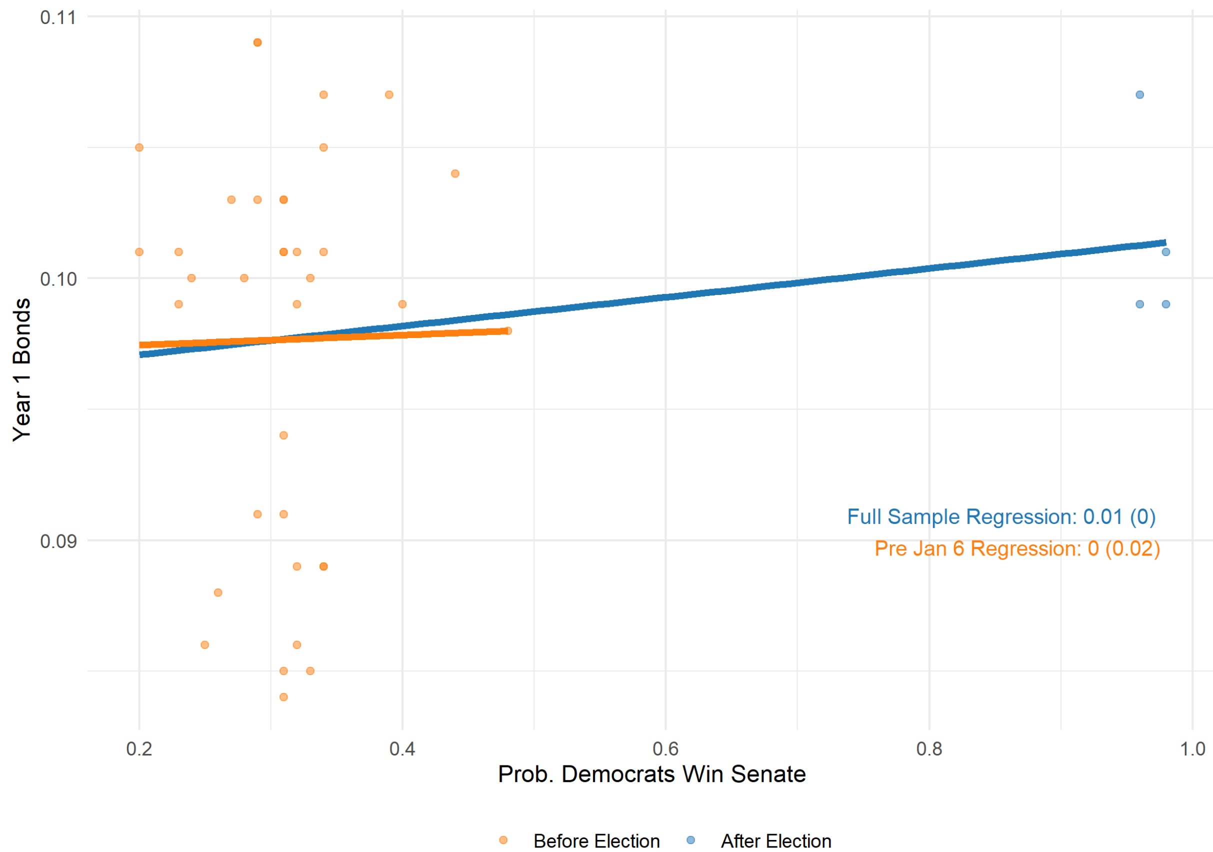
Notes: this graph plots the causal effect of the Georgia shock on the expected price level at various horizons, from regressing the change in the expected price level at various horizons on the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon inflation swaps data from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. We plot 95% confidence intervals associated with Newey-West standard errors with three lags. We plot horizons associated with inflation swaps at 1, 2, 5 and 10 year tenors.

Figure 7: Change in Nominal Interest Rates, Event Study



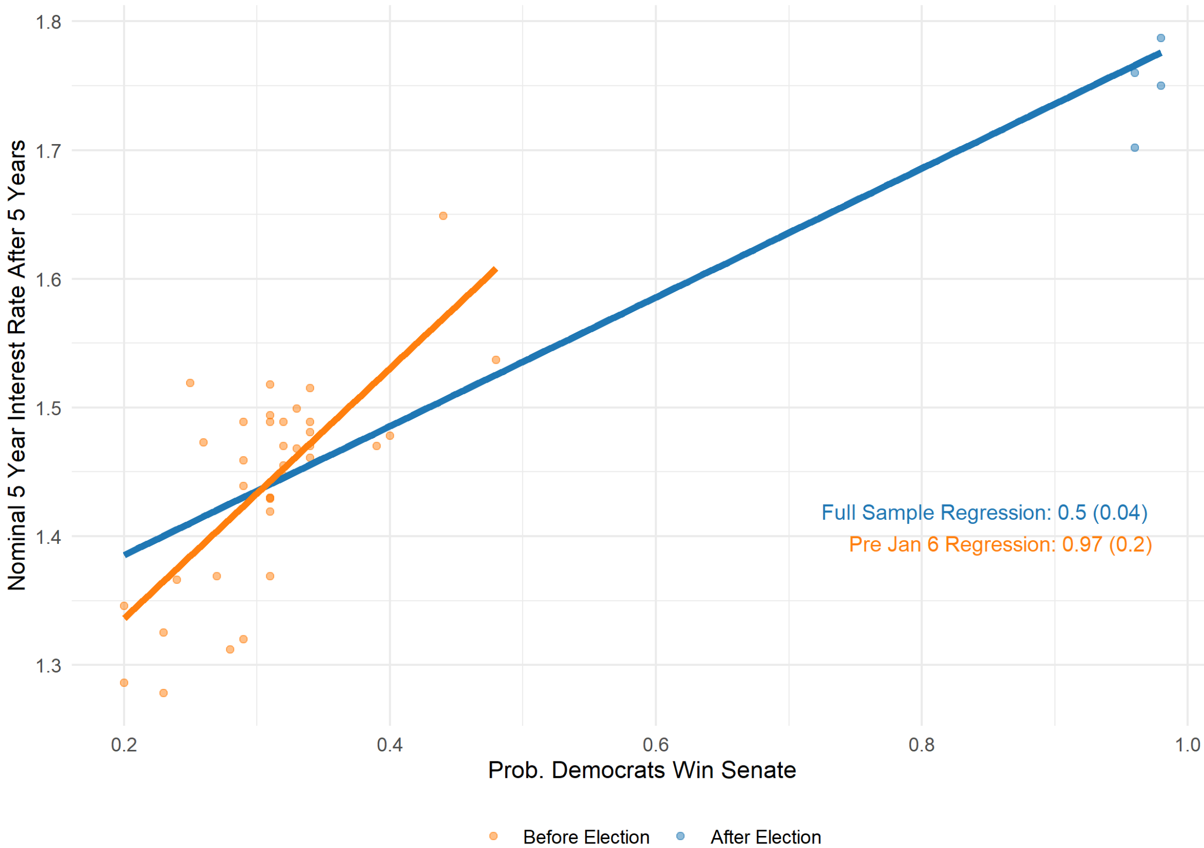
Notes: this graph plots end-of-day nominal interest rates from December 28th to January 12th. The interest rates are sourced from Bloomberg's series of zero coupon nominal interest rates on US government debt. We study spot interest rates for 1, 2, 5 and 10 year debt, and use these interest rates to calculate implied forwards. The dashed lines plot the date at January 4th and January 7th.

Figure 8: 1 Year Nominal Bond Rate and Probability of Democrat Senate Win



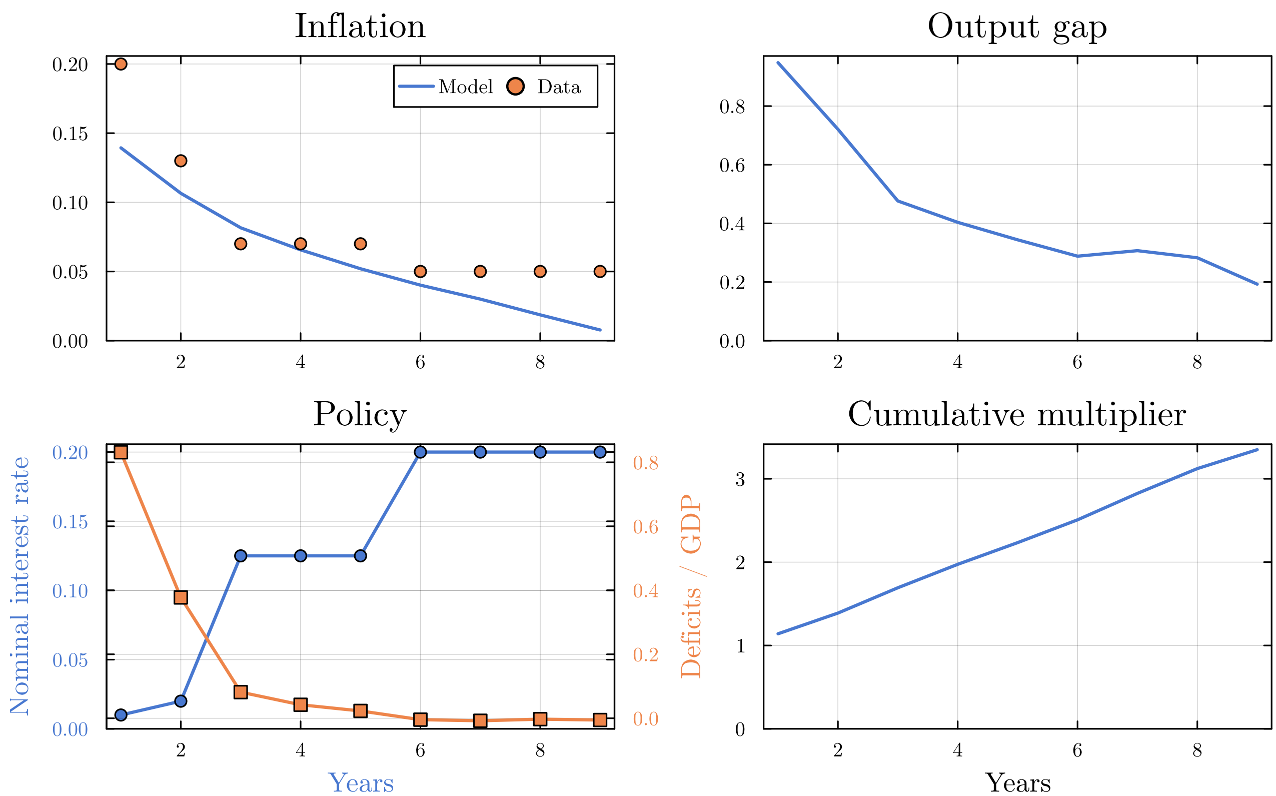
Notes: this graph relates the 1 year nominal bond rate to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon spot bond yields from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 9: 5 Year Nominal Bond Rate After 5 Years and Probability of Democrat Senate Win



Notes: this graph relates the 5 year 5 year forward nominal bond rate to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon spot bond yields from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 10: Impulse Response to Georgia Shock



Notes: this studies the impulse response of model variables to a shock calibrated to match the properties of the fiscal impulse from the Georgia shock. We calibrate the model as discussed in the text and feed in the path of nominal interest rates implied by the event study. The top left panel shows inflation predicted by the model and in the data. The top right panel shows the output gap. The bottom left panel shows interest rates—taken from the data—and the path of deficits relative to GDP. The final panel shows the cumulative government spending multiplier, calculated as the cumulative response of output to the fiscal impulse from the Georgia shock.

9 Tables

Table 1: Increase in Expected Price Level, Event Study

Overall outcome: Percent increase in the price level from inflation swaps

	Jan 7, non Stationary	Jan 6, non Stationary	Difference	Jan 7, Stationary	Drop missing
	(1)	(2)	(3)	(4)	(5)
Panel A: Percent increase over 1 year					
Jump in Expectations	0.21	0.13	0.22	0.21	0.21
	(0.05)	(0.03)	(0.02)	(0.02)	(0.09)
Panel B: Percent increase over 2 year					
Jump in Expectations	0.34	0.16	0.33	0.41	0.34
	(0.04)	(0.03)	(0.04)	(0.04)	(0.08)
Panel C: Percent increase over 5 year					
Jump in Expectations	0.56	0.28	0.56	0.74	0.56
	(0.22)	(0.15)	(0.08)	(0.07)	(0.22)
Panel D: Percent increase over 10 year					
Jump in Expectations	0.76	0.43	0.74	0.99	0.74
	(0.18)	(0.14)	(0.12)	(0.11)	(0.48)

Note: Each panel corresponds to the expected percentage increase in the price level over a specific maturity. The data for inflation expectations come from the intraday prices of zero-coupon inflation swaps at 10-minute frequency, sourced from Bloomberg. In all panels, we calculate the increase in inflation expectations compared to the counterfactual scenario where the series would have continued to behave as before January 5th, 2021, just before the announcement of the Georgia election results. In Column (1), we fit a non-stationary ARIMA model to the data from the start of December 18th, 2020 to the start of January 5th. We then use the model's prediction at the end of January 7th as the counterfactual. The 'causal' jump in inflation expectations is the difference between the actual swap price and this ARIMA prediction. Column (2) sets the counterfactual at 2:00 PM on January 6th, 2021. In Column (3), we simply take the difference between the swap prices at the end of January 7th and the beginning of January 5th. Column (4) fits a stationary ARMA model to the data from December 18th, 2020 to January 7th,2021 to estimate the counterfactual. Column (5) drops all missing values and then fits the ARIMA model. In Columns 1,2,4, and 5 the standard error is the ARMA prediction's standard error at the point of calculating the effect. In Column 3, we calculate the standard error empirically by calculating the standard deviations of the price series before January 5th, over periods equal in length to the time between the start of January 5th and the end of January 7th.

Table 2: Increase in Expected Price Level, Instrumental Variables

Overall outcome: Percent increase in the price level from inflation swaps

	Full Sample	Before Jan 6	Before Jan 6 IV	Outliers Dropped	Diff
	(1)	(2)	(3)	(4)	(5)
Panel A: Percent increase over 1 year					
Democrats Win Probability	0.69	2.41	2.78	0.69	0.14
	(0.12)	(0.38)	(0.58)	(0.14)	(0.06)
Observations	39	35	29	34	37
F-Stat.			[24.14]		
Panel B: Percent increase over 2 years					
Democrats Win Probability	1.29	4.56	4.97	1.29	0.20
	(0.23)	(0.71)	(1.09)	(0.26)	(0.14)
Observations	40	36	30	35	39
F-Stat.			[24.94]		
Panel C: Percent increase over 5 years					
Democrats Win Probability	2.14	7.44	9.33	2.17	0.45
	(0.36)	(1.08)	(1.99)	(0.42)	(0.16)
Observations	40	36	30	35	39
F-Stat.			[23.29]		
Panel D: Percent increase over 10 years					
Democrats Win Probability	2.92	11.06	14.77	2.99	0.56
	(0.55)	(1.65)	(3.46)	(0.65)	(0.31)
Observations	40	36	30	35	39
F-Stat.			[21.71]		

Note: Each panel in the table represents a different horizon for changes in the price level. For all panels, we regress the expected increase in the price level on the lagged probability of a Democratic win in the 2021 Georgia Senate election. We use Newey-West standard errors with three lags. Our dataset is daily, sourcing expected increases in the price level from zero-coupon inflation swaps from Bloomberg, and probabilities of a Democratic victory from Predictit's 2020 Senate election betting prices. The data spans from November 17, 2020, to January 12, 2021. Column (1) analyzes the entire dataset. Column (2) considers only data gathered before January 6, 2021. Column (3) uses the same dataset as Column (2) but applies polling data for the Georgia Senate election from FiveThirtyEight.com as an instrument for victory probability. Column (4) omits data from outliers, namely the 6th and 7th of January and the 2nd-4th December. Lastly, in Column (5), the analysis uses the differenced values of both dependent and independent variables. Counts refer to the number of daily observations. For the IV estimates in Column (3), the first stage F-statistics is reported in brackets.

Table 3: Increase in Nominal Interest Rates, Instrumental Variables

Overall outcome: Nominal Interest Rate

	Panel A: Percent increase over 1 year				
	Full Sample	Before Jan 6	Before Jan 6 IV	Outliers Dropped	Diff
	(1)	(2)	(3)	(4)	(5)
Democrats Win Probability	0.01	0.002	−0.01	0.003	0.02
	(0.01)	(0.02)	(0.03)	(0.01)	(0.01)
Observations	40	36	30	35	39
F-Stat.			[11.34]		
	Panel B: Percent increase over 5 years, after 5 years				
Democrats Win Probability	0.50	0.97	1.46	0.53	0.37
	(0.05)	(0.16)	(0.34)	(0.05)	(0.22)
Observations	40	36	30	35	39
F-Stat.			[18.83]		

Table 1: Regression Results for Nominal Interest Rates

Note: Each panel in the table represents a different horizon for changes in nominal interest rates. For all panels, we regress nominal interest rates of U.S. government bonds on the lagged probability of a Democratic win in the 2021 Georgia Senate election. We use Newey-West standard errors with three lags. Our dataset is daily, sourcing interest rate from Bloomberg and probabilities of a Democratic victory from Predictit's election betting prices. The data spans from November 17, 2020, to January 12, 2021. Column (1) analyzes the entire dataset. Column (2) considers only data gathered before January 6, 2021. Column (3) uses the same dataset as Column (2) but applies polling data from FiveThirtyEight.com as an instrument for victory probability. Column (4) omits data omits data from outliers, namely the 6th and 7th of January and the 2nd-4th December. Lastly, in Column (5), the analysis uses the differenced values of both dependent and independent variables. Counts refer to the number of daily observations. For the IV estimates in Column (3), the first stage F-statistics is reported in brackets. The 5year-5year interest rate is calculated from 10-year and 5-year government bonds.

Table 4: Model Calibration

Parameter	Description	Value	Target
σ	Intertemporal elasticity of substitution	1	Standard
φ	Frisch elasticity	1	Standard
η	Bond utility curvature	6.69	Auclert, Rognlie, and Straub (2023a)
β	Discount factor	0.87	Auclert, Rognlie, and Straub (2023a)
R	Real interest rate	1.05	Auclert, Rognlie, and Straub (2023a)
κ	NKPC slope (annual)	0.04	Hazell et al (2022)
τ_y	Marginal tax rate	0.33	Angeletos, Lian & Wolf (2023)
A/Y	Gov't debt	1.05	US debt to GDP

Notes: this table reports the baseline calibration of the model in the main text. In all cases other than the final parameter, we calibrate to standard values from other papers, using pre 2020 data. We calibrate the final parameter to the ratio of US debt to GDP from national accounts.

References

AUCLERT, A., M. ROGNLIE, AND L. STRAUB (2023a): "The Intertemporal Keynesian Cross," .

——— (2023b): "The Trickling Up of Excess Savings," in *AEA Papers and Proceedings*, vol. 113, pp. 70–75. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.

BAGGA, S., L. MANN, A. SAHIN, AND G. L. VIOLANTE (2023): "Job Amenity Shocks and Labor Reallocation," .

BAHAJ, S., R. CZECH, S. DING, AND R. REIS (2023): "The Market for Inflation Risk," *Available at SSRN 4488881*.

BAI, X., J. FERNÁNDEZ-VILLAVERDE, Y. LI, AND F. ZANETTI (2023): "The causal effects of global supply chain disruptions on macroeconomic outcomes: evidence and theory," .

BARRO, R. (2022): "Understanding Recent US Inflation," *Project Syndicate*.

BARRO, R. J., AND F. BIANCHI (2023): "Fiscal Influences on Inflation in OECD Countries, 2020-2022," Discussion paper, National Bureau of Economic Research.

BENIGNO, P., AND G. B. EGGERTSSON (2023): "Its baaack: The surge in inflation in the 2020s and the return of the non-linear phillips curve," Discussion paper, National Bureau of Economic Research.

BERNANKE, B., AND O. BLANCHARD (2023): "What caused the US pandemic-era inflation?," *Hutchins Center Working Papers*.

BIANCHI, F., R. FACCINI, AND L. MELOSI (2023): "A Fiscal Theory of Persistent Inflation," *The Quarterly Journal of Economics*, p. qjad027.

CERRATO, A., AND G. GITTI (2022): "Inflation since covid: Demand or supply," *Available at SSRN 4193594*.

COCHRANE, J. H. (2022): "Inflation past, present and future: Fiscal shocks, Fed response, and fiscal limits," Discussion paper, National Bureau of Economic Research.

COGLIANESE, J. M., M. OLSSON, AND C. PATTERSON (2023): "Monetary policy and the labor market: a quasi-experiment in sweden," *University of Chicago, Becker Friedman Institute for Economics Working Paper*, (2023-123).

COIBION, O., AND Y. GORODNICHENKO (2015): “Information rigidity and the expectations formation process: A simple framework and new facts,” *American Economic Review*, 105(8), 2644–2678.

DI GIOVANNI, J., Á. KALEMLI-ÖZCAN, A. SILVA, AND M. A. YILDIRIM (2023): “Pandemic-Era Inflation Drivers and Global Spillovers,” Discussion paper, National Bureau of Economic Research.

FRIEDMAN, M., AND A. J. SCHWARTZ (1967): *A monetary history of the United States, 1867-1960*, vol. 9. Princeton University Press.

GAGLIARDONE, L., AND M. GERTLER (2023): “Oil Prices, Monetary Policy and Inflation Surges,” Discussion paper, National Bureau of Economic Research.

GERTLER, M., AND P. KARADI (2015): “Monetary policy surprises, credit costs, and economic activity,” *American Economic Journal: Macroeconomics*, 7(1), 44–76.

GITTI, G. (2024): “Nonlinearities in the Regional Phillips Curve with Labor Market Tightness,” .

GUERRIERI, V., M. MARCUSSEN, L. REICHLIN, AND S. TENREYRO (2023): “Geneva Report: The art and science of patience: relative prices and inflation,” .

GÜRKAYNAK, R. S., B. P. SACK, AND E. T. SWANSON (2004): “Do actions speak louder than words? The response of asset prices to monetary policy actions and statements,” *The Response of Asset Prices to Monetary Policy Actions and Statements (November 2004)*.

HAZELL, J., J. HERRENO, E. NAKAMURA, AND J. STEINSSON (2022): “The slope of the Phillips Curve: evidence from US states,” *The Quarterly Journal of Economics*, 137(3), 1299–1344.

KÄNZIG, D. R. (2021): “The macroeconomic effects of oil supply news: Evidence from OPEC announcements,” *American Economic Review*, 111(4), 1092–1125.

——— (2023): “The unequal economic consequences of carbon pricing,” Discussion paper, National Bureau of Economic Research.

KRISHNAMURTHY, A., AND A. VISSING-JORGENSEN (2011): “The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy,” *Brookings Papers on Economic Activity*.

MACKINLAY, A. C. (1997): “Event studies in economics and finance,” *Journal of economic literature*, 35(1), 13–39.

NAKAMURA, E., AND J. STEINSSON (2018): “High-frequency identification of monetary non-neutrality: the information effect,” *The Quarterly Journal of Economics*, 133(3), 1283–1330.

RAMEY, V. A. (2011): “Identifying government spending shocks: It’s all in the timing,” *The Quarterly Journal of Economics*, 126(1), 1–50.

ROMER, C. D., AND D. H. ROMER (1989): “Does monetary policy matter? A new test in the spirit of Friedman and Schwartz,” *NBER macroeconomics annual*, 4, 121–170.

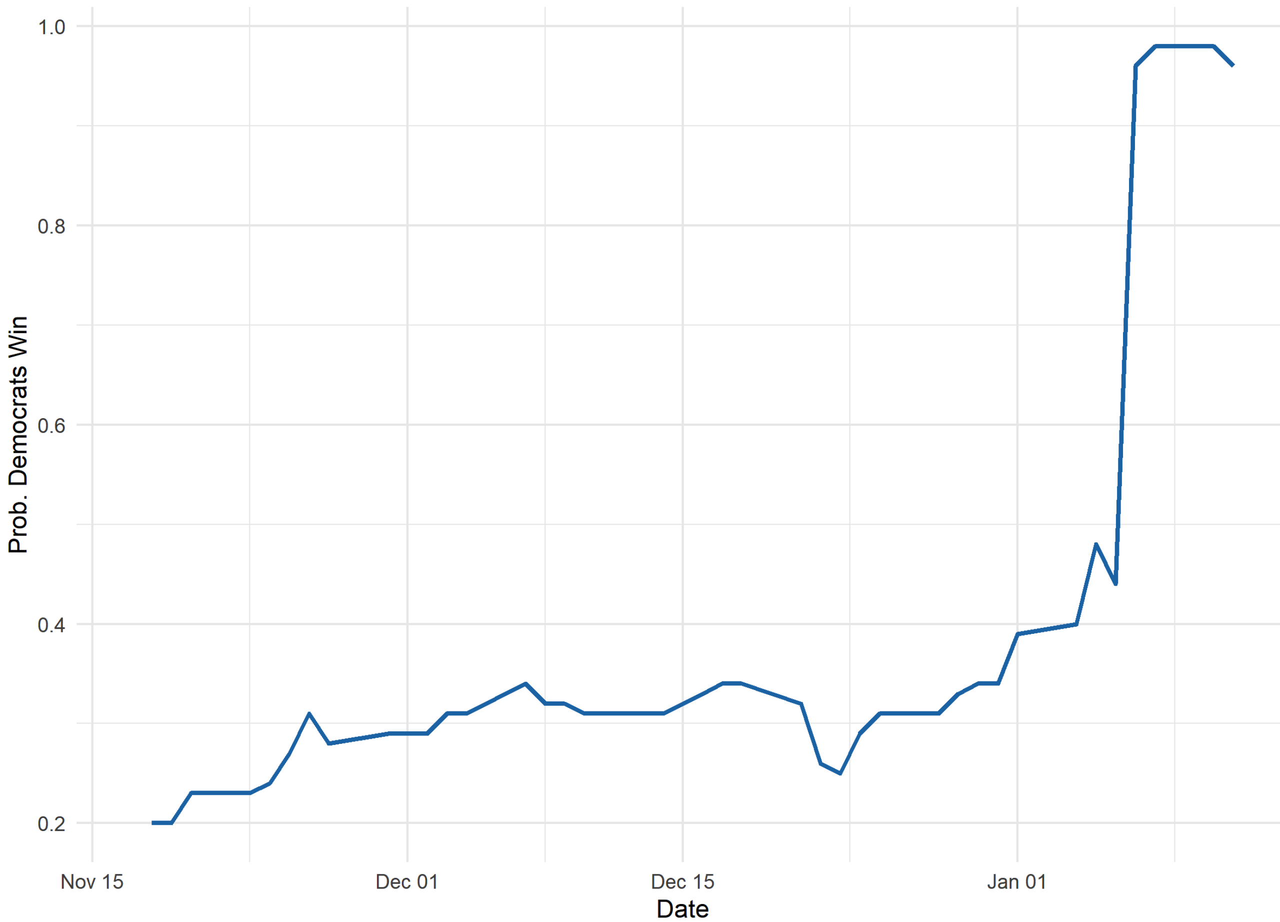
——— (2010): “The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks,” *American Economic Review*, 100(3), 763–801.

SARGENT, T. J., AND N. WALLACE (1981): “Some unpleasant monetarist arithmetic,” *Federal reserve bank of minneapolis quarterly review*, 5(3), 1–17.

Appendix—For Online Publication

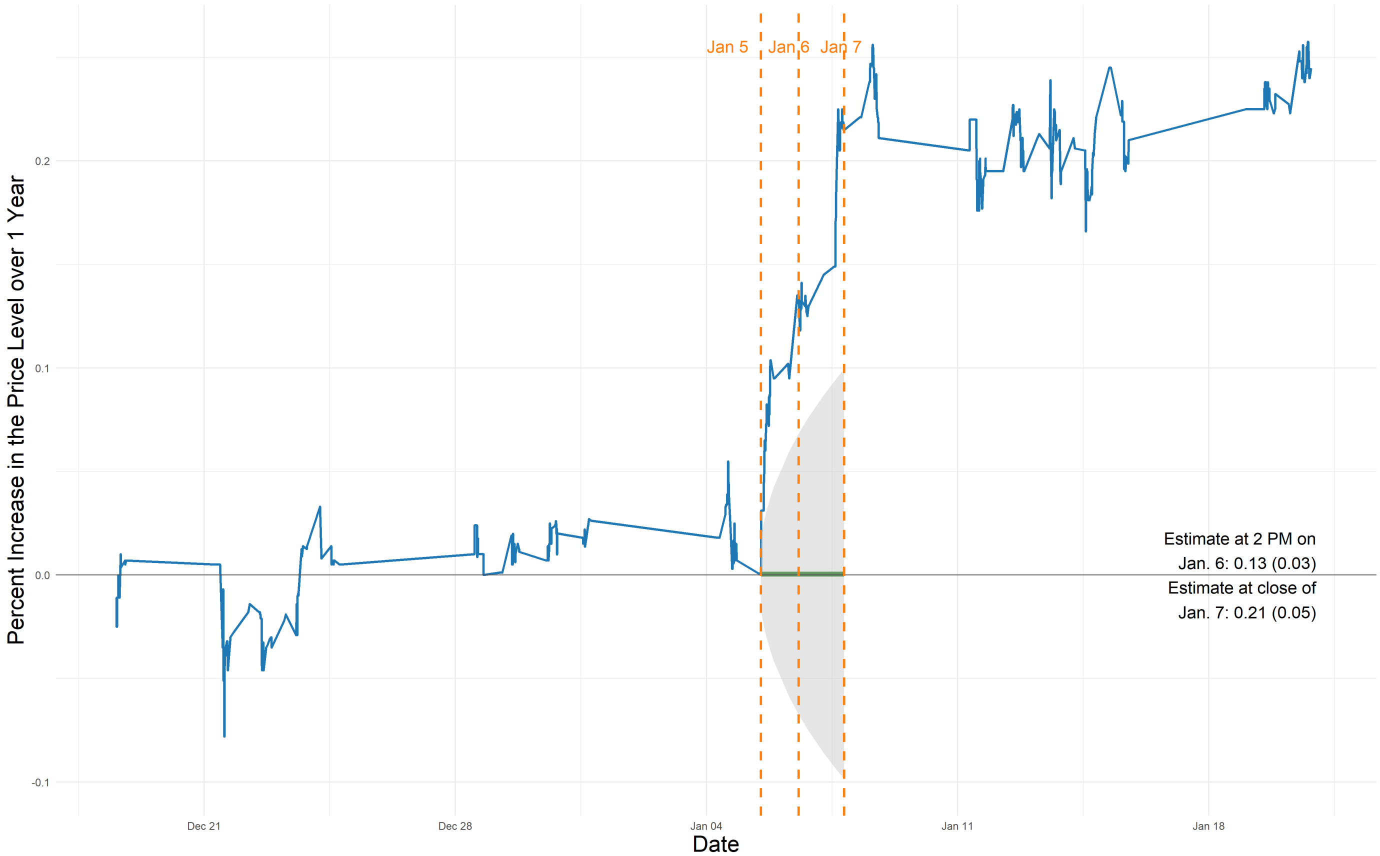
A Additional Figures

Figure 1: Daily Probability that Democrats Win Senate Election



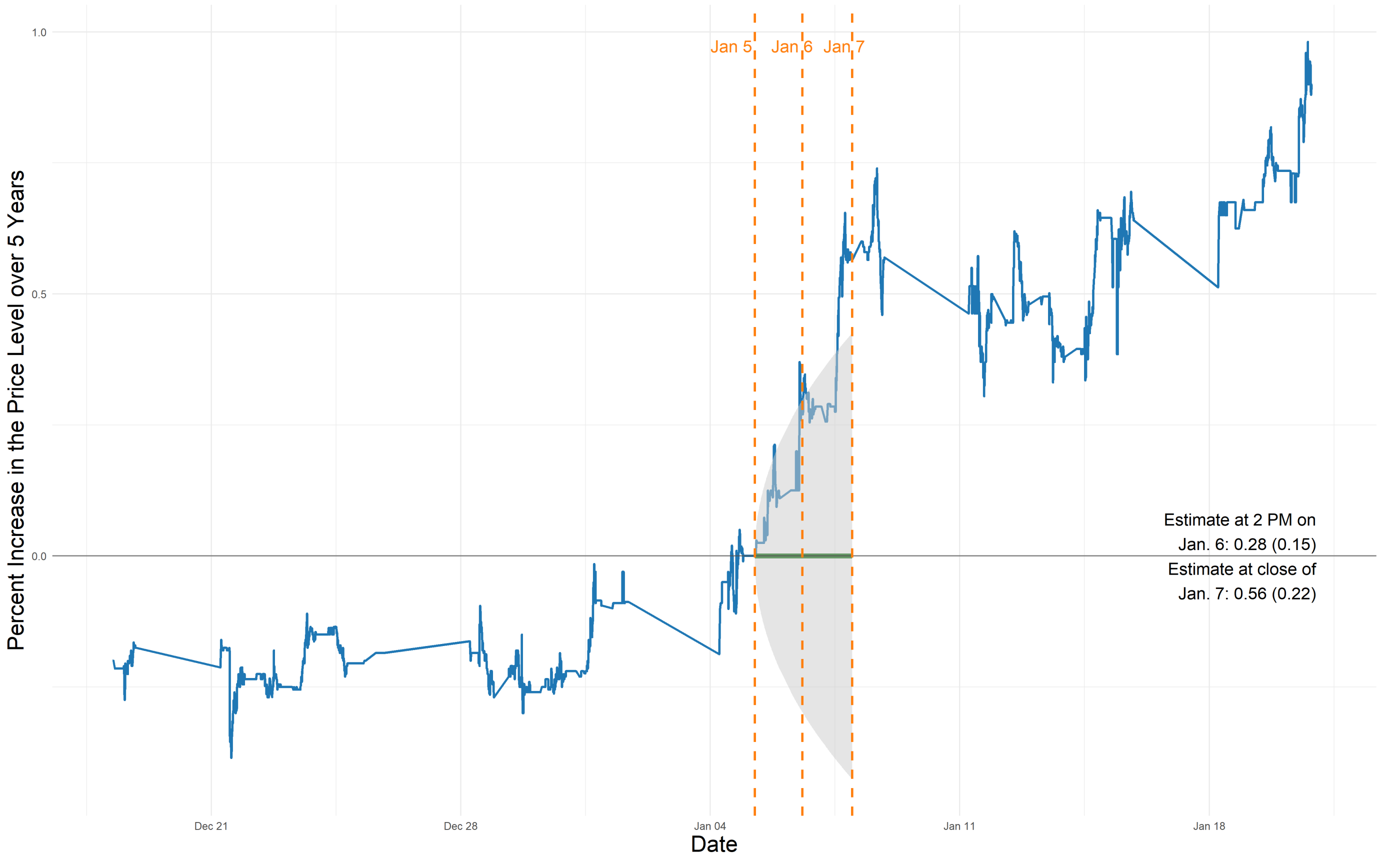
Notes: this graph plots the end-of-day perceived probability that Democrats will win both Georgia senate election seats, and hence gain the overall senate majority, according to end-of-day data from PredictIt's betting markets.

Figure 2: Expected Price Level Growth Over 1 Year from Intraday Inflation Swaps



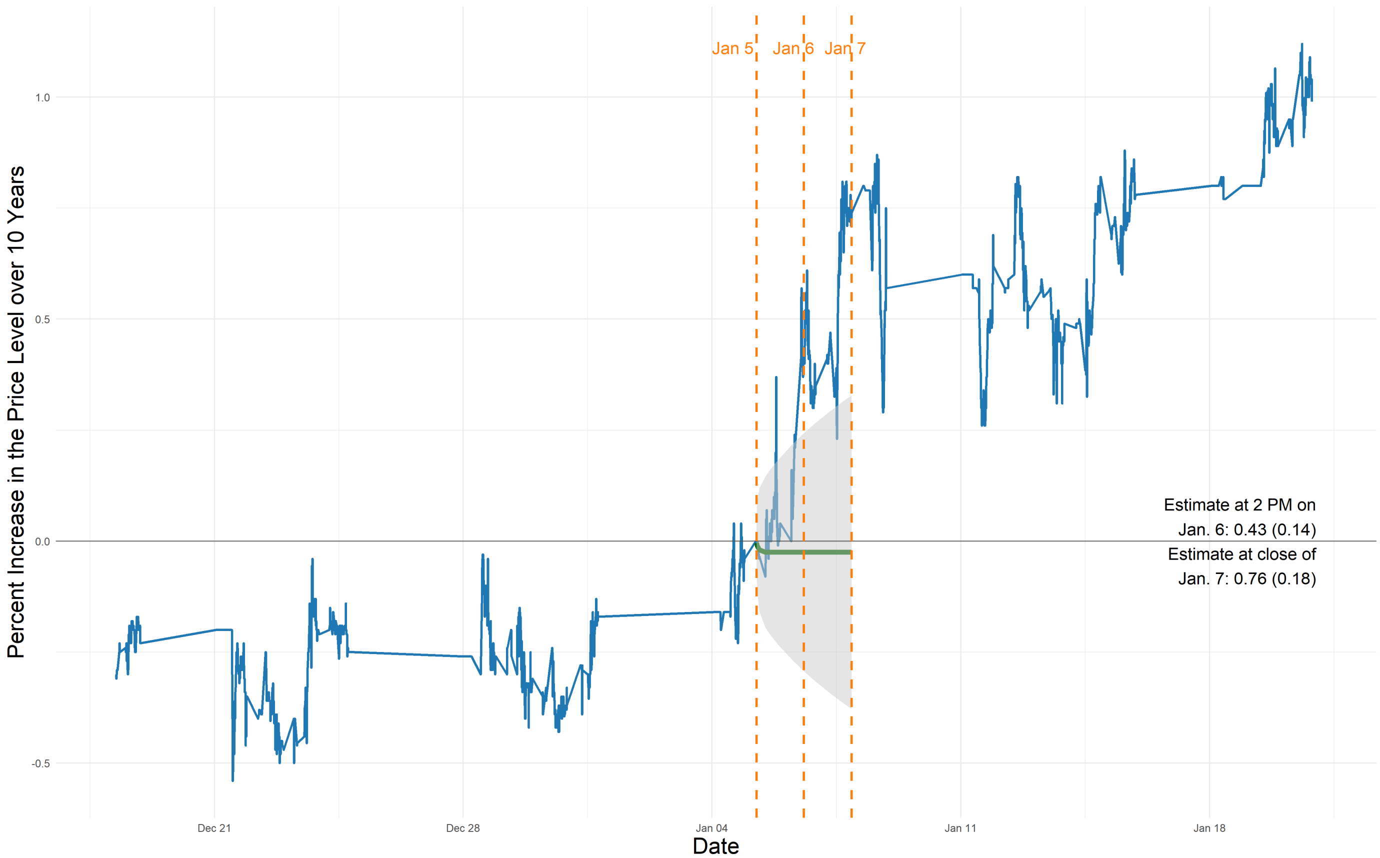
Notes: this graph plots the expected increase in the price level over one year, according to zero coupon inflation swaps from Bloomberg. The data are normalized so that the first observation on January 5th has a value of zero. The first vertical orange line denotes the first value on January 5th, the second vertical orange line denotes the value at 2 PM on January 6th, and the final vertical orange line denotes the last value on January 7th. The solid green line indicates the forecast of inflation swaps according to an ARIMA model estimated on the prior data only, the shaded area is the uncertainty associated with this forecast. The estimates and standard errors are calculated from the difference between actual data and the ARIMA forecast. The data is from December 18th to January 20th, reported at 10 minute frequency. Dashed lines indicate missing data due to weekends or public holidays.

Figure 3: Expected Price Level Growth Over 5 Years from Intraday Inflation Swaps



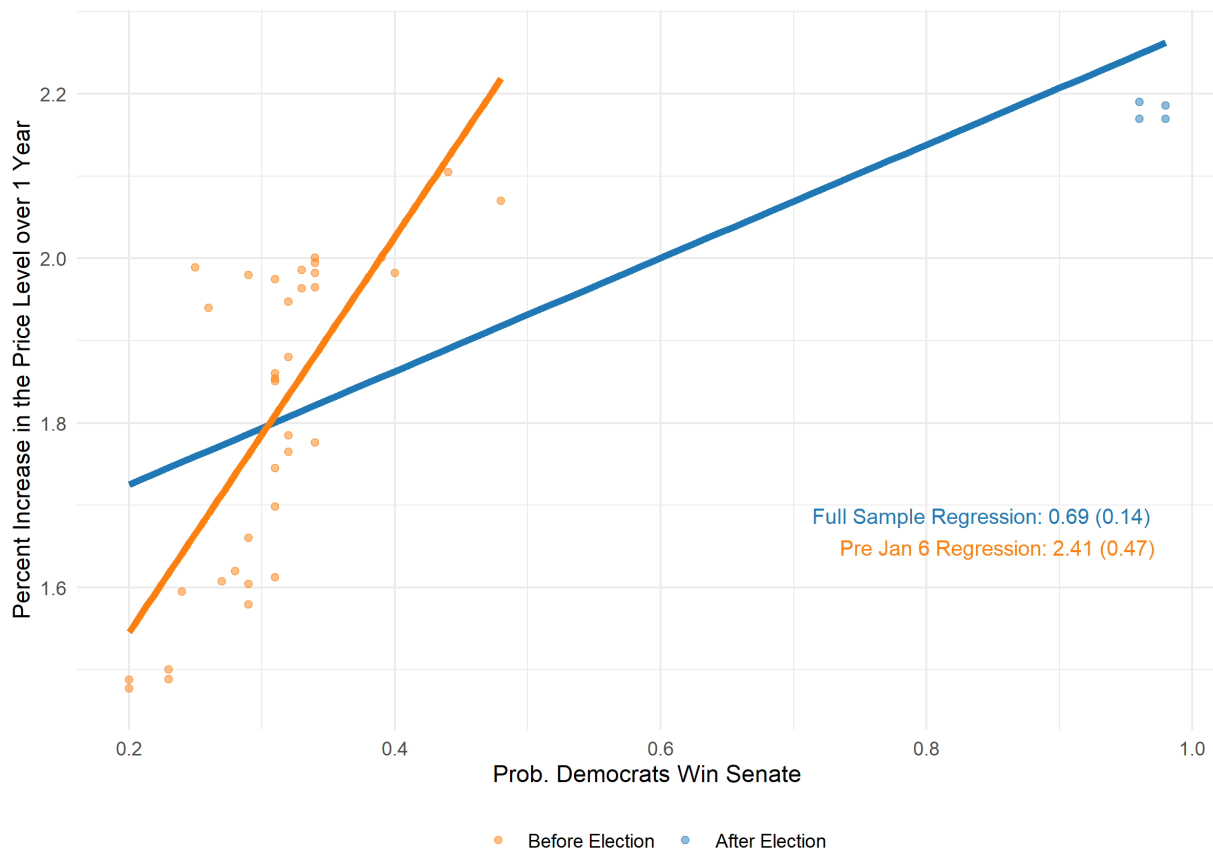
Notes: this graph plots the expected increase in the price level over five years, according to zero coupon inflation swaps from Bloomberg. The data are normalized so that the first observation on January 5th has a value of zero. The first vertical orange line denotes the first value on January 5th, the second vertical orange line denotes the value at 2 PM on January 6th, and the final vertical orange line denotes the last value on January 7th. The solid green line indicates the forecast of inflation swaps according to an ARIMA model estimated on the prior data only, the shaded area is the uncertainty associated with this forecast. The estimates and standard errors are calculated from the difference between actual data and the ARIMA forecast. The data is from December 18th to January 20th, reported at 10 minute frequency. Dashed lines indicate missing data due to weekends or public holidays.

Figure 4: Expected Price Level Growth Over 10 Years from Intraday Inflation Swaps



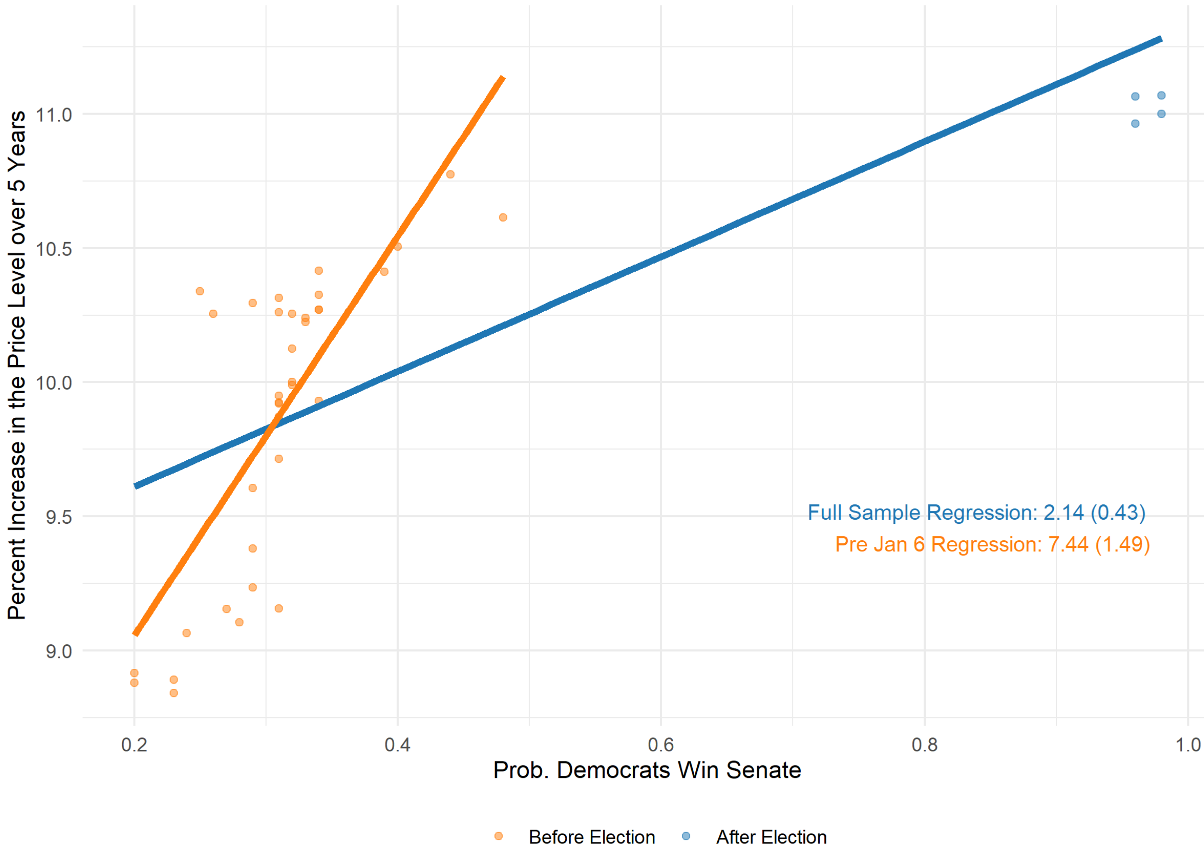
Notes: this graph plots the expected increase in the price level over ten years, according to zero coupon inflation swaps from Bloomberg. The data are normalized so that the first observation on January 5th has a value of zero. The first vertical orange line denotes the first value on January 5th, the second vertical orange line denotes the value at 2 PM on January 6th, and the final vertical orange line denotes the last value on January 7th. The solid green line indicates the forecast of inflation swaps according to an ARIMA model estimated on the prior data only, the shaded area is the uncertainty associated with this forecast. The estimates and standard errors are calculated from the difference between actual data and the ARIMA forecast. The data is from December 18th to January 20th, reported at 10 minute frequency. Dashed lines indicate missing data due to weekends or public holidays.

Figure 5: Expected Price Level Growth over 1 Year and Probability of Democrat Senate Win



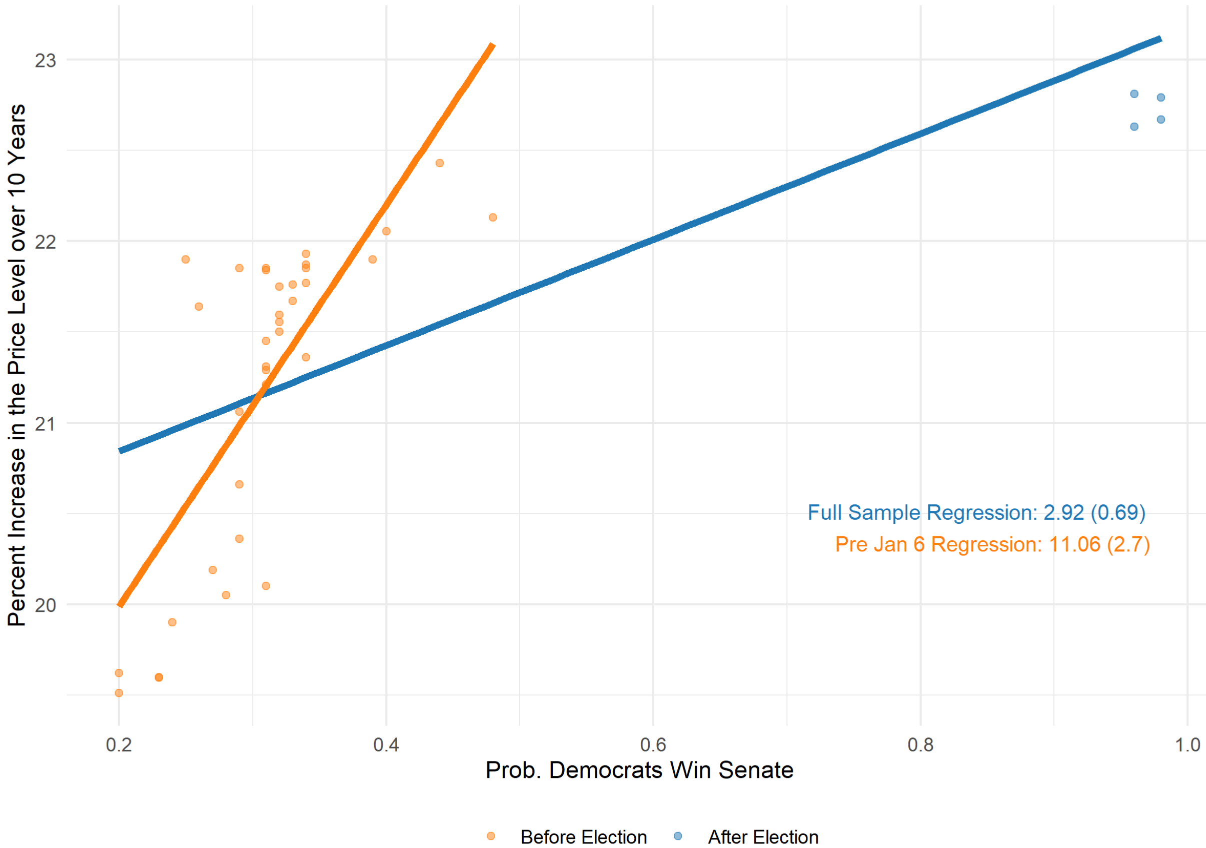
Notes: this graph relates the expected price level increase over one year to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon inflation swaps data from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 6: Expected Price Level Growth over 5 Years and Probability of Democrat Senate Win



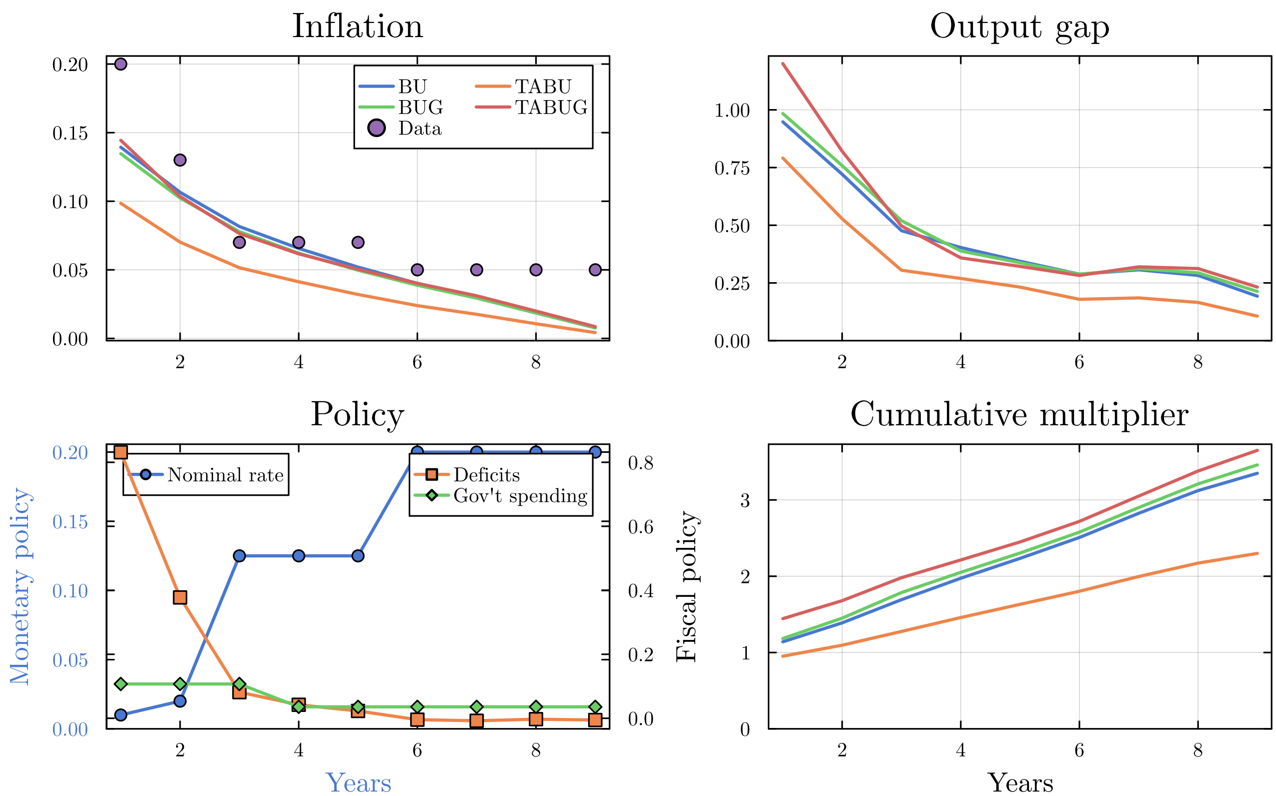
Notes: this graph relates the expected price level increase over five years to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon inflation swaps data from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 7: Expected Price Level Growth over 10 Years and Probability of Democrat Senate Win



Notes: this graph relates the expected price level increase over ten years to the lagged probability that Democrats win the Senate. The sample period is November 17th 2020 to January 12th 2021. We use end-of-day zero coupon inflation swaps data from Bloomberg, and the end-of-day probability that Democrats win the Senate, from PredictIt betting markets data. Each dot is a single observation, in orange before the January 5th election, and in blue after the January 5th election. The orange line is fit only to data before January 6th, whereas the blue line is fit to the whole sample. In the graph we report the associated coefficient estimates, and Newey-West standard errors with three lags.

Figure 8: Impulse Response to Georgia Shock—Model Extensions



Notes: this studies the impulse response of model variables to a shock calibrated to match the properties of the fiscal impulse from the Georgia shock. We calibrate the model as discussed in the text and feed in the path of nominal interest rates implied by the event study. BU denotes the baseline model from the text, BUG denotes the baseline model with the addition of government spending, TABU denotes a two agent BU model, where a share of the agents are hand to mouth, and TABUG is the BU model with both hand to mouth agents and government spending. The top left panel shows inflation predicted by the model and in the data. The top right panel shows the output gap. The bottom left panel shows interest rates—taken from the data—and the path of deficits relative to GDP. The final panel shows the cumulative government spending multiplier, calculated as the cumulative response of output to the fiscal impulse from the Georgia shock.