Regional Dissent: Local Economic Conditions Influence FOMC Votes*

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U.S. monetary-policy decisions are made by the 12 voting members of the Federal Open Market Committee (FOMC). Seven of these members, coming from the Federal Reserve Board of Governors, inherently represent national-level interests. The remaining five members, a rotating group of presidents from the 12 Federal Reserve districts, come instead from sub-national jurisdictions. Does this structure have relevant implications for the monetary policy-making process? In this paper, we first build a panel dataset on economic activity across Fed districts. We then provide evidence that regional economic conditions influence the voting behavior of district presidents. Specifically, a regional unemployment rate that is one percentage point higher than the U.S. level is associated with an approximately nine percentage points higher probability of dissenting in favor of looser policy at the FOMC. This result is statistically significant, robust to different specifications, and indicates that the regional component in the structure of the FOMC could matter for monetary policy.

JEL codes: E32, E52, E58, E61.

Keywords: Monetary Policy, FOMC, Regional Economic Conditions, Taylor Rule.

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1 Introduction

The Federal Reserve System is composed of a Board of Governors in Washington D.C. and 12 Federal Reserve districts (see Figure 1 for a map of the System). The System is responsible for upholding the dual mandate of price stability and full employment in the nation. To do so, the Federal Reserve Open Market Committee (FOMC) which consists of 19 members, determines the best course of action for monetary policy. Seven members, including the Chair, come from the Board of Governors. They are nominated by the President of the United States, confirmed by the Senate, and have voting rights at every FOMC meeting. The remaining 12 members are the presidents of the Federal Reserve districts.[1] The FOMC employs a scheme where all district presidents participate in discussions but only five out of the 12 vote on monetary policy matters in any given year according to a rotating schedule. The Federal Reserve Bank of New York votes every year, Chicago and Cleveland vote every other year, and the other nine districts vote every three years.

In this paper, we investigate whether the rotating, regional component in the FOMC's voting structure has implications for monetary-policy decisions. To answer this question, we proceed in three steps. First, we construct a panel dataset of economic activity and FOMC voting across the 12 Federal Reserve districts. Second, we use our dataset to document how voting power scaled by population or economic activity has evolved across districts over time. Finally, we examine whether local economic conditions influence the voting behavior of district presidents. In brief, we run a district-level Taylor-rule-like specification where the decision of district presidents to dissent for looser or tighter policy at the FOMC is regressed on district-level inflation and unemployment. In what follows, we describe each of these steps in further detail, along with our main results and the related literature.

Section 2 describes our data construction process. Federal Reserve districts are not necessarily divided along state lines. Specifically, there are 14 states that belong to more

[1] The process for selecting the president of a Fed district is set forth in the Federal Reserve Act. Subject to the approval of the Federal Reserve Board of Governors, the president is appointed by the respective Reserve Bank's Class B and C directors (those directors who are not affiliated with a supervised bank entity).

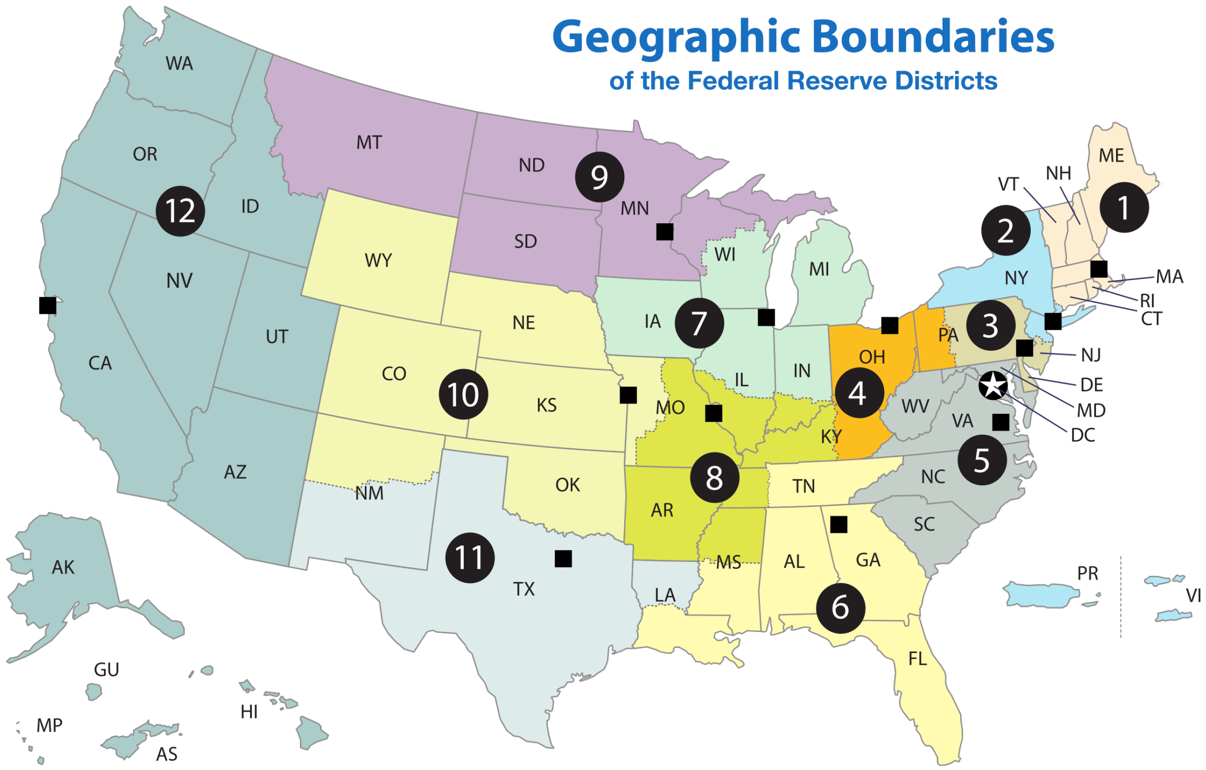

Figure 1: Map of the Federal Reserve System

Notes: Map of the geographic boundaries of the Federal Reserve System. The star depicts the Federal Reserve Board of Governors in Washington D.C. A black square indicates the location of a given district's headquarter office. The districts are as follows: 1-Boston, 2-New York, 3-Philadelphia, 4-Cleveland, 5-Richmond, 6-Atlanta, 7-Chicago, 8-St. Louis, 9-Minneapolis, 10-Kansas City, 11-Dallas, 12-San Francisco. Image taken from Wikipedia, produced by Chris N. Houston, and shared under a creative commons license.

than one Fed district. Consequently, we must construct macro variables from county-level data (when possible) and aggregate these county observations to the Fed-district level. We obtain county-level labor-force data from the Local Area Unemployment Statistics program of the Bureau of Labor Statistics (BLS) which provides monthly labor force statistics for U.S. counties starting in 1990. We obtain non-tradable inflation data from Hazell et al. (2022). These authors construct state-level non-tradable inflation series for the majority of U.S. states using non-public micro-price data that the BLS collects for the purpose of constructing the CPI. We obtain FOMC voting data from Thornton et al. (2014), which presents a record of dissents on monetary policy votes. We collect the presidents' dissents related to tighter and looser policy and encode them as an indicator of agreement with the policy proposed by the Fed Chair: 0 indicates agreement, -1 indicates a dissent in favor of tighter policy, and 1 indicates a dissent in favor of looser policy.

Our final dataset is a panel across Fed districts and FOMC meetings between 1990 and 2017. There are eight scheduled FOMC meetings a year, so we have a total of 224 scheduled meetings in our sample. Excluding New York, which never dissents during our sample period, there are four other districts that vote each meeting. Therefore, we have 896 votes by non-New-York Fed district presidents during scheduled meetings in our sample. Out of these 896 votes, there are 72 dissents in favor of tighter policy and 17 in favor of looser policy.

Section 3 describes how voting shares differ across the 12 districts and how voting shares scaled by population or economic activity have evolved. Over time, the disparities in voting power relative to population or economic activity across the district banks have changed. When the Federal Reserve System was founded, the San Francisco Fed had more representation in monetary policy (relative to population) than all but the New York, Minneapolis, and Dallas Feds. Today, the San Francisco Fed is the least represented district, with its FOMC voting share being less than a third than what would be warranted by its population. Given the disparities in voting power, if district presidents' votes reflect the economic conditions of their own district, then monetary policy may be biased towards achieving the dual mandate in the over-represented districts.

Section 4 presents the analysis of how local economic conditions influence votes at the FOMC. To study this issue, we run regressions in the spirit of a Taylor rule, where the dissent variable for a voting district president in a given FOMC meeting is regressed on local economic conditions including district unemployment and non-tradable inflation as well as on a rich set of fixed effects. The coefficient on non-tradable inflation is insignificant; however, the sign is in the expected direction. Greater non-tradable inflation in a district implies that its president is more likely to dissent in favor of tighter policy.[2] More importantly, the coefficient on unemployment goes in the expected direction and is economically and statistically significant. A one percentage point higher district unem-

[2] Our specification is symmetric, so this also implies that the president of a district with lower non-tradable inflation is more likely to dissent in favor of looser policy.

ployment increases the probability of dissenting in favor of looser policy at the FOMC by roughly 9.2 percentage points. This is conclusive evidence that district presidents do not base their voting decisions solely on national-level evidence. However, we do not take a stand on the cause of this bias. For example, presidents may have better information about their own district's economy and extrapolate this information to their beliefs about the nation's economy, or they may be partial towards their own district.

We perform a battery of robustness checks. First, we include different sets of fixed effects: just time fixed effects, time and district fixed effects, or time and president fixed effects. This does not alter our conclusions. We also include unscheduled FOMC meetings, include the NY Fed, use overall inflation instead of non-tradable inflation, lag the inflation variable, or vary the way we compute standard errors (adding more lags in a Driscoll-Kraay specification), without significant changes in the findings. Importantly, we also allow different responses of dissent to local economic conditions during and after the chairmanship of Alan Greenspan. During Greenspan's era, the coefficient on unemployment had approximately half the magnitude (5.6 instead of 9.2) and was non-significant. After his era, the coefficient increases (to approximately 13.3) and becomes very significant. As detailed below, this corresponds well with a notion in the literature that under Chairman Greenspan other FOMC members rarely used their votes to express dissent with the proposed policies.

The role of local economic conditions in the FOMC's decision-making process has been the subject of a small but growing literature. Early studies showed that local economic variables did not seem to impact the votes of district presidents at the FOMC. One of the first studies in this field, Tootell (1991), showed that regional economic performance had little to no effect on the voting patterns of district presidents from 1965 to 1985. Tootell argued that regional presidents were more concerned with maintaining their reputation and credibility as national policymakers than with pursuing parochial interests. Likewise, Jung and Latsos (2015) used forward-looking Taylor-type rules to estimate FOMC members' implicit policy reaction functions based on their observed votes and found that few presidents exhibited regional biases in their voting record during the Greenspan era.

Studies that examined FOMC members' spoken words, rather than votes, have challenged the conclusion that district conditions do not affect policy opinions. For instance, Meade and Sheets (2005) used FOMC transcripts rather than voting records to measure voiced dissent at FOMC meetings. They found that FOMC members reacted to local inflation measures, especially during periods of high inflation uncertainty. Hayo and Neuenkirch (2013) used a probit model with regional and national macroeconomic variables to explain the content of Federal Reserve president speeches. The authors found that district presidents put relatively more weight on regional information when speaking within their home districts than when speaking outside of their home districts.

With more recent data, some papers have started to find that local economic conditions might indeed influence FOMC votes. Eichler et al. (2018) uses forward-looking Taylor-type rules with regional bank stability as an additional variable and finds that regional bank stability had a large statistically significant effect on FOMC members' interest rate votes during Yellen's term (2014–2018). Coibion and Goldstein (2012) find that dispersion in economic conditions (especially unemployment) across Fed districts matters for the setting of interest rates at the FOMC due to the non-linearity of regional Phillips curves. However, they find no evidence that the relationship between interest rate decisions and regional heterogeneity is driven by FOMC members voting based on their regions of origin. The paper most closely related to ours is Fos and Xu (2023). Among other results, these authors find that district presidents cast dissenting votes at the FOMC based partly on economic conditions in their districts.

The main differences between Fos and Xu (2023) and our paper are fourfold. First, as a measure of economic activity, Fos and Xu (2023) use quarterly personal income growth at the state level, so aggregation to Fed districts is imperfect. In contrast, we use monthly unemployment at the county level, which allows clean aggregation to the Fed-district level and provides a higher-frequency measure of economic activity. Unemployment also has the advantage of being related directly to one of the two pillars of the Fed's dual mandate (full employment and price stability). Second, as their baseline measure of inflation, Fos and Xu (2023) use overall inflation from the BLS for the most populous Metropolitan Statistical Area (MSA) in a Fed district, while we use non-tradable state-level inflation from Hazell et al. (2022) and aggregate that to the Fed-district level using population weights.[3] Third, the regression specification in our paper includes dissents for looser and tighter symmetrically (coded as 1 and -1 respectively), while Fos and Xu (2023) study either dissent regardless of direction, or dissents for tighter and easier separately.[4] Finally, in terms of results, we find that inflation is not statistically significant for driving dissent at the FOMC while unemployment is statistically and economically significant. By contrast, Fos and Xu (2023) find that inflation is significant in their specification without direction of dissent, but no variables are significant at the 10% level in their separate specifications for tighter and looser indicators. The differences in results are due to different sample periods, variable construction, and regression specification.

The literature has also proposed that FOMC chairs may amplify or dampen the effect of local economic conditions on policy preferences depending on their leadership style and communication strategy. Dominant leaders such as Greenspan may reduce the impact of local economic conditions by pressuring other members to follow their views. More open leaders such as Bernanke, Yellen, or Powell may increase the impact of local economic conditions by allowing more diversity in opinions and dissent among other members. This is consistent with our finding in Section 4 that the impact of economic conditions on dissent at the FOMC increases substantially after Greenspan's period.

Overall, the literature suggests that the influence of local economic conditions on FOMC decisions has historically been present in policy discussions, speeches, and general forms of voiced policy preference. We complement the literature by providing evidence that unemployment at the local level matters for the voting records of regionally-affiliated FOMC participants. Moreover, we find evidence in support of strong leadership effects during the Greenspan era, suggesting that only the recent voting record allows a researcher to pick up the significance of local unemployment on FOMC dissents.

[3] The data from Hazell et al. (2022) has the benefit of including more cities than what the BLS publishes directly, not imputing missing prices from other cities (which might belong to a different Fed district), and providing a measure of non-tradable inflation which is more representative of local economic conditions than overall inflation (a large component of which is tradable). In a robustness check, Fos and Xu (2023) use inflation from Hazell et al. (2022) aggregated to the district (either using the district's main state or using population weights) to assess the effects of voting districts' economic conditions on the change on the interest rate. However, they only use overall inflation rather than non-tradable inflation and do not use this measure when assessing FOMC voting behavior (our main outcome of interest).

[4] This refers specifically to columns (4) to (6) of Table 4 in Fos and Xu (2023), which are the closest to our baseline specification, including time fixed effects and president fixed effects.

2 Institutional Details and Data

The FOMC was formed by the Banking Act of 1933, granting voting rights exclusively to Fed district presidents. The Banking Act of 1935 revised these protocols to include the Board of Governors and closely resembles the organization of the present-day FOMC. The final changes were instituted in 1942 to give the structure of 12 voting members with the current rotation scheme. As defined by 12 U.S.C. § 263, the President of the New York Fed acts as the vice-chair of the FOMC and votes in every meeting. The historic economic significance of the Ohio River Valley and the manufacturing and transportation hub of Chicago resulted in the Cleveland and Chicago Feds' participation in FOMC votes every other year. The remaining nine districts vote in a rotation, with any given district issuing votes one year out of every three. Besides participating in the FOMC discussions, non-voting district presidents act as alternate votes in the rare case of absent voting presidents.

Federal Reserve districts are not necessarily divided along state lines, some states are split between two different Fed districts. There are 14 states that belong to more than one Fed district, they are the following: Connecticut (Districts 1 and 2), Illinois (7 and 8), Indiana (7 and 8), Kentucky (4 and 8), Louisiana (6 and 11), Michigan (7 and 9), Mississippi (6 and 8), Missouri (8 and 10), New Jersey (2 and 3), New Mexico (10 and 11), Pennsylvania (3 and 4), Tennessee (6 and 8), West Virginia (4 and 5), and Wisconsin (7 and 9). Every Fed district, except for the San Francisco Fed (District 12), contains partitioned states. Consequently, we must construct macroeconomic variables from county-level data (when possible) and aggregate these county observations to the Fed-district level.

We obtain county-level labor-force data from the Local Area Unemployment Statistics program of the BLS. This dataset provides monthly labor force statistics (total number of people employed, unemployed, and in the labor force) for U.S. counties starting in 1990. We aggregate the labor force statistics to the Fed-district level and then construct the unemployment rate by dividing the total number of unemployed people in a district by the number of people in the labor force in that same district.

We obtain inflation data from Hazell et al. (2022). These authors construct quarterly state-level inflation series for the majority (35 out 50) of U.S. states. They do so for an overall category, as well as for tradable and non-tradable subcategories. The authors use non-public micro-price data that the BLS collects for the purpose of constructing the CPI. The sample period is 1978 to 2017 (with a 26-month gap in 1986–1988 due to missing micro-data). Importantly, the authors do not impute missing-price observations using inflation rates calculated for other sectors or regions. We aggregate the state-level price changes of Hazell et al. (2022) to the Fed-district level. To do so, we weigh each state's inflation by the share of a district's labor force that it represents. This approach allows us to account for states that are split across Fed districts.[5]

Each Fed district contains at least two states with available inflation data in the Hazell et al. (2022) dataset (and the average Fed district contains roughly four states with available inflation data). A common approach in the literature for measuring local inflation is to aggregate BLS U.S. city-level CPI indices to the Fed-district level. We prefer using the Hazell et al. (2022) inflation data over the common approach, in part, due to greater coverage. The Hazell et al. (2022) state-level CPI data includes census areas such as Portland, Oregon; Pittsburgh, Pennsylvania; Columbus, Ohio; and Oklahoma City, Oklahoma; among others, for which the Census Bureau does not publish price series. Additionally, as mentioned above, Hazell et al. (2022) do not impute missing-price observations in a given city or state using inflation rates calculated for other cities or states. However, the Hazell et al. (2022) data is quarterly, while our unemployment data and FOMC meeting dissent data is at the monthly frequency. We assign the quarterly inflation in the Hazell et al. (2022) dataset to all months in that quarter (which will typically cover two FOMC meetings). In our empirical specifications, we sometimes lag the inflation data to account for the fact that the inflation of a given quarter is usually not known

[5]As an example, the Cleveland Fed contains the entire state of Ohio as well as parts of Pennsylvania, Kentucky, and West Virginia. Out of these four states, only Ohio and Pennsylvania have inflation data available in the Hazell et al. (2022) dataset. In the first quarter of 1990, Ohio had an inflation of 2.97% in the Hazell et al. (2022) dataset and Pennsylvania had an inflation of 4.30%. In that quarter, the labor force in Ohio was 5 347 369, while the labor force in the part of Pennsylvania that belongs to the Cleveland Fed was 1 570 524 (even though the total labor force in Pennsylvania was 5 775 154). Therefore, the inflation that we calculate for the Cleveland Fed District in that quarter is $2.97\% \cdot 0.7729 + 4.30\% \cdot 0.2270 = 3.276\%$. This method of constructing inflation at the district level is not necessarily representative, because some states have no data in the Hazell et al. (2022) dataset (i.e., Kentucky and West Virginia in the previous example), but this approach is still the most appropriate one given data constraints. Using population, instead of labor force, for the weighting makes no qualitative difference for our results.

when monetary policy decisions are being taken in that quarter (although this makes little difference for our results).

Using the aforementioned data, we find that any given district's inflation and unemployment rate can differ significantly from the rest of the nation. As an example, Appendix Figure A.1 plots inflation and the unemployment rate from 1990 to 2022 for the San Francisco Fed District, in red, and for the rest of the United States, in blue. How the San Francisco Fed District is fairing economically compared to the rest of the United States changes at the business cycle frequency. For instance, the San Francisco Fed District saw a higher peak of the unemployment rate following the Great Recession and a slower recovery. Yet, during the COVID-19 recession the San Francisco Fed District and the nation has similar spikes and recoveries in the unemployment rate.

We source county-level population data for years 1970 to 2020 from IPUMS NHGIS (Manson et al., 2022) which, in turn, comes from the decennial U.S. census. Additionally, we supplement historical county-level population for years 1900-1960 directly from the Census. We obtain county-level GDP between 2001 and 2021 from the Regional Economic Accounts of the BEA. In terms of national variables, we obtain U.S. level CPI inflation (`CPIAUCSL`) and unemployment rate (`UNRATE`) from the Federal Reserve Bank of St. Louis' FRED database.

We obtain voting data from Thornton et al. (2014). This dataset lists the Federal Reserve Board Governors and district presidents who dissent from the policy proposed by the Fed Chair and categorizes the individual dissents as either being attributed to "tighter", "looser", or "other" justification. We collect the district presidents' dissents related to tighter and looser policy and encode them as an indicator of agreement with the proposed policy vote: -1 indicates a dissent in favor of tighter policy, 0 indicates agreement, and 1 indicates a dissent in favor of looser policy.

Our final dataset is a panel across Fed districts and FOMC meetings between 1990 and 2017. There are eight scheduled FOMC meetings a year, so we have a total of 224 scheduled meetings in our sample. There are also five unscheduled meetings, occurring on January 3rd 2001, April 18th, 2001, September 17th, 2001, January 21st, 2008, and October 7th, 2008.[6] There are two unscheduled meetings that occur before the first scheduled meeting of the corresponding year. Specifically, these are the ones on January 3rd, 2001 and January 21st, 2008. Interestingly, these meetings maintain the voting rotation of the preceding year (2000 and 2007, respectively), instead of utilizing the voting rotation of the calendar year when they occurred. For our baseline specification, we exclude unscheduled meetings, but we include them in some of our robustness checks, with no important consequences for any of our results.

The New York Fed President plays an important institutional role at the FOMC as the Vice-Chair. Excluding New York, which never dissents during our sample period, there are four remaining districts that vote each meeting. Therefore, multiplying the 224 meetings in our data by four gives 896 votes by non-New-York Fed district presidents during scheduled meetings in our sample. Out of these 896 votes, there are 72 dissents in favor of tighter policy and 17 dissents in favor of looser policy. The remaining 807 votes are therefore implicitly agreements with the action proposed by the Fed Chair.

3 Voting Shares and Economic Activity Across Districts

Due to the structure of FOMC voting, Fed districts have heterogeneous vote shares. Figure 2 displays the voting power of each Federal Reserve district as a share of the total voting power available to district presidents. Specifically, each FOMC meeting contains five votes by district presidents. Of those five votes, one comes from the New York Fed (because it votes every year), 0.5 votes come from each of Cleveland and Chicago (because each of them votes every other year), and 0.33 votes come from the remaining nine district presidents (because each of them votes every third year). As a result, the voting shares are 20% for New York, 10% (0.5 out of five) for Cleveland and Chicago, and 6.66% (0.33 out of five) for the remaining districts. The allocation of voting power across the regional banks of the Federal Reserve System does not necessarily correspond to the population or economic significance of the regions they represent, which may create a democratic

[6]These unscheduled meetings usually occur around big economic or geopolitical disruptions, like the dot-com crisis, the terrorist attacks of September 11, 2001, or the Global Financial Crisis of 2008/2009.

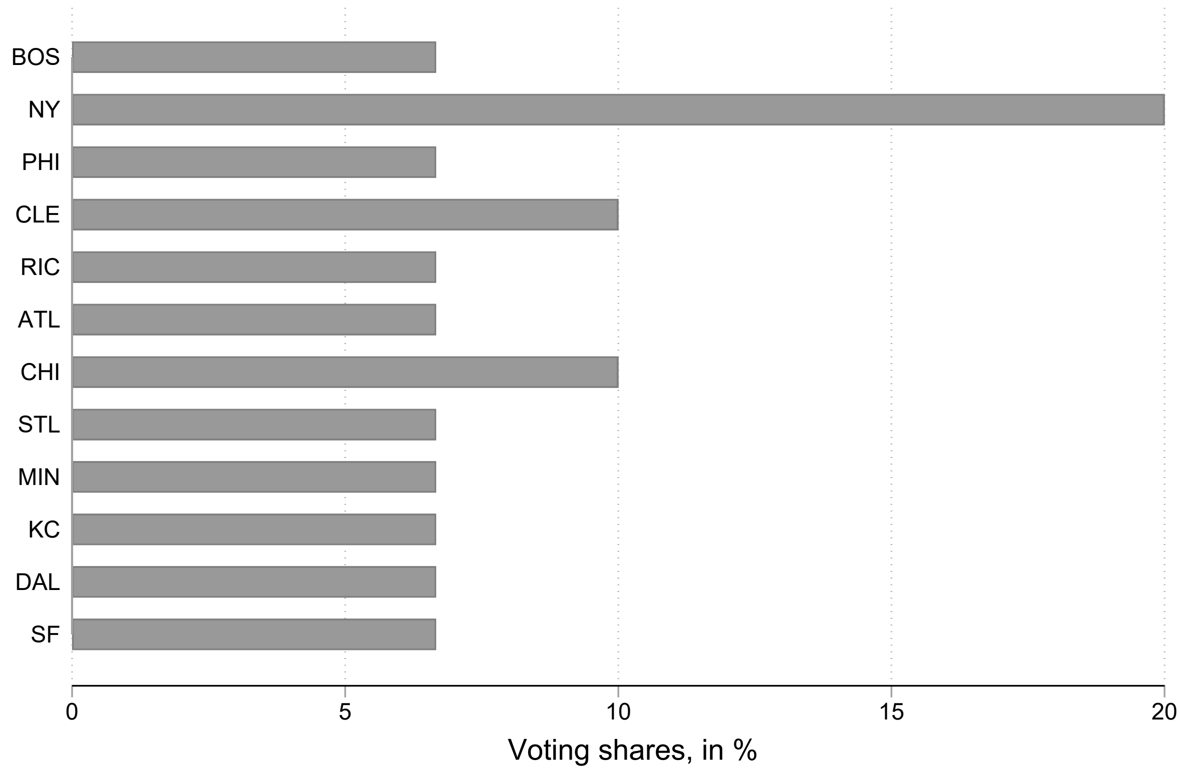

Figure 2: FOMC Voting Shares

Notes: This figure displays the distribution of district president voting power, as a fraction of the total voting power available to district presidents.

deficit in monetary policy decision-making.

Over time, the disparities in voting power relative to population across the regional Feds have evolved. Figure 3 shows the population share of each Federal Reserve district since 1900 in the top panel and the population-scaled voting share (i.e., the FOMC voting shares divided by the population shares) in the bottom panel. A value of one for the population-scaled voting share would indicate that a district has the same representation at the FOMC as would be warranted by its population. A value above one indicates over-representation at the FOMC, while a value below one indicates under-representation.

Note that district boundaries were set in 1914. When the Federal Reserve System was founded the San Francisco Fed had one of the highest representations in monetary policy relative to its population. Today, the San Francisco Fed is the least represented district, with a voting share that is just around a third of its population share. By contrast, the

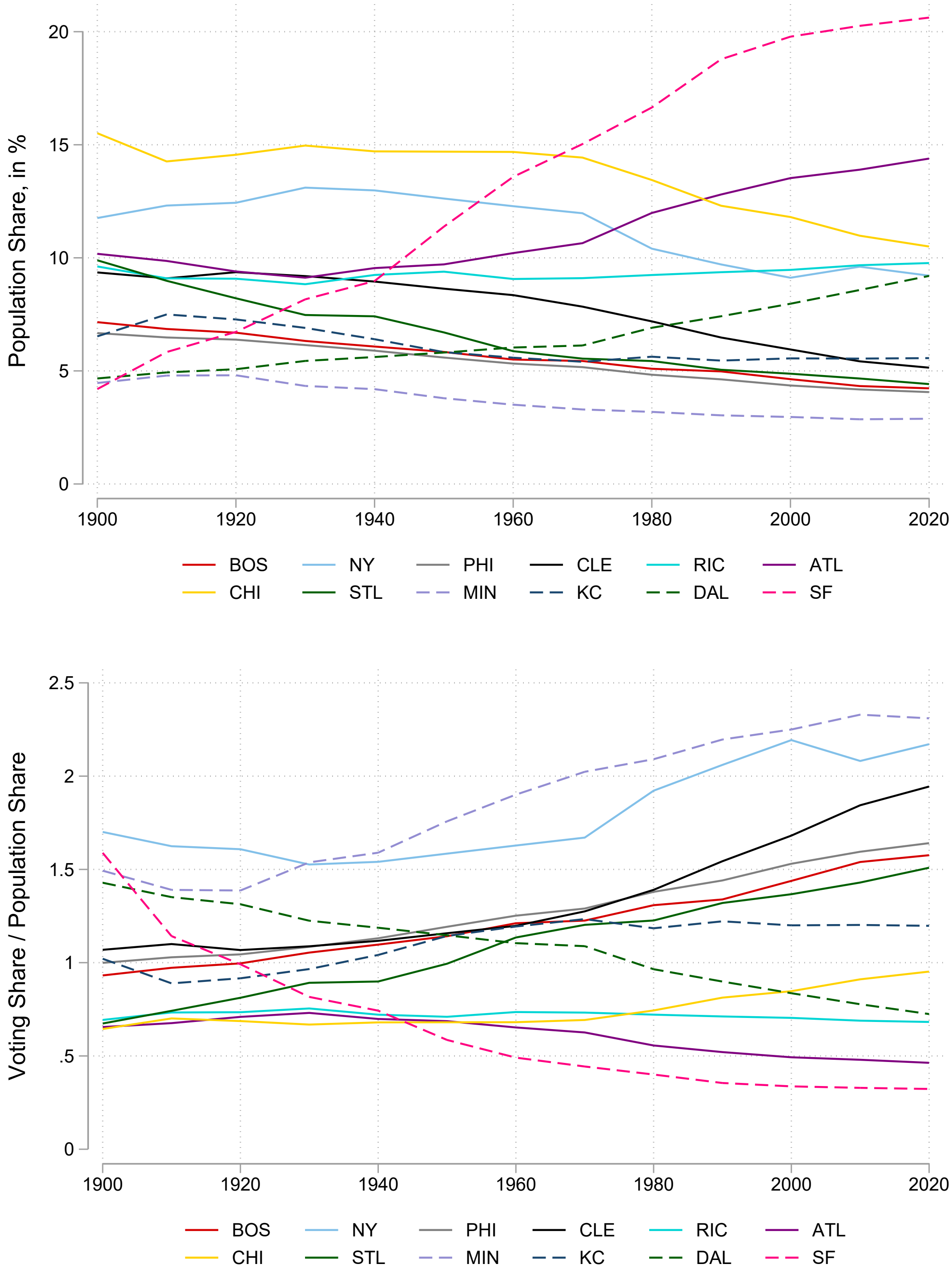

Figure 3: Evolving Representation of Federal Reserve Districts

Notes: The top panel displays how population shares across Federal Reserve districts have evolved between 1900 and 2020, with linear interpolations between census years. The bottom panel displays the voting shares at the FOMC shown in Figure 2 divide by the population shares shown in the top panel of this figure.

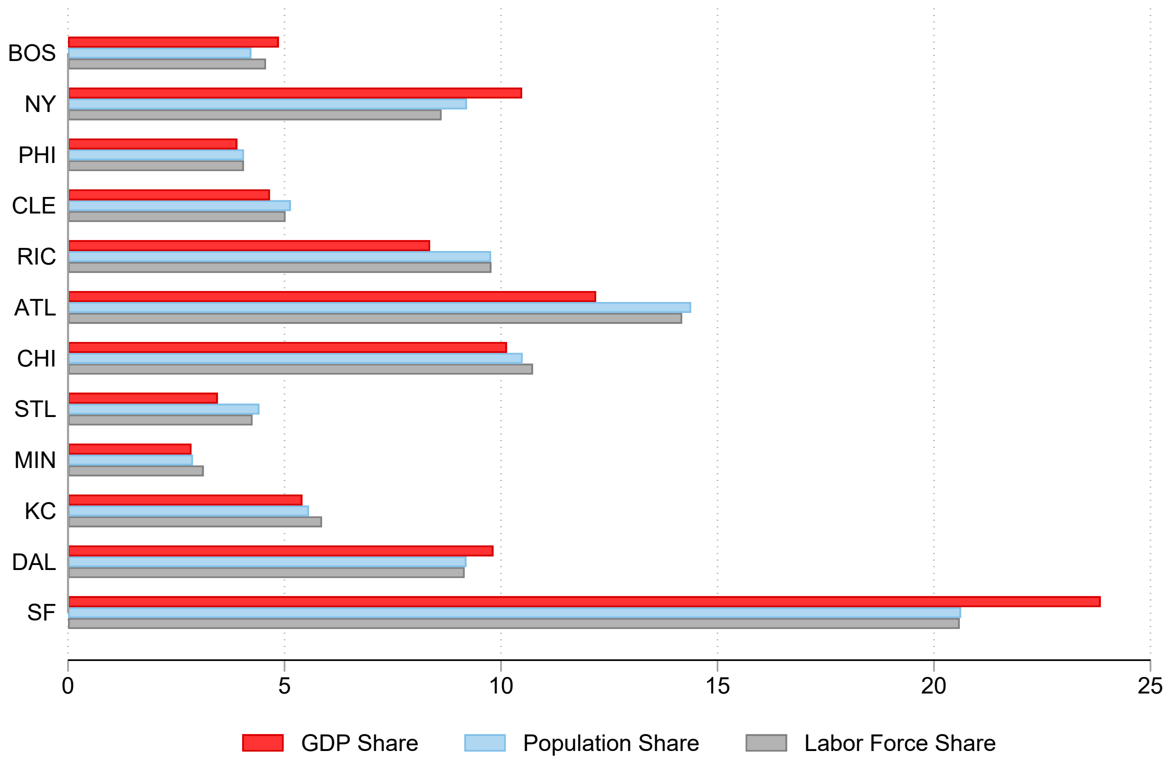

Figure 4: Economic and Population Shares of Fed Districts

Notes: This figure displays the shares of GDP, population, and employment that each of the 12 Federal Reserve districts accounted for in 2020 (population) or 2021 (GDP and employment).

Minneapolis Fed has a voting share that is more than double its population share.

Figure 4 shows the real GDP, employment, and population shares of each Fed district. Real GDP and employment are based on 2021 data; however, population figures are for 2020 which is a Census year and has more accurate population data by county. Figure 5 plots the voting share at the FOMC scaled by the shares of those variables in Figure 4. This provides an intuitive illustration of the current economic and popular representation of the Federal Reserve System. A value around two for the Cleveland Fed's voting share relative to its GDP share, for example, implies that the fourth District has twice as much voting power as would be expected by the District's share of GDP. Likewise, a value of 0.25 for the San Francisco Fed's voting share relative to its GDP share implies that the twelfth District has a quarter of the representation than would be expected by the

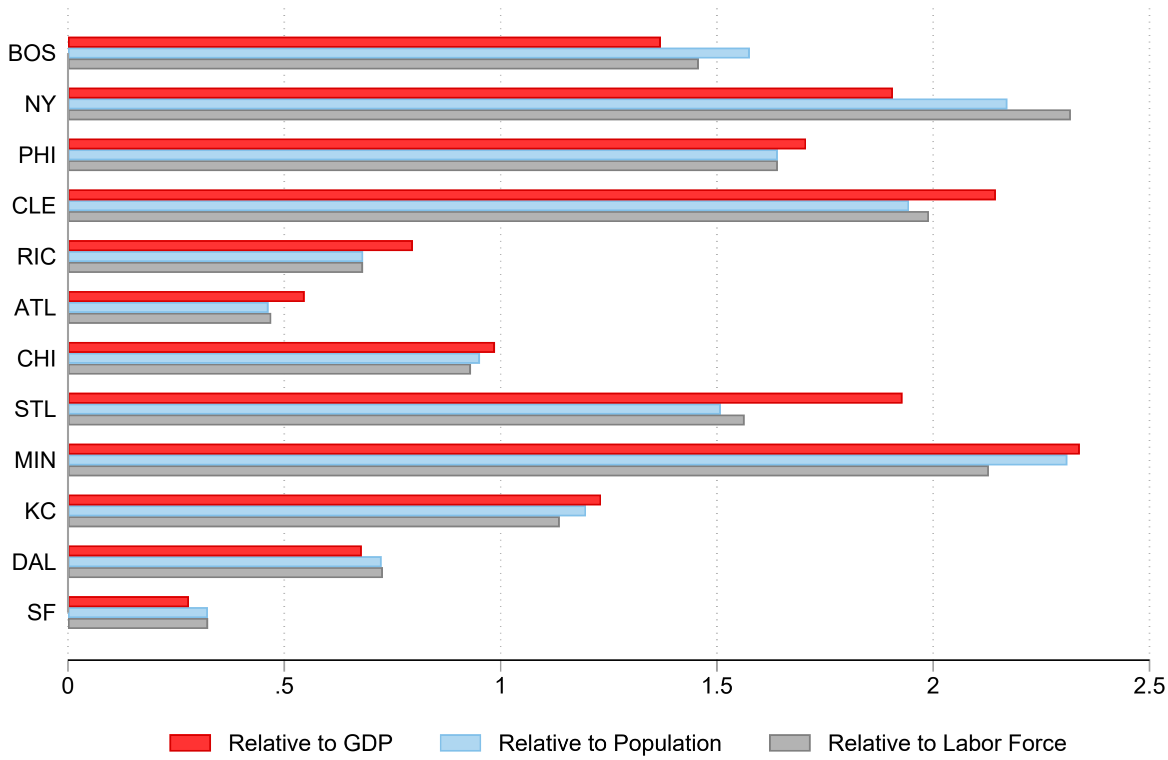

Figure 5: FOMC Voting Shares Divided by Economic or Population Shares

Notes: This figure displays the voting shares of each of the 12 Federal Reserve districts divided by their GDP, population, or employment shares. A value of one would indicate that the voting share of a given district is equal to its economic or population share. A value above one indicates over-representation at the FOMC while a value below one indicates under-representation.

District's share of GDP.

Does this variation in district voting power (relative to population or economic activity) have implications for monetary policy? On one hand, it may not, if district presidents are equally informed about the aggregate economy and only vote based on the nation's economic status. On the other, it may affect monetary policy if district presidents care more about their own district or extrapolate their economic understanding of their district to the nation. Specifically, monetary policy may be biased towards achieving full employment and stabilizing inflation in the districts that are over-represented in voting. To answer this question, we now turn to evaluating if the votes of district presidents indeed reflect their own district's economic conditions.

4 Regional Dissent at the FOMC

4.1 Specification

In order to evaluate whether local economic conditions impact the votes of Fed district presidents at FOMC meetings, we run the following Taylor-type regression:

$$y_{it} = \delta_t + \zeta_i + \alpha_0 \pi_{it} + \alpha_1 \pi_{it} \mathbb{1}(t > 2006M1) + \beta_0 u_{it} + \beta_1 u_{it} \mathbb{1}(t > 2006M1) + \epsilon_{it}, \qquad (1)$$

where i refers to the district $(1, 2, \ldots, 12)$, t refers to the FOMC meeting, y_{it} is the dissent variable for the President of District i at time t (-1 for a dissent in favor of tighter policy, 0 for agreement with the proposed policy, and 1 for a dissent in favor of looser policy), π_{it} and u_{it} are District's i non-tradable inflation and unemployment respectively, δ_t is a set of time fixed effects, and ζ_i is a set of District fixed effects.[7] In some regression specifications, we also include an indicator variable for FOMC meetings that occur after January 2006 interacted with local unemployment and inflation; this allows us to separately identify the effects of local economic conditions during and after the term of Alan Greenspan (which ended on January 31st, 2006).

In all of our regressions, we use Driscoll-Kraay standard errors, which are robust to very general forms of cross-sectional and temporal dependence with large time dimensions. Our preferred specification uses three lags for the computations of the Driscoll-Kraay standard errors. We increase the lags up to five in some of our robustness checks, with very little change in the results. In some of our specifications, we also swap the set of district fixed effects for a set of president fixed effects, which subsume the district fixed effects and can control for some presidents being ideologically more hawkish or dovish, as long as this is a permanent feature of their decision making.

[7] The previous specification can be obtained from proposing a Taylor rule for a given district, a Taylor rule for the nation as a whole, and then subtracting the two to obtain an specification in terms of "dissents" about the proposed policy in the left hand side, and deviations from national variables in the right hand side. However, the national levels of unemployment and inflation would be absorbed by the time fixed effects, so they do not appear explicitly in regression equation (1).

4.2 Baseline Results

Table 1 summarizes the results from different regressions in the spirit of equation (1). In column (1), we present the simplest possible specification where we only include time fixed effects, we do not include district or president fixed effects and we do not separate the Greenspan and post-Greenspan periods. Additionally, we drop unscheduled meetings, exclude the New York Fed, and use three lags for the Driscoll-Kraay standard error computation. The coefficient on non-tradable inflation is not significant, but it goes in the right direction, greater non-tradable inflation in a district implies that its president is more likely to dissent in favor of tighter policy. More importantly, the coefficient on unemployment is economically and statistically significant and goes in the expected direction. A one-percentage-point higher district unemployment is associated with a probability of dissenting in favor of looser policy that is 8.5 percentage points higher.

In column (2) of Table 1 we incorporate district fixed effects, to account for the fact that some districts might be consistently more hawkish or dovish in their dissents. This makes the coefficient on non-tradable inflation more negative (although it continues to be insignificant), but leaves the unemployment coefficient almost unaltered. Column (3), which is our baseline specification, substitutes the district fixed effects with a set of president fixed effects. This broader set of fixed effects subsumes the district fixed effects and allows for the possibility that some district presidents dissent in the same direction consistently over time. This specification takes the coefficient on non-tradable inflation almost to zero, but the coefficient on unemployment gets stronger and continues to be significant at the 5% level. Under our preferred (baseline) specification, a one-percentage-point higher district unemployment is associated with a probability of dissenting in favor of looser policy that is 9.2 percentage points higher.

Including unscheduled FOMC meetings, as we do in column (4), or increasing the number of Driscoll-Kraay lags, as we do in column (5), does not alter the results in any significant way. In column (6), we include the New-York Fed, this decreases the coefficient on unemployment to 5.9 p.p., but the significance actually increases to the 1% level, since there are more observations to include in the regression.

Table 1: FOMC Dissent, using non-tradable inflation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemploy	0.085***	0.084**	0.092**	0.087**	0.092**	0.059***		
	(0.028)	(0.041)	(0.038)	(0.037)	(0.040)	(0.022)		
NT Infla.	-0.009	-0.017	-0.001	-0.002	-0.001	-0.005		
	(0.026)	(0.021)	(0.020)	(0.020)	(0.020)	(0.015)		
Unemp. 1990-2005							0.056	0.024
							(0.038)	(0.023)
NT Infl. 1990-2005							0.002	0.002
							(0.025)	(0.021)
Unemp. 2006-2017							0.133**	0.106**
							(0.062)	(0.044)
NT Infl. 2006-2017							-0.010	-0.018
							(0.034)	(0.022)
Const.	-0.990***	-0.815***	-0.402*	-0.369	-0.402*	-0.203		
	(0.198)	(0.210)	(0.236)	(0.229)	(0.243)	(0.149)		
Observations	896	896	896	916	896	1120	896	1120
District FE	NO	YES	NO	NO	NO	NO	NO	NO
President FE	NO	NO	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Unscheduled	DROP	DROP	DROP	KEEP	DROP	DROP	DROP	DROP
Includes NY	NO	NO	NO	NO	NO	YES	NO	YES
DK lags	3	3	3	3	5	3	3	3
R Squared	0.338	0.418	0.529	0.524	0.529	0.465	0.532	0.470
Adj. R Squared	0.116	0.211	0.335	0.328	0.335	0.300	0.337	0.304

Notes: This table presents the estimation results from regressions of the type in equation (1). Columns (1) through (6) do not include separate effects for the Greenspan and post-Greenspan periods, while columns (7) and (8) do. The effects of inflation and unemployment after 2005 are $\alpha_0 + \alpha_1$ and $\beta_0 + \beta_1$ respectively. The effects of inflation and unemployment before 2006 are only α_0 and β_0 respectively. Driscoll-Kraay standard errors are given in parenthesis. Stars indicate significance: $^* = p < 0.1$, $^{**} = p < 0.05$, $^{***} = p < 0.01$.

Within the FOMC-voting literature, there is a notion that some FOMC chairs exhibited greater influence on their committees than others. Namely, narrative accounts and empirical evidence from Meade (2005) illuminate the power that Chair Alan Greenspan had to limit dissenting votes at the FOMC. Hayo and Neuenkirch (2013) also found that under Greenspan's tenure the district presidents' speech content was largely based on national macroeconomic data; however, starting in Bernanke's tenure, regional economic information starts playing a larger role. In order to test this hypothesis, in column (7) of Table 1, we split our sample period into the Greenspan era and the post-Greenspan era.

In the Greenspan era, the unemployment coefficient goes in the expected direction, but it is smaller than in our baseline specification (5.6 p.p.) and non-significant. By contrast, in the post-Greenspan era, the unemployment coefficient is higher than in our baseline specification, at 13.3 p.p., and is highly significant. These results do not change much when including the New York Fed, as done in column (8) of Table 1. Overall, these results support the notion that either Chairman Greenspan discouraged dissent, or for some other reason, district presidents did not previously take into consideration regional economic conditions when voting at the FOMC. To illustrate the potential sway Greenspan had over his committee, exhibit A.2 in the Appendix reproduces an excerpt from FOMC minutes during his chairmanship.

During the Greenspan period, dissenting votes by district presidents were rare. So it is not surprising that earlier literature did not reveal a significant relationship between voting behavior and local economic conditions. To detect the effects of regional economic conditions during that period, a "dissent in voice" approach is required to obtain statistical significance. However, since 2006, there has been a rise in voting dissents. Specifically, our sample contains only 33 dissents between 1990 and 2005, for an average number of dissents per year of roughly 2 (0.25 dissents per FOMC meeting). The remaining 66 dissents in our sample happen between 2006 and 2017, for an average of 5.5 dissents per year (approximately 0.7 dissents per FOMC meeting).

While the regression in equation (1) captures correlations and not necessarily causal relationships, it is worth emphasizing that even then, our results allow us to conclude that district presidents are not making decisions by considering national outcomes exclusively. This is the case because any such national influences on FOMC dissents would be absorbed by the time fixed effects, even if they were non-linear and different than the traditional Taylor rule variables (inflation, unemployment, or the output gap).

While we cannot necessarily say why the district presidents act as if regional conditions matter, some options are as follows: 1) they inherently care more about their districts than the whole nation, perhaps because they are accountable to their local board of directors which is impacted primarily by local economic conditions, 2) they have better or more up to date information about their own district than about the whole nation, and they believe that their local information is representative of the national economy, 3) they believe that the sectoral composition of their district is representative of the national economy and receive more signals from sectors that are important in their district (e.g., oil for the Dallas Fed, finance for the NY Fed, technology for the San Francisco Fed, etc.). Regardless of the cause, we can say with a 95% confidence interval, that district presidents consider regional economic conditions (especially unemployment) when voting at the FOMC meetings.

4.3 Robustness

Besides the eight different specifications we have presented in Table 1, in this section we discuss additional robustness checks. Appendix Table A.1 is equivalent to Table 1 but where we lag non-tradable inflation by two FOMC meetings. This is meant to control for the fact that quarterly inflation might not be known at the time that FOMC decisions are being made in the current quarter. However, our results are not affected much by lagging the non-tradable inflation measure, and the regression R-squared is slightly smaller. Appendix Table A.2 presents the results when we use overall inflation instead of non-tradable inflation, this does not make much difference for our estimates. In principle, we prefer to use non-tradable inflation, because the tradable component of inflation is extremely correlated across districts, so the non-tradable measure should give us a better chance to capture if district presidents react to the local component of price changes. Nevertheless, changing between one measure or the other does not affect the results much. Finally, Appendix Table A.3 presents the results when we use overall inflation lagged by one FOMC meeting, also with little consequence for our results.

4.4 Expanding-Window Regressions

So far, we have ran all of our regressions in the full sample between 1990 and 2017 (even if in some of the robustness checks we allow for different effects in the Greenspan and post-Greenspan samples). But the question arises if it has always been possible to detect the influence of local economic conditions on FOMC votes, or if this is a new development. To investigate this, we run expanding-window regressions. These regressions correspond to our baseline specification, like the one in column (3) of Table 1, but where

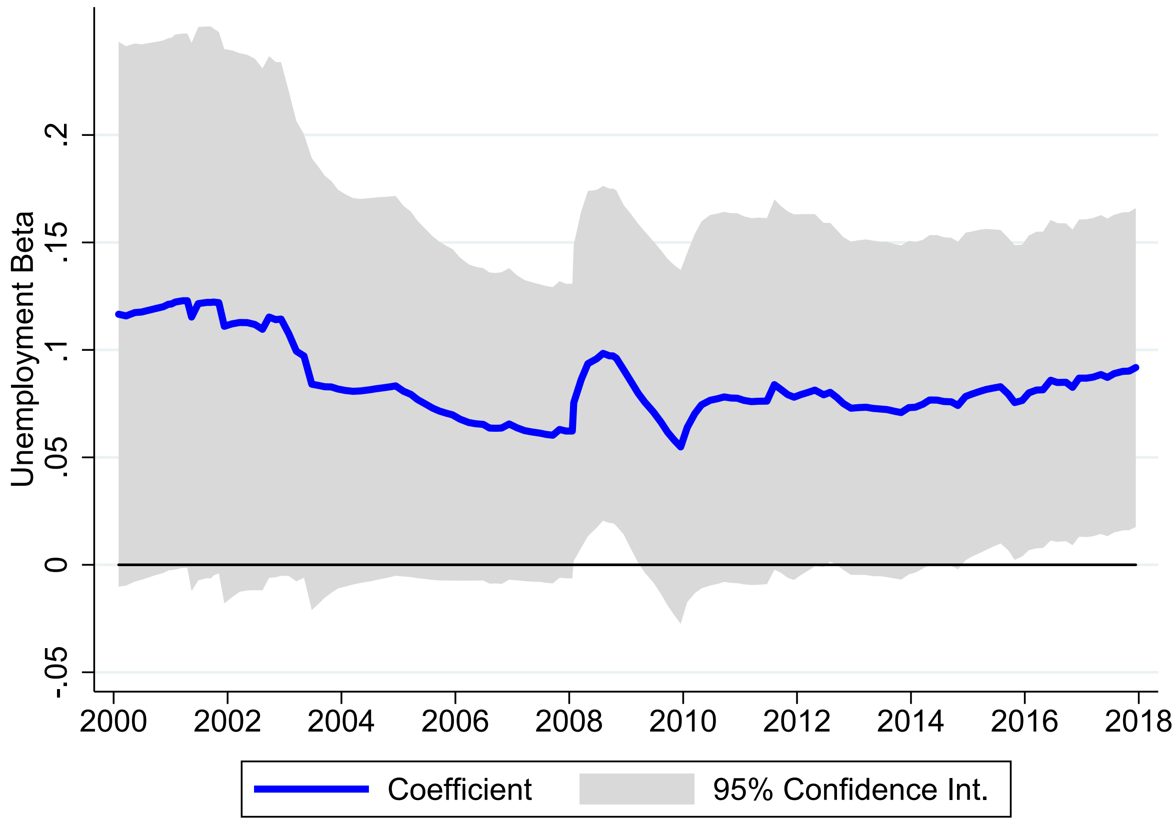

Figure 6: Baseline Expanding-Window Regressions (2000-2017)

Notes: This figure displays the beta coefficient on unemployment from regressions like (1) but where the estimation sample stops at the date in the x-axis of the graph. That is, each point in the graph contains one more FOMC meeting in the estimation sample that the previous one. The gray area depicts the 95% confidence interval. The specification corresponds to the one in column (3) of Table 1, with Driscoll-Kraay standard errors computed using 3 lags.

the sample spans from 1990 to year T. We then expand T from $T = 2000$ to $T = 2017$. Therefore, the regression with the shortest window includes roughly 11 years of data (1990-2000), while the one with the longest window includes roughly 28 years (1990-2017).[8]

The results of the expanding-window regressions are presented in Figure 6. We plot

[8]These expanding-window regressions are different from rolling-window regressions, which keep the size of the sample constant. Here, we explicitly want to increase the sample as time goes by to account for the fact that, over time, researchers would have accumulated more data that, at some point, might allow them to detect the significance of local economic conditions due to either a change in the estimated coefficient or smaller standard errors.

the coefficient on local unemployment from the baseline version of regression (1) on the y-axis against the end-of-sample period on the x-axis. The coefficient starts above 0.1, falls consistently between 2000 and 2008, has a short-lived hump shape during the Global Financial Crisis, and then increases gradually between 2010 and the end of our sample in 2017. The standard errors are large when the sample is short; however, as the sample increases, more dissents are added to the dataset, and the standard errors decrease.

Overall, the significance of the coefficient on unemployment cannot be detected at the 5% confidence interval (except for a very brief period around the Global Financial Crisis), until roughly 2015. Between 2000 and 2015, there would not have been enough power in the data to detect a significant coefficient on local unemployment. Nevertheless, for the three years between early 2015 and the end of 2017, the coefficient on unemployment has been consistently increasing, significant at the 5% level, and has displayed reduced uncertainty (the standard errors are decreasing) due to the greater number of dissents. This evolution of the significance of the coefficient of local economic conditions on FOMC dissents explains why the previous literature has either found that local economic conditions did not matter for FOMC votes or has focused on dissents "in voice". The data was simply not sufficient to detect the significance of local economic conditions on FOMC dissents until recently.

5 Conclusion

We contribute to the FOMC decision-making literature by providing evidence that regional economic conditions, especially unemployment, influence the voting behavior of regionally-affiliated FOMC members. Economic deviations between the local economy and the United States as a whole can be large, and may induce Federal Reserve district presidents to react to the conditions in their jurisdiction. These reactions manifest themselves not only in official communications as ascertained by previous work, but also in official policy votes. Specifically, we find that a one percentage point higher district unemployment rate increases the likelihood that the president associated with that district dissents in favor of looser policy at the FOMC by more than nine percentage points. Overall, this suggests the district and voting structure of the FOMC results in monetary policy that may be biased towards over-represented districts. While we do not take a stand on why presidents' votes reflect their own districts' economic conditions, this would be an interesting avenue for future work.

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Appendix

A Additional Figures and Tables

Table A.1: FOMC Dissent, using non-tradable inflation lagged two FOMC meetings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemploy	0.090***	0.088**	0.093**	0.087**	0.093**	0.061***		
	(0.027)	(0.042)	(0.038)	(0.037)	(0.040)	(0.023)		
Lagged NT Infla.	0.001	-0.011	0.003	0.000	0.003	-0.007		
	(0.024)	(0.022)	(0.015)	(0.015)	(0.015)	(0.012)		
Unemp. 90-05							0.052	0.022
							(0.039)	(0.025)
Lagged NT Infl. 90-05							-0.011	-0.016
							(0.019)	(0.015)
Unemp. 06-17							0.138**	0.109**
							(0.062)	(0.044)
Lagged NT Infl. 06-17							0.015	-0.000
							(0.026)	(0.020)
Const.	-0.491***	-0.105	-0.015	-0.891**	-0.015	-0.614***		
	(0.187)	(0.128)	(0.159)	(0.366)	(0.160)	(0.224)		
Observations	888	888	888	908	888	1110	888	1110
District FE	NO	YES	NO	NO	NO	NO	NO	NO
President FE	NO	NO	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Unscheduled	DROP	DROP	DROP	KEEP	DROP	DROP	DROP	DROP
Includes NY	NO	NO	NO	NO	NO	YES	NO	YES
DK lags	3	3	3	3	5	3	3	3
R Squared	0.337	0.417	0.519	0.514	0.519	0.456	0.523	0.460
Adj. R Squared	0.115	0.209	0.321	0.314	0.321	0.286	0.323	0.291

Notes: This table is equivalent to Table 1 but laggjng non-tradable inflation by two FOMC meetings. Columns (1) through (6) do not include separate effects for the Greenspan and post-Greenspan periods, while columns (7) and (8) do. The effects of inflation and unemployment after 2005 are $\alpha_0 + \alpha_1$ and $\beta_0 + \beta_1$ respectively. The effects of inflation and unemployment before 2006 are only α_0 and β_0 respectively. Driscoll-Kraay standard errors are given in parenthesis. Stars indicate significance: $^* = p < 0.1$, $^{**} = p < 0.05$, $^{***} = p < 0.01$.

Table A.2: FOMC Dissent, using overall inflation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemploy	0.084***	0.083**	0.091**	0.086**	0.091**	0.058**		
	(0.028)	(0.041)	(0.038)	(0.037)	(0.040)	(0.022)		
Inflation	-0.018	-0.029	-0.003	-0.003	-0.003	-0.011		
	(0.035)	(0.030)	(0.028)	(0.028)	(0.028)	(0.021)		
Unemp. 1990-2005							0.057	0.024
							(0.039)	(0.023)
Infl. 1990-2005							0.011	0.002
							(0.034)	(0.026)
Unemp. 2006-2017							0.129**	0.104**
							(0.062)	(0.045)
Infl. 2006-2017							-0.028	-0.028
							(0.045)	(0.030)
Const.	-0.954***	-0.767***	-0.392	-0.365	-0.392	-0.179		
	(0.204)	(0.227)	(0.242)	(0.236)	(0.247)	(0.148)		
Observations	896	896	896	916	896	1120	896	1120
District FE	NO	YES	NO	NO	NO	NO	NO	NO
President FE	NO	NO	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Unscheduled	DROP	DROP	DROP	KEEP	DROP	DROP	DROP	DROP
Includes NY	NO	NO	NO	NO	NO	YES	NO	YES
DK lags	3	3	3	3	5	3	3	3
R Squared	0.339	0.419	0.529	0.524	0.529	0.466	0.532	0.470
Adj. R Squared	0.117	0.212	0.335	0.328	0.335	0.300	0.337	0.304

Notes: This table is equivalent to Table 1 but using overall inflation instead of non-tradable inflation. Columns (1) through (6) do not include separate effects for the Greenspan and post-Greenspan periods, while columns (7) and (8) do. The effects of inflation and unemployment after 2005 are $\alpha_0 + \alpha_1$ and $\beta_0 + \beta_1$ respectively. The effects of inflation and unemployment before 2006 are only α_0 and β_0 respectively. Driscoll-Kraay standard errors are given in parenthesis. Stars indicate significance: $^{*} = p < 0.1$, $^{**} = p < 0.05$, $^{***} = p < 0.01$.

Table A.3: FOMC Dissent, inflation lagged one FOMC meeting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unemploy	0.087^{***}	0.085^{**}	0.092^{**}	0.087^{**}	0.092^{**}	0.058^{***}		
	(0.027)	(0.041)	(0.038)	(0.037)	(0.040)	(0.023)		
Lagged Infla.	-0.011	-0.024	-0.000	-0.002	-0.000	-0.014		
	(0.035)	(0.032)	(0.025)	(0.025)	(0.024)	(0.019)		
Unemp. 1990-2005							0.058	0.024
							(0.040)	(0.024)
Lagged Infl. 1990-2005							0.012	-0.005
							(0.032)	(0.023)
Unemp. 2006-2017							0.130^{**}	0.104^{**}
							(0.061)	(0.044)
Lagged Infl. 2006-2017							-0.020	-0.025
							(0.041)	(0.031)
Const.	-0.885^{***}	-0.699^{*}	-0.010	-0.006	-0.010	-0.055		
	(0.277)	(0.378)	(0.165)	(0.164)	(0.167)	(0.109)		
Observations	892	892	892	912	892	1115	892	1115
District FE	NO	YES	NO	NO	NO	NO	NO	NO
President FE	NO	NO	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES
Unscheduled	DROP	DROP	DROP	KEEP	DROP	DROP	DROP	DROP
Includes NY	NO	NO	NO	NO	NO	YES	NO	YES
DK lags	3	3	3	3	5	3	3	3
R Squared	0.338	0.418	0.524	0.518	0.524	0.460	0.527	0.465
Adj. R Squared	0.116	0.211	0.327	0.321	0.327	0.292	0.329	0.297

Notes: This table is equivalent to Table 1 but using overall inflation lagged by one FOMC meeting. Columns (1) through (6) do not include separate effects for the Greenspan and post-Greenspan periods, while columns (7) and (8) do. The effects of inflation and unemployment after 2005 are $\alpha_0 + \alpha_1$ and $\beta_0 + \beta_1$ respectively. The effects of inflation and unemployment before 2006 are only α_0 and β_0 respectively. Driscoll-Kraay standard errors are given in parenthesis. Stars indicate significance: $^{*} = p < 0.1$, $^{**} = p < 0.05$, $^{***} = p < 0.01$.

Figure A.1: Inflation and Unemployment for the 12th District and the rest of the US

Notes: Unemployment is reported at a monthly frequency and inflation at a quarterly one. Unemployment data is sourced from the Local Area Unemployment Statistics of the BLS. Inflation is sourced from Hazell et al. (2022) as the winsorized state-level consumer price index weighted by population.

Figure A.2: Excerpt from FOMC minutes

MR. ANGELL: *That's why I want to have a tilt policy.*
CHAIRMAN GREENSPAN: *Yes, but the point is that if that is in fact the case, the risks are very clear; and one has much more clout per unit of action by moving in advance. I must admit I'm really trying to listen to your argument and I'm having difficulty with it, because there has been a general thrust of policy here which has been extraordinarily successful . . . The markets in this context cannot perceive of a further slight tightening of the targets as being negative. I really can't [see it].*
MR. AGNELL: *Well–*
CHAIRMAN GREENSPAN: *Remember this economy–*
MR. ANGELL: *That's the reason we have a 12-member group–because some people might see it differently.*
CHAIRMAN GREENSPAN: *Well, I think we've conveyed our points. I will take it out on a tennis court and see if–*
VICE CHAIRMAN CORRIGAN: *Well, I feel sorry for that ball!*

–Meeting of the Federal Open Market Committee June 29-30, 1988