Regional House Price Dynamics and Voting Behavior in the FOMC

This paper examines the impact of house price gaps in Federal Reserve districts on the voting behavior in the FOMC from 1978 to 2010. Applying a random effects ordered probit model, we find that a higher regional house price gap significantly increases (decreases) the probability that this district's representative in the FOMC casts interest rate votes in favor of tighter (easier) monetary policy. In addition, our results suggest that Bank presidents react more sensitively to regional house price developments than Board members do. (JEL classification: E31; E58; R31)

Keywords: FOMC voting; Regional house prices

I. INTRODUCTION

Interest rate decisions by the Federal Open Market Committee (FOMC) are not always made unanimously. Different individual views about the appropriate monetary policy stance may lead to the result that members cast dissenting interest rate votes in FOMC meetings, i.e. they opt for a higher or lower interest rate than proposed by the Chairman of the FOMC. Several studies find that FOMC members have different views about the appropriate monetary policy when casting interest rate votes (Belden, 1989; Havrilesky and Schweitzer, 1990; Gildea, 1990, 1992; Havrilesky and Gildea, 1991, 1995; Tootell, 1991, 1996; Chappell and McGregor, 2000; Meade and Sheets, 2005; Chappell et al., 2008, 2012; Meade, 2010). An important source of such dissenting votes may be the regional bias of the FOMC member, which is constituted by its regional affiliation. Several studies have examined the impact of the regional unemployment rate on the interest rate votes of FOMC members. While Gildea (1992), Meade and Sheets (2005), and Chappell et al. (2008) find that a higher regional unemployment rate relative to the national rate increases (decreases) FOMC members' preference for monetary easing (tightening), Tootell (1991) finds no significant evidence.[1]

In this paper we analyze whether FOMC members align their interest rate voting behavior with house price developments of the Federal Reserve district they represent (in addition to the regional unemployment rate studied so far). In this way, we can test whether regional house prices and/or regional unemployment rates have a significant impact on the voting behavior of FOMC members and we examine whether there are systematic differences between regional Bank presidents and Board members.

Various studies have examined the link between monetary policy and asset price developments. According to Gilchrist and Leahy (2002), there are some good reasons why

[1] While Gildea (1992), Meade and Sheets (2005), and Tootell (1991) use categorical data of dissenting votes, Chappell et al. (2008) use the continuous desired federal funds rate of each FOMC member (as expressed in transcripts in the period 1987-1999) in order to study the relevance of regional economic factors.

central banks should align their monetary policies with asset prices. First, the Consumer Price Index (CPI) or Gross domestic Product (GDP) deflator are incomplete measures since they only signal information on the prices of goods consumed today, whereas a more complete measure would also signal future cost of living, such as the information contained in asset prices (Alchian and Klein, 1973). Second, asset prices may be useful in forecasting inflation (Goodhart and Hofmann, 2000). Third, asset prices may directly affect real economic activity and inflation since, for example, wealthier consumers spend more, which may affect price developments (Carroll et al., 2011).

Whether central banks should react to asset prices is, however, debated in the literature. The traditional view is that central banks should only react to asset prices to the extent that they feed back into the conventional monetary policy goals inflation and output (Bernanke and Gertler, 1999, 2001). On the contrary, Cecchetti et al. (2000) conclude that it may be reasonable for central banks to react to asset prices (in particular house prices) in order to avoid the build-up of asset price bubbles. As the burst of asset price bubbles may lead to financial crises (Reinhart and Rogoff, 2009), leaning against the build-up of extreme asset price changes may therefore be a reasonable choice for central banks as a part of their mission to manage systemic risk (Bordo and Jeanne, 2002; Allen and Carletti, 2009). Another rationale that central banks should take asset prices, particularly house prices, into account is that house prices have been shown to be suitable early warning indicators for the outbreak of the recent financial crisis (Kemme and Roy, 2012).

Several empirical papers analyze the impact of asset prices on interest rate setting. Rigobon and Sack (2003) and Dupor and Conley (2004) find evidence that FOMC interest rate decisions are influenced by equity prices. On the contrary, Fuhrer and Tootell (2008) find that FOMC interest rate decisions are not a direct response to equity price movements and are an indirect response only to the extent that equity prices helped forecast the conventional monetary policy goals. For Europe, Botzen and Marey (2010) find evidence of a monetary

policy response to equity prices in the European Central Bank, while Bohl et al. (2007) do not find such evidence for the Deutsche Bundesbank in the pre-euro era.

To the best of our knowledge, we are not aware of any study that analyzes the impact of regional house prices on the voting behavior in the FOMC.[2] The subprime crisis has shown that monitoring house prices should be of crucial importance for central banks. Taylor (2007) argues that the Federal Reserve has kept interest rates too low for too long after 2001 and that the rapid interest rate swing in 2005/06 has contributed to the boom-bust cycle in U.S. house prices. There have been, however, regional differences with California, Florida, Arizona and Nevada experiencing the most pronounced boom-bust cycles in house prices while Texas and Michigan had a relatively remote development in house prices (Taylor, 2009). Given these regional differences in house price dynamics, it may be difficult for a central bank to implement interest rates that fit all regional real estate markets at one time.[3] Thus, it remains an empirical question as to whether monetary policymakers do indeed react to house prices.

As interest rate decisions are committee decisions in the United States, a FOMC member may dissent from the consensus interest rate decision since this rate may not suit the development of house prices in the region he/she presents. We analyze the regional dimension of the impact of house prices on monetary policy by investigating the impact of the (heterogeneous) regional house price developments on the interest rate decisions of regionally affiliated FOMC members. In order to measure the voting behavior in the FOMC, we use either a categorical dissents indicator (presenting dissenting votes of each member against the majority decision in the FOMC) or a categorical voting indicator (presenting actual interest rate votes of each member). Both models use data from 1978 to 2010 and are estimated using a

[2] There are several studies that empirically examine the influence of central banks on house prices (see, e.g., Del Negro and Otrok, 2007; Jarociński and Smets, 2008; Dokko et al., 2011; Bjørnland and Jacobsen, 2008, 2010; Iacoviello and Neri, 2010). Most of these studies find that some variation in house prices can be attributed to monetary policy changes.

[3] In a theoretical model, Allen and Carletti (2010) show that central banks' interest rate setting should respond to real estate prices in small countries, where real estate prices move relatively homogeneously, whereas such a policy may not be optimal in large countries with regional differences in house price developments.

random effects ordered probit model. Our analysis seeks to answer three research questions: Is the voting behavior of FOMC members affected by regional house price developments in their district? Do Bank presidents and Board members differ with respect to such a house price-related voting pattern? How large is the impact of regional house prices on the voting behavior in the FOMC as compared to the effect of the regional unemployment rate?

II. DESCRIPTIVE EVIDENCE

The Federal Reserve System is structured in 12 Federal Reserve districts that are represented in the FOMC. The FOMC consists of 12 monetary policymakers, including five voting Federal Reserve Bank presidents[4] who come directly from the district they represent, and seven members of the Board of Governors, who are only legally[5] affiliated with the district they represent but are located at the main office in Washington D.C.[6] Considering regional affiliations, it is often argued that Bank presidents should react more sensitively to changes of regional economic conditions than Governors should.[7]

In order to analyze interest rate decisions of individual FOMC members we use the minutes of the FOMC meetings that have been used by several other papers dealing with interest rate voting. FOMC meeting minutes provide information as to whether each voting member agrees with the interest rate decision of the committee (coded as 0), dissents in favor of a tighter monetary policy, indicating a higher preferred interest rate (coded as +1) or dissents in favor of easier policy, indicating a lower preferred interest rate (coded as –1).

<Insert Table 1 around here>

[4] While the Federal Reserve Bank of New York has a permanent voting right in the FOMC, the voting rights of the remaining eleven districts rotate in an annual manner.

[5] "Institutional practice does not closely link Governors to the regions with which they are formally affiliated. Indeed, Governors' formal district affiliations often seem to be determined as a matter of convenience in meeting the legal requirement for regional diversity." (Chappell et al., 2008, p. 285).

[6] The members of the Board of Governors are appointed by the President of the United States and confirmed by the Senate. The Board of Directors of the regional Federal Reserve Banks selects its Bank president.

[7] The Bank presidents have, of course, frequent contacts to businessmen living and working in their particular districts they represent in the FOMC. These business people provide information concerning economic conditions that should be considered by Bank presidents in the FOMC meetings.

Table 1 summarizes the heterogeneity in the voting behavior of the representatives of the 12 Federal Reserve districts in the period from 1978M3 thru 2010M9.[8] Overall, dissents are quite rare. Members of the FOMC have cast dissenting votes relative to the majority of just 6.86% out of 3264 recorded votes during the sample period. Bank presidents have cast dissenting votes more frequently than Board members[9] (8.22% vs. 5.75%).

Nearly 70% of all dissents were cast in favor of tighter monetary policy and just about 30% in favor of easier monetary policy (155 vs. 69, respectively). Bank presidents generally show a tendency towards tighter dissents, while Board members more frequently cast easier dissents. Around two thirds of tighter dissents were cast by Bank presidents and only one third by Board members. Around 77% of easier dissents were cast by Board members and only 23% by Bank presidents. Notably, all dissents in the district of Atlanta were cast in favor of tighter monetary policy and only by Bank presidents, as opposed to the Chicago district where only Board members cast dissenting votes and only for easier monetary policy stance. Dissents from Kansas City, Cleveland, St. Louis, Dallas, Richmond and Minneapolis districts were mainly cast by Bank presidents and in favor of a tighter monetary policy. For Boston, we find dissenting votes in favor of monetary tightening mostly cast by Board members. The districts of San Francisco and New York show no clear voting behavior. To summarize, this descriptive analysis shows that Bank presidents in particular tend to dissent more frequently for tighter monetary policy than Governors do.

In order to study whether voting behavior in the FOMC is driven by regional house prices, we use house price data provided by the Federal Housing Finance Agency and taken from the Federal Reserve Bank of St. Louis. This house price index is a weighted repeated

[8] Data on dissenting votes from 1978M3 to 2000M12 have been taken from the dataset introduced by Meade and Sheets (2005) and was extended until 2010M9 using the minutes of the Federal Board of Governors.
[9] Excluding chairmen, the share of dissenting votes of Board members equals 6.88%.

sales index and tracks the development of single-family house prices in each U.S. state.[10] In order to study the relevance of house prices for a possible regional bias in FOMC voting, we focus on the regional house price gap, which is defined as the deviation of regional house prices from their time trend. Similar to the output gap used in the literature, we opt for using a house price gap (in contrast, for example, to the case of the national unemployment rate where the raw number is used) since in all considered states' house prices show a long term upward trend and therefore monetary policymakers may be concerned about significant deviations from that trend (similar to the case of output). We calculate the regional house price gap in the following way. First, we compute percentage deviations of the house price index from its time trend for each U.S. state using the Hodrick-Prescott-filter. Second, we construct the district house price gap by weighting the state house price gaps by population shares based on county level data.[11] Positive values of the house price gap indicate that regional house prices are above the time trend and should be associated with a voting behavior in favor of monetary tightening of this district's FOMC member. Negative values of the house price gap indicate that house prices are below the time trend and should be associated with a voting behavior in favor of monetary easing.

<Insert Figure 1 around here>

Figure 1 illustrates the development of the house price gaps of each Federal Reserve district. From the late 70s to the late 80s, many districts show a clear boom-bust period, where house price volatilities have been considerably high, particularly in the districts of Boston, New York, Philadelphia, and Cleveland. During the 90s house prices show a relatively remote behavior with levels near their time trends. During the mid-2000s house prices rose markedly above their time trends in several districts. The subsequent bust with house prices falling below their trend levels starting at the beginning of 2007 was most striking in the districts of

[10] It measures the change in average prices paid in repeat sales or refinancings on the same single-family properties, whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since 1975.
[11] District boundaries are taken from Chappell et al. (2008).

Atlanta, Richmond and San Francisco. Notably, the San Francisco district, as the region with the highest economic importance, experienced the most volatile house prices during the last decade with a house price gap ranging from 12% at the beginning of 2006 to -8% at the beginning of 2009.

<Insert Tables 2 and 3 around here>

Table 2 summarizes the heterogeneity of regional house price gaps with respect to Federal Reserve districts and time periods. The first period, lasting from 1978 to 1989, shows high volatilities in almost every single district, particularly in Boston, New York, Philadelphia, and San Francisco (5.1, 4.7, 3.2, and 2.7, respectively). The 1990-1999 period is characterized by relatively tranquil house prices with low volatilities ranging between 0.5 and 1.8. Finally, the 2000-2010 period shows high volatilities in the U.S. housing markets associated with the sub-prime crisis, especially in San Francisco, Atlanta, Richmond, New York and Philadelphia (with volatilities of 8.5, 4.7, 3.4, 3.2 and 2.2 respectively).

Table 3 describes the link between FOMC dissenting votes and regional house price gaps. The data suggests that during periods with high house price volatilities (period I and III) FOMC members tend to dissent more frequently for tighter (easier) monetary policy when the regional house price is above (below) its long-term trend. For district/period cases highlighted in dark grey color, the majority of dissents show such a voting pattern – i.e. positive house price gaps (p) correspond to tighter dissents (+1) and negative house price gaps (n) correspond to easier dissents (-1) –, while light grey color is used for cases where the majority of dissents show a contrary voting pattern. Overall, this descriptive evidence supports our hypothesis that interest rate voting may be influenced by regional house price developments. During the first period (1978-89) we find evidence for such a voting pattern for Boston, Cleveland, and San Francisco in particular, where house price gap volatilities are relatively high. For the period 2000-2010 we find this pattern particularly for the districts of

Philadelphia, Richmond, and San Francisco with their high house price volatilities. For the middle period, with its relatively remote house price developments, such a clear voting pattern cannot be detected. There are also districts that provide contradictive evidence to our hypothesis (underlined in light grey color) such as Chicago[12] and Kansas. However, in these districts house prices are much less volatile and therefore voting dissents may be driven by other factors, such as unemployment rates. All in all, descriptive evidence suggests that FOMC members seem to align their interest rate voting with regional house prices.

III. REGRESSION ANALYSIS

A. Hypothesized Determinants

Our dataset comprises several additional control variables, including regional, national, and institutional variables. Table A1 in the Appendix provides an overview of definitions and sources of the variables. Table A2 in the Appendix provides some summary statistics. Beside the *regional house price gap* our dataset contains the *regional unemployment rate,* which is calculated as the difference between the district's unemployment rate and the national unemployment rate.[13] The per capita value of *failed assets of regional banks* is included to control for a possible regional bias of FOMC members accounting for trouble in the banking sector of their district. As a fourth regional variable, we include the *regional coincident index*, which reflects current economic conditions in the district (as measured using various regional labor market indicators). As already outlined, we assume that a larger *regional house price gap* is assumed to increase (decrease) the probability of voting for monetary tightening (easing). Thus, a positive coefficient is predicted. Higher levels of the

[12] The finding for Chicago may be explained by the fact that 100% of dissenting votes cast by these representatives were in favor of monetary easing. Therefore one may argue that this tradition of preferring monetary easing may be explained by factors other than house prices.

[13] The regional inflation rate is not included as a control variable since no appropriate data exists for this variable on the district level. Data on inflation rates for several metropolitan areas are available. However, these metro areas are not always representative for the Federal Reserve district used.

regional unemployment rate and *failed assets of regional banks* per capita and a lower *regional coincident index* reflecting deteriorating regional economic conditions are assumed to increase (decrease) the incentive to vote for monetary easing (tightening). These hypotheses are based on the assumption that FOMC members take actual economic developments in their district into account when casting interest rate votes in the FOMC.

We include a number of national macroeconomic variables, in particular the *national house price gap*, the *national industrial production gap*, the *national unemployment rate*, the *national inflation rate*, a *commodity price index* and an *exchange rate index*. Additionally we include the one year ahead forecasts for the national *industrial production gap*, *unemployment rate*, and *inflation rate* (provided by the Survey of Professional Forecasters) in order to test whether FOMC members rely on forward-looking variables when deciding about their votes. For all national variables (except for the actual and expected unemployment rate), a positive coefficient is predicted for the voting model, since higher values indicate a higher risk of inflationary pressure and overheating of the national economy, which constitutes the need for monetary tightening. For the dissents model, it is not a priori clear to formulate hypotheses for these national variables since they should determine the consensus among FOMC members concerning the appropriate interest rate and may therefore have no major effect on the dissenting behavior. In addition, we include the *previous funds rate* in order to test for an autoregressive voting pattern. We use all regional and national variables one month lagged in order to account for the fact that data for the voting month is only available around one month after the meeting.[14]

We also use several institutional dummy variables including *tape,* which is the date when all FOMC members became aware that the meetings were being tape recorded[15], a dummy indicating as to whether the FOMC *meeting* was a face-to-face meeting or a

[14] One exception is the federal funds rate where we use the value of Wednesdays prior to the meeting.
[15] Meade and Stasavage (2008) and Meade (2010) show that voting behavior changed after publishing voting records in 1993.

conference call, a dummy indicating as to whether the voting member is a *Board member* or Bank president, and time dummies for the FOMC meetings under chairmen *Volcker*, *Greenspan*, and *Bernanke*. These institutional characteristics may have a systematic influence on voting behavior although the expected direction of the influence is not clear a priori.

B. Regression Results of the Dissents Model

In order to test the impact of regional house prices on FOMC members' voting behavior, we use two alternative dependent variables: a *dissent* indicator (used in this sub-section) and a *vote* indicator (used in the following sub-section). The *dissent* indicator is an ordered categorical variable. For each FOMC meeting, the minutes published by the Board of Governors of the Federal Reserve provide information for each voting member as to whether the member agrees with the interest rate decision of the committee (coded as 0), dissents in favor of a tighter monetary policy with a higher preferred interest rate (coded as +1), or dissents in favor of an easier monetary policy with a lower preferred interest rate (coded as –1). This coding procedure follows previous studies such as Gildea (1990, 1992), Chappell and McGregor (2000) and Meade and Sheets (2005). In order to account for the categorical nature of the dependent variable we use an ordered probit model to test our hypotheses. In order to account for the unobserved heterogeneity among Federal Reserve districts we use a random effects estimator for the ordered probit model.[16]

We estimate our regression models for three datasets. The full sample uses FOMC interest rate votes of Board members and Bank presidents together.[17] The second dataset only considers votes of Bank presidents and the third dataset only uses data on votes of Board members. We estimate four specifications for each dataset which consider different

[16] This estimator was proposed by Frechette (2001). We used fixed effects models as a sensitivity check, but the results remained relatively robust.

[17] The full dataset includes 3264 interest rate votes. Due to absence or illness of participants, this number of observations is somewhat smaller than the number implied by the voting scheme of the FOMC, which implies 3540 observations, i.e. 12 votes for each of the 295 considered meetings.

combinations of regional, national, and institutional control variables to check for the robustness of the results. In order to assess the economic significance of the regional house price gap for the FOMC voting pattern, we compute marginal effects, which give the change in the probability of casting easier dissents (category -1), tighter dissents (category +1), or voting with majority decision (category 0) for a one unit change in the explanatory variable. Tables 4 and 5 report the estimation results and the marginal effects[18] for the dissents model.

<Insert Tables 4 and 5 around here>

Overall, the regression results confirm our hypotheses. For the full dataset comprising Bank presidents and Board members, the coefficient of the *regional house price gap* is highly significant and shows the expected positive sign in each specification. Inspecting the marginal effects reveals the result that a one standard deviation increase in the *regional house price gap* (being 2.744) raises the probability of tighter dissents by around 0.73%[19] (category +1) and decreases the probability of easier dissents (category -1) or the agreement with the majority (category 0) by 0.28% and 0.45% on average, respectively. These results suggest that FOMC members generally take regional house price developments into account when deciding about dissenting votes.

The results for the subsamples reveal significant differences with respect to the impact of the *regional house price gap* between Bank presidents and Board members. While for Bank presidents the coefficient of the *regional house price gap* is positive and significant in each specification, for Board members we find a weakly significant effect only in one specification. Comparing the marginal effects of Bank presidents and Board members also yields interesting results. The average marginal effect of an increase in the *regional house price gap* by one standard deviation on casting tighter dissents is about 1.33% for Bank

[18] The marginal effects for the institutional variables are not reported in order to save space (but are available from the authors upon request).

[19] This average standardized impact is calculated by multiplying the average marginal effect in the tightening category (being 0.267) by the standard deviation of the *regional house price* gap (being 2.744). The other average standardized marginal impacts discussed in the following, are calculated in the same way.

presidents and about 0.19% for Board members. Regarding easier dissents, we find that the standardized average marginal effects for both groups are about the same. All in all, our results suggest that regional house price developments have a much greater effect on the voting behavior of Bank presidents than of Board members.

Turning to the control variables, we find that both Bank presidents and Board members significantly align their voting behavior with the *regional unemployment rate* (confirming the results of previous studies, e.g., Gildea, 1992; Meade and Sheets, 2005; Chappell et al., 2008). A rise in the regional unemployment rate (relative to the national level) reduces the likelihood for casting tighter dissents and increases the likelihood for casting easier dissents. This effect is more pronounced for Board members than for Bank presidents. A one standard deviation increase in the *regional unemployment rate* increases the probability that a Bank president casts a dissent in favor of easier monetary policy by 0.27% on average, while this standardized marginal effect is 1.00% for Board members. A one standard deviation increase in the *regional unemployment rate* reduces the probability of tighter dissents, on average, by 1.42% for Bank presidents and by 1.06% for Board members.

A comparison of the economic significance of the *regional house price gap* and the *regional unemployment rate* yields interesting implications for monetary policy goals of both types of FOMC members. For the full sample, the impact of a one standard deviation change in the *regional unemployment rate* on the probability of casting a dissenting vote is twice as high as for the *regional house price gap*. A comparison of the inflation- and output orientation of Bank presidents and Board members yields the following results. For Bank presidents we find that the *regional house price gap* and the *regional unemployment rate* have similar standardized marginal effects, while for Board members the marginal effect of the *regional unemployment rate* is around four times as high as for the *regional house price gap*.

Thus, while Bank presidents' dissenting votes significantly depend on both the regional house prices and the regional unemployment rate, Board members seem to align their

dissents much more with the regional unemployment rate than with the regional house prices. The significant differences in the voting behavior of both types of FOMC members may be explained by several aspects. First, Bank presidents are typically supposed to have a more pronounced regional bias due to their stronger affiliation to the Federal Reserve region they represent, while Board members' regional affiliation is more constituted on a de jure basis. Due to their closer de facto regional affiliation Bank presidents may be more aware of regional house price developments than Board members who serve in Washington D.C. and have fewer opportunities to monitor changes in regional house prices. Bank presidents maintain frequent contacts in the business community of their region and regional businessmen may provide them with information concerning regional economic conditions including house price developments.[20] Bank presidents therefore typically have an information advantage over Board members concerning regional house prices and should more probably align their voting behavior with regional house price developments. Second, difference in the voting behavior of Bank presidents and Board members may also be explained by different preferences with respect to monetary policy goals. Board members are appointed by the President of the United States, while Bank presidents are elected by the Board of Directors of their regional Federal Reserve Bank. These differences in the appointment process may yield the result that Board members share the government's preference for output stabilization to a much greater extent than Bank presidents who may want to stabilize both output and inflation. Since house price dynamics may indicate both inflation and output risks, it seems to be a reasonable result that the voting behavior of Bank presidents depends much more on regional house prices than the voting behavior of Board members who put more weight on the unemployment rate. A third explanation for the different voting behavior may be that Board members may less likely perceive house prices as

[20] Bank presidents also benefit from regional information provided by members of their regional Federal Reserve Banks's Board of Directors, which – by construction – consists of different branches, particularly banking, agriculture, industry, trade, and public interest.

a relevant monetary policy goal than Bank presidents. According to the traditional view, monetary policy should only be conducted towards stabilizing output and inflation and asset prices should be relevant solely to the extent that they feed back into output and inflation (see, for example, Bernanke and Gertler, 1999, 2001). Board members may more probably share this traditional view since the Board of Governors and the Board's staff are active in shaping such consensus views to make monetary policy explicable. Bank presidents may have less orthodox views about monetary policy goals and may more likely align their voting behavior with a multitude of economic variables including regional house prices.

Turning to other regional control variables, we find that current regional economic conditions (measured by the *coincident index*) have a significant impact on the voting behavior, while trouble in the regional banking sector does not. For the national variables we generally find no significant impact on dissenting votes in the FOMC. This suggests that FOMC members agree on average with the committee's decisions to change the interest rate based on national economic indicators. The *previous funds rate* is also insignificant, pointing to no autoregressive behavior in voting dissents. Regarding the institutional variables, we find that Board members show significant preferences for a more expansive monetary policy than Bank presidents, confirming the findings of previous studies (see, e.g. Belden, 1989; Havrilesky and Gildea, 1995; Meade and Sheets, 2005). In contrast to previous studies (e.g. Meade and Stasavage, 2008; Meade, 2010), the *tape* dummy is insignificant in all regressions, indicating that a higher transparency of FOMC meetings does not influence the members' probability to dissent. For the *meeting* dummy we generally find a positive impact on dissents, but this effect is only significant for Bank presidents. This suggests that Bank presidents more often choose face-to-face meetings than conference calls when dissenting in favor of a tighter monetary stance.

C. Regression Results of the Voting Model

In order to check for the robustness of our results we estimate all specifications using *vote* as the dependent variable. This ordered categorical variable indicates as to whether a FOMC member votes in favor of an interest rate increase (+1), an interest rate decrease (-1), or an unchanged interest rate (0).[21] This alternative indicator also signals the monetary preferences of FOMC members and allows us to study the impact of regional house prices on regionally affiliated FOMC members' voting behavior. Similar to the dissents model, we expect that a higher regional house price gap in the member's Federal Reserve district would lead to a higher probability of votes in favor of a tighter monetary policy, i.e. higher interest rates (+1), while lower regional house price gaps should be associated with a higher probability of votes in favor of easier monetary policy, i.e. lower interest rates (-1). In contrast to the *dissents* indicator (which shows solely deviations from the consensus interest rate decision), the vote variable should be more sensitive towards variation in national variables since they should shape the consensus view about the appropriate monetary policy stance. Similarly to the *dissents* indicator, the *vote* variable also captures disagreement among FOMC members, since the majority view of interest rate increase or decrease may not be shared by FOMC members with a preference for easier or tighter monetary policy, respectively.

We estimate the same specifications for the three datasets using the random effects ordered probit model as for the dissents model. The estimation results and marginal effects for the voting model are reported in Tables 6 and 7, respectively.

<Insert Tables 6 and 7 around here>

The results generally confirm the findings of the dissents model. The coefficient of the *regional house price gap* is positive and significant in most specifications indicating that an increase in the *regional house price gap* is associated with a higher probability of voting in

[21] We thank an anonymous referee for this helpful suggestion.

favor of interest rate increases (or, equivalently, a lower probability of voting in favor of interest rate decreases). This result generally confirms the findings of the dissents model that larger heterogeneity in house price dynamics among Federal Reserve districts results in larger heterogeneity in the stabilization needs of the districts, which, in turn, leads to more disagreement in FOMC voting. Inspecting the marginal effects (see Table 7) reveals that the average standardized marginal effect of the regional house price gap on votes for Bank presidents is around fifty percent higher than the average marginal effect for Board members.[22] This result resembles the findings of the dissents model that Bank presidents align their voting behavior in the FOMC with regional house prices to a much greater extent than Board members do, due to their supposedly more intense regional affiliation and the associated better information about regional house price developments, more pronounced preferences for fighting (regional) inflation, and a more pragmatic view of monetary policy goals.

The regional unemployment rate is insignificant in most specifications, while the coefficient of the regional coincident index is highly significant and has the predicted positive sign. In contrast to the dissents model, the national inflation rate and the national industrial production gap, as well as the forecasts of these variables, play a highly significant role for voting in the FOMC, which is in line with the expectation that changes in the national interest rate should be mostly determined by national inflation and output. Moreover, higher commodity prices are associated with votes for tighter monetary policy, which suggests that FOMC members anticipate the risks of inflation pressure exerted by higher commodity prices. In line with the dissents model, we find that significantly tighter interest rate votes are cast

[22] For Bank presidents, a one standard deviation increase in the *regional house price gap* (being 2.744) raises the probability of votes in favor of higher interest rates, on average, by around 3.3% and lowers the probability of votes in favor of lower and unchanged interest rates by around 2.5% and 0.7%, on average. For Board members, a one standard deviation increase in the *regional house price gap* increases the probability of votes in favor of higher interest rates, on average, by around 2.2% and lowers the probability of votes in favor of lower and unchanged interest rates by around 1.7% and 0.4%, on average.

during regular meetings (as opposed to conference calls) and by Bank presidents (as opposed to Board members).

IV. CONCLUSIONS

Using FOMC voting records over the period 1978M3-2010M9 we find that regional house price developments significantly influence the voting behavior in the FOMC. A one standard deviation increase in the regional house price gap raises the probability of tighter dissents by around 0.73% and decreases the probability of easier dissents by 0.28%. We find that particularly Bank presidents take regional house prices into account when casting (dissenting) interest rate votes while for Board members this effect is mostly insignificant or small. Board members, on the contrary, are more concerned about the regional unemployment rate while this effect is much smaller, though also significant, for Bank presidents. Overall, Bank presidents appear to be much more focused in regional house prices when casting (dissenting) votes in the FOMC than Board members. This result may be explained by Bank presidents' stronger regional affiliation and the associated better awareness of regional house price developments, their stronger preferences for fighting inflation, and their more pragmatic view about monetary policy goals.

ABBREVIATIONS

CPI: Consumer Price Index
FOMC: Federal Open Market Committee
GDP: Gross Domestic Product

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TABLE 1

Regional Dispersion of Interest Rate Votes in the FOMC

District	Total	Boston	New York	Philadelphia	Cleveland	Richmond	Atlanta	Chicago	St. Louis	Minneapolis	Kansas City	Dallas	San Francisco
Total votes	3264	345	564	244	152	354	201	357	179	137	282	251	198
Average vote per meeting	11.07	1.17	1.91	0.83	0.52	1.20	0.68	1.21	0.61	0.46	0.96	0.85	0.67
Board	6.07	0.83	0.92	0.49	0.00	0.87	0.36	0.73	0.27	0.13	0.62	0.52	0.35
Bank	5.00	0.34	1.00	0.34	0.52	0.33	0.33	0.48	0.34	0.34	0.34	0.34	0.32
Dissents per casted votes	6.86	9.86	1.95	1.23	13.82	9.04	3.48	8.68	8.94	8.03	9.22	8.76	5.05
Board (%)	5.75	12.60	1.85	0.00	0.00	4.28	0.00	14.35	0.00	2.70	6.04	5.26	4.85
Bank (%)	8.22	3.03	2.04	3.03	13.82	21.65	7.29	0.00	16.00	10.00	15.00	14.14	5.26
Favored direction of total dissents													
Tightening (%)	69.20	94.12	45.45	66.67	85.71	71.88	100.00	0.00	81.25	90.91	92.31	81.82	30.00
Easing (%)	30.80	5.88	54.55	33.33	14.29	28.13	0.00	100.00	18.75	9.09	7.69	18.18	70.00
Dissents in favor of tightening													
Board (%)	32.26	91.18	0.00	0.00	0.00	6.25	0.00	0.00	0.00	0.00	38.46	31.82	0.00
Bank (%)	67.74	2.94	45.45	66.67	85.71	65.63	100.00	0.00	81.25	90.91	53.85	50.00	30.00
Dissents in favor of easing													
Board (%)	76.81	0.00	45.45	0.00	0.00	28.13	0.00	100.00	0.00	9.09	3.85	4.55	50.00
Bank (%)	23.19	5.88	9.09	33.33	14.29	0.00	0.00	0.00	18.75	0.00	3.85	13.64	20.00
Ranking													
Area size		10	11	12	9	8	5	6	7	3	2	4	1
Population		10	6	11	8	4	2	3	9	12	7	5	1
Population density		4	1	2	3	5	6	7	8	12	11	9	10
Assets		5	1	10	6	4	7	2	11	12	9	8	3
Real GDP		8	2	10	7	5	4	3	11	12	9	6	1
Votes per meeting		4	1	7	11	3	8	2	10	12	5	6	9

SOURCE: Own calculations. Rankings based on assets and real GDP are taken from Meade and Sheets (2002).

TABLE 2

Descriptive Analysis of the Regional House Price Gap

		Boston	New York	Philadel-phia	Cleveland	Richmond	Atlanta	Chicago	St. Louis	Minnea-polis	Kansas City	Dallas	San Francisco
1978-1989	Mean	0.352	0.408	-0.404	0.699	0.455	0.434	0.981	1.241	0.315	0.421	-1.717	-0.929
	Standard dev.	5.048	4.679	3.158	2.169	2.034	1.447	2.320	1.566	1.476	1.321	2.236	2.725
1990-1999	Mean	-1.362	-0.519	0.057	0.165	0.136	-0.117	-0.114	-0.144	-0.336	-0.551	-0.135	-0.154
	Standard dev.	1.362	1.310	0.959	0.492	0.642	0.602	0.527	0.611	0.929	0.846	1.123	1.751
2000-2010	Mean	-0.207	-0.236	-0.352	-0.146	-0.243	-0.594	0.175	0.100	0.167	0.221	0.823	-1.442
	Standard dev.	2.487	3.205	2.233	1.161	3.369	4.743	1.144	1.211	1.828	1.314	1.162	8.531

TABLE 3

Descriptive Analysis of FOMC Dissents and Regional House Price Gaps

Period	Dissenting vote	Boston		New York		Philadel-phia		Cleveland		Richmond		Atlanta		Chicago		St. Louis		Minnea-polis		Kansas City		Dallas		San Francisco	
		p	n	p	n	p	n	p	n	p	n	p	n	p	n	p	n	p	n	p	n	p	n	p	n
1978-1989	+1	19	7	3	2	0	0	8	0	3	8	7	0	0	0	6	0	5	2	3	5	4	0	2	1
	-1	0	1	3	3	0	0	0	1	4	2	0	0	19	10	3	0	0	0	1	1	5	1	1	5
1990-1999	+1	0	6	0	0	0	0	10	0	4	4	0	0	0	0	1	4	3	0	1	6	1	3	0	0
	-1	0	0	0	0	1	0	2	0	2	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0
2000-2010	+1	0	0	0	0	2	0	0	0	4	0	0	0	0	0	2	0	0	0	3	6	5	0	0	0
	-1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	1

NOTE: "p" indicates a positive value of the regional house price gap when casting tighter (1) or easier (-1) dissents; "n" indicates a negative value of the regional house price gap when casting tighter (+1) or easier (-1) dissents.

TABLE 4
Random Effects Ordered Probit Estimates of the Dissents Model

	Full sample				Bank presidents sample				Board members sample			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Regional house price gap	0.033 ** (1.99)	0.039 *** (2.91)	0.038 *** (2.63)	0.038 *** (2.78)	0.044 * (1.82)	0.070 *** (3.26)	0.047 ** (2.27)	0.046 ** (2.36)	0.036 (1.43)	0.017 (0.83)	0.030 (1.35)	0.037 * (1.78)
Regional unemployment rate	-0.224 *** (-5.87)	-0.205 *** (-4.84)	-0.230 *** (-5.87)	-0.223 *** (-5.42)	-0.158 *** (-2.92)	-0.109 * (-1.88)	-0.165 *** (-2.76)	-0.167 *** (-2.89)	-0.405 *** (-7.85)	-0.419 *** (-7.45)	-0.401 *** (-7.72)	-0.402 *** (-7.76)
Failed assets of regional banks		0.000 (0.26)	0.000 (0.35)	0.000 (0.44)		0.001 (0.42)	0.000 (0.19)	0.000 (0.09)		0.000 (0.07)	0.000 (0.23)	0.000 (0.28)
Regional coincident index		0.460 ** (2.28)				1.306 *** (4.00)				-0.259 (-0.84)		
National inflation rate	0.024 (0.24)	0.019 (0.18)		0.028 (0.21)	0.038 (0.27)	0.041 (0.27)		-0.105 (-0.57)	-0.037 (-0.24)	0.023 (0.14)		0.217 (1.09)
National house price gap	0.019 (0.79)				0.025 (0.71)				0.012 (0.31)			
National un-employment rate	0.028 (0.61)				0.034 (1.06)				0.040 (1.09)			
National industrial Production gap	0.031 (1.33)	-0.022 (-0.45)		0.035 (0.74)	0.034 (0.52)	-0.070 (-0.97)		0.043 (0.64)	0.059 (0.81)	0.055 (0.69)		0.052 (0.73)
Commodity price index				-0.003 (-0.52)				0.001 (0.07)				-0.011 (-1.11)
Exchange rate index				-0.020 (-0.75)				-0.071 * (-1.85)				0.037 (0.95)
Inflation forecast			0.038 (0.77)				0.039 (0.54)				0.067 (0.89)	
Unemployment rate forecast			0.018 (0.45)				-0.038 (-0.67)				0.061 (1.00)	

Industrial production forecast			0.003 (0.24)				0.032 * (1.69)				-0.015 (-0.79)	
Tape			0.01 (0.09)	-0.052 (-0.50)			-0.142 (-0.87)	-0.136 (-0.91)			0.244 (1.43)	0.118 (0.75)
Meeting			0.355 *** (2.67)	0.340 *** (2.59)			0.411 ** (2.15)	0.421 ** (2.22)			0.232 (1.17)	0.202 (1.04)
Board member			-0.482 *** (-6.63)	-0.485 *** (6.72)								
Previous funds rate			-0.017 (-0.72)	-0.007 (-0.45)			-0.008 (-0.22)	0.018 (0.75)			-0.034 (-0.98)	-0.036 (-1.47)
Volcker			-0.287 * (-1.66)	-0.266 * (-1.83)			-0.235 (-0.95)	-0.301 (-1.46)			-0.286 (-1.11)	-0.229 (-1.06)
Greenspan			-0.316 * (-1.78)	-0.366 ** (-2.41)			-0.307 (-1.22)	-0.338 (-1.58)			-0.191 (-0.72)	-0.329 (-1.44)
Bernanke			-0.275 (-1.20)	-0.292 (-1.49)			0.057 (0.18)	-0.033 (-0.12)			-0.689 * (-1.88)	-0.770 ** (-2.49)
Threshold 1	-2.064 *** (-12.66)	-2.269 *** (-22.13)	-2.359 *** (-6.95)	-2.555 *** (-11.37)	-2.187 *** (-9.52)	-2.507 *** (-19.04)	-2.400 *** (-4.92)	-2.366 *** (-7.59)	-1.683 *** (-6.87)	-2.729 *** (-16.27)	-1.867 *** (-3.72)	-2.553 *** (-7.77)
Threshold 2	1.982 *** (12.49)	1.829 *** (20.92)	1.791 *** (5.35)	1.598 *** (7.34)	1.856 *** (8.50)	1.630 *** (18.22)	1.685 *** (3.50)	1.759 *** (5.82)	3.074 *** (10.90)	2.065 *** (17.56)	2.934 *** (5.70)	2.256 *** (6.99)
Rho	0.108 *** (3.78)	0.095 *** (2.95)	0.208 *** (4.81)	0.076 *** (3.63)	0.220 *** (3.24)	0.241 *** (3.71)	0.211 *** (2.84)	0.212 *** (2.72)	0.455 *** (7.86)	0.425 *** (6.41)	0.650 *** (9.07)	0.657 *** (9.43)
Chi2	47.18 ***	39.57 ***	102.75 ***	104.51 ***	20.25 ***	34.09 ***	33.58 ***	34.46 ***	34.97 ***	28.52 ***	22.42 **	22.22 *
Number of obs.	3264	2978	3264	3264	1472	1337	1472	1472	1792	1641	1792	1792

NOTE: The dataset includes 295 meetings from 1978M3 thru 2010M9. Dependent variable: *dissent*. *t*-values in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

TABLE 5

Marginal Effects for the Random Effects Ordered Probit Estimates of the Dissents Model

		Full sample				Bank presidents sample				Board members sample			
Variable	Category	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Regional house price gap	-1	-0.09	-0.11	-0.10	-0.11	-0.09	-0.10	-0.09	-0.08	-0.18	-0.01	-0.07	-0.08
	0	-0.17	-0.18	-0.18	-0.13	-0.34	-0.51	-0.37	-0.36	0.15	-0.08	0.00	0.00
	+1	0.26	0.29	0.28	0.24	0.43	0.61	0.46	0.44	0.03	0.09	0.07	0.08
Regional unemployment rate	-1	0.61	0.55	0.57	0.65	0.32	0.18	0.30	0.30	2.07	0.31	0.88	0.87
	0	1.17	0.96	1.09	0.75	1.24	0.89	1.30	1.30	-1.71	1.96	-0.01	-0.00
	+1	-1.78	-1.51	-1.66	-1.40	-1.56	-1.07	-1.60	-1.60	-0.36	-2.27	-0.87	-0.87
Failed assets of regional banks	-1		-0.00	-0.00	-0.00		-0.00	-0.00	-0.00		-0.00	-0.00	-0.00
	0		-0.00	-0.00	-0.00		-0.01	-0.00	-0.00		-0.00	0.00	0.00
	+1		0.00	0.00	0.00		0.01	0.00	0.00		0.00	0.00	0.00
Regional coincident index	-1		-1.25				-2.09				0.19		
	0		-2.14				-10.64				1.21		
	+1		3.39				12.73				-1.40		
National inflation rate	-1	-0.07	-0.05		-0.08	-0.07	-0.07		0.19	0.19	-0.02		-0.47
	0	-0.12	-0.09		-0.09	-0.30	-0.33		0.82	-0.16	-0.11		0.00
	+1	0.19	0.14		0.17	0.37	0.40		-1.01	-0.03	0.13		0.47
National house price gap	-1	-0.05				-0.05				-0.06			
	0	-0.10				-0.20				0.05			
	+1	0.15				0.25				0.01			
National un-employment rate	-1	-0.08				-0.07				-0.20			
	0	-0.16				-0.27				0.17			
	+1	0.24				0.34				0.03			
National industrial Production gap	-1	-0.07	0.06		-0.10	-0.07	0.11		-0.08	-0.30	-0.04		-0.11
	0	-0.15	0.10		-0.12	-0.26	0.57		-0.34	0.25	-0.26		0.00
	+1	0.22	-0.16		0.22	0.33	-0.68		0.42	0.05	0.30		0.11
Commodity price index	-1				0.01				-0.00				0.02
	0				0.01				-0.01				-0.00
	+1				-0.02				0.01				-0.02
Exchange rate index	-1				0.06				0.13				-0.08
	0				0.07				0.55				0.00
	+1				-0.13				-0.68				0.08
Inflation forecast	-1			-0.09				-0.07				-0.15	
	0			-0.18				-0.31				0.00	
	+1			0.27				0.38				0.15	
Unemployment rate forecast	-1			-0.05				0.07				-0.13	
	0			-0.08				0.30				0.00	
	+1			0.13				-0.37				0.13	

Industrial production forecast	-1	-0.01	-0.06	0.03
	0	-0.01	-0.25	0.00
	+1	0.02	0.31	-0.03

TABLE 6

Random Effects Ordered Probit Estimates of the Voting Model

	Full sample				Bank presidents sample				Board members sample			
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Regional house price gap	0.020 * (1.93)	0.049 *** (5.98)	0.061 *** (6.79)	0.064 *** (7.49)	0.025 * (1.65)	0.057 *** (4.69)	0.075 *** (5.59)	0.069 *** (5.47)	0.012 (0.84)	0.043 *** (3.79)	0.032 *** (2.65)	0.067 *** (5.57)
Regional unemployment rate	-0.039 (-1.60)	-0.006 (-0.23)	-0.025 (-1.16)	-0.036 * (-1.67)	-0.023 (-0.58)	0.007 (0.15)	0.186 (0.49)	-0.009 (-0.24)	-0.077 ** (-2.43)	-0.045 (-1.48)	-0.057* (-1.79)	-0.057 * (-1.68)
Failed assets of regional banks		-0.000 (-1.17)	-0.001 (-1.28)	-0.000 (-0.48)		-0.001 (-1.10)	-0.001 (-0.84)	-0.001 (-0.66)		-0.000 (-0.68)	-0.001** (-1.99)	-0.000 (-0.47)
Regional coincident index		0.477 *** (3.69)				0.641 *** (3.29)				0.365 ** (2.11)		
National inflation rate	0.465 *** (7.30)	0.200 *** (3.01)		0.484 *** (5.78)	0.451 *** (4.82)	0.233 ** (2.37)		0.427 *** (3.31)	0.488 *** (5.58)	0.218 ** (2.39)		0.531 *** (4.61)
National house price gap	0.021 (1.38)				0.024 (1.06)				0.026 (1.27)			
National un-employment rate	-0.020 (-1.40)				-0.007 (-0.31)				-0.036 * (-1.81)			
National industrial Production gap	0.430 *** (13.92)	0.425 *** (12.85)		0.421 *** (12.93)	0.434 *** (9.47)	0.412 *** (8.41)		0.427 *** (8.87)	0.441 *** (10.43)	0.445 *** (9.84)		0.434 *** (9.71)
Commodity price index				0.020 *** (4.80)				0.020 *** (3.25)				0.019 *** (3.44)
Exchange rate index				-0.002 (-0.10)				-0.020 (-0.81)				0.013 (0.59)

Inflation forecast			0.335 *** (10.29)				0.283 *** (5.72)				0.508 *** (13.27)	
Unemployment rate forecast			-0.014 (-0.57)				0.004 (0.10)				-0.106 *** (-3.37)	
Industrial production forecast			0.059 *** (6.93)				0.068 *** (5.23)				0.072 *** (6.42)	
Tape			0.416 *** (5.98)	0.177 *** (2.79)			0.406 *** (3.84)	0.171 * (1.77)			0.280 *** (3.10)	0.187 ** (2.16)
Meeting			0.427 *** (5.17)	0.383 *** (4.59)			0.396 *** (3.25)	0.362 *** (2.94)			0.348 *** (3.08)	0.352 *** (3.06)
Board member			-0.083 ** (-2.03)	-0.083 ** (-2.01)								
Previous funds rate			-0.126 *** (-8.41)	-0.048 *** (-4.72)			-0.102 *** (-4.51)	-0.041 *** (-2.65)			-0.177 *** (-9.16)	-0.056 *** (-3.97)
Volcker			-0.632 *** (-5.45)	-0.713 *** (-7.27)			-0.665 *** (-3.86)	-0.619 *** (-4.23)			-0.015 (-0.12	-0.737 *** (-5.43)
Greenspan			-0.561 *** (-4.73)	-1.025 *** (-9.98)			-0.613 *** (-3.50)	-0.943 *** (-6.15)			0.262 *** (3.05)	-1.045 *** (-7.36)
Bernanke			-1.133 *** (-7.59)	-1.625 *** (-12.61)			-1.153 *** (-5.25)	-1.481 *** (-7.73)				-1.769 *** (-9.78)
Threshold 1	-1.019 *** (-10.20)	-0.949 *** (-21.48)	-0.109 (-0.00)	-2.232 (-0.02)	-1.014 *** (-6.81)	-1.017 *** (-14.13)	- 0.585 * (-1.85)	-1.735 *** (-8.52)	-1.071 *** (-8.10)	-1.178 *** (-7.66)	-0.107 (-.39)	-1.808 *** (-9.54)
Threshold 2	0.839 *** (8.42)	0.951 *** (21.69)	1.769 (0.01)	-0.300 (-0.00)	0.849 *** (5.73)	0.892 *** (12.60)	1.284 *** (4.05)	0.197 (0.99)	0.820 *** (6.24)	0.762 *** (5.03)	1.808 *** (6.54)	0.179 (0.97)
Rho	0.015 (1.56)	0.007 (1.15)	0.521 (0.00)	0.514 (0.00)	0.059 ** (2.46)	0.070 (1.58)	0.045 ** (2.08)	0.052 ** (2.19)	0.006 (0.87)	0.294 (1.30)	0.006 (0.93)	0.010 (1.13)
LR χ^2	363.19 ***	295.90 ***	413.14 ***	554.96 ***	169.13 ***	147.39 ***	185.21 ***	257.11 ***	206.42 ***	146.64 ***	238.38 ***	341.84 ***
Number of obs.	3264	2978	3264	3264	1472	1337	1472	1472	1792	1641	1792	1792

NOTE: The dataset includes 295 meetings from 1978M3 thru 2010M9. Dependent variable: *vote*. *t*-values in parentheses. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

TABLE 7

Marginal Effects for the Random Effects Ordered Probit Estimates of the Voting Model

		Full sample				Bank presidents sample				Board members sample			
Variable	Category	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Regional house price gap	-1	-0.35	-0.89	-1.35	-0.66	-0.41	-0.97	-1.21	-1.08	-0.21	-0.63	-0.55	-1.14
	0	-0.07	-0.07	0.44	-0.84	-0.14	-0.18	-0.38	-0.38	-0.03	-0.29	-0.09	-0.20
	+1	0.42	0.96	0.91	1.50	0.55	1.15	1.59	1.46	0.24	0.93	0.64	1.34
Regional unemployment rate	-1	0.67	0.11	0.54	0.36	0.37	-0.11	-0.30	0.14	1.34	0.67	0.99	0.96
	0	0.15	0.01	-0.17	0.47	0.12	-0.02	-0.10	0.05	0.21	0.31	0.16	0.17
	+1	-0.82	-0.12	-0.37	-0.83	-0.49	0.13	0.40	-0.19	-1.55	-0.98	-1.15	-1.13
Failed assets of regional banks	-1		0.01	0.01	0.00		0.02	0.02	0.01		0.01	0.02	0.00
	0		0.00	-0.00	0.00		0.01	0.00	0.01		0.00	0.00	0.00
	+1		-0.01	-0.01	-0.00		-0.03	-0.00	-0.02		-0.01	-0.02	-0.00
Regional coincident index	-1		-8.66				-11.03				-5.39		
	0		-0.73				-2.02				-2.49		
	+1		9.39				13.05				7.88		
National inflation rate	-1	-7.98	-3.63		-4.95	-7.29	-4.01		-6.39	-8.55	-3.22		-8.96
	0	-1.72	-0.31		-6.38	-2.40	-0.73		-2.29	-1.34	-1.49		-1.58
	+1	9.70	3.94		11.33	9.69	4.74		8.68	9.89	4.71		10.54
National house price gap	-1	-0.36				-0.39				-0.46			
	0	-0.08				-0.13				-0.07			
	+1	0.44				9.52				0.53			
National un-employment rate	-1	0.35				0.11				0.63			
	0	0.07				0.03				0.10			
	+1	-0.42				-0.14				-0.73			
National industrial Production gap	-1	-7.39	-7.71		-4.30	-7.00	-7.10		-6.67	-7.74	-6.58		-7.31
	0	-1.60	-0.65		-5.55	-2.31	-1.30		-2.39	-1.22	-3.01		-1.29
	+1	8.99	8.36		9.85	9.31	8.40		9.06	8.96	9.63		8.60
Commodity price index	-1				-0.20				-0.31				-0.32
	0				-0.26				-0.11				-0.06
	+1				0.46				0.42				0.38
Exchange rate index	-1				0.02				0.32				-0.23
	0				0.02				0.11				-0.04
	+1				-0.04				-0.43				0.27
Inflation forecast	-1			-7.39				-4.59				-8.83	
	0			2.39				-1.46				-1.42	
	+1			5.00				6.05				10.25	
Unemployment rate forecast	-1			0.31				-0.06				1.84	
	0			-0.10				-0.02				0.30	
	+1			-0.21				0.08				-2.14	

	-1	-1.29	-1.10	-1.25
Industrial production forecast	0	0.42	-0.35	-0.20
	+1	0.87	1.45	1.45

APPENDIX

TABLE A1
Definitions and Sources of Variables

Variable	Definition	Data sources
	Dependent Variable	
Dissent	FOMC member from Federal Reserve district *i* dissents either in favor of tighter (+1) or easier (-1) monetary policy or agrees with the majority (0)	FOMC voting *minutes*
Vote	FOMC member from Federal Reserve district *i* votes in favor of interest rate increase (+1), interest rate decrease (-1), or unchanged interest rate (0)	FOMC voting *minutes*
	Regional variables[a]	
Regional house price gap	Percentage deviation of district *i*'s house price index from time trend State-specific house price gap is calculated as percentage difference between state-specific house price index and Hodrick-Prescott-based time trend; smoothing parameter for the Hodrick-Prescott filter was set to 1,600; quarterly house price indexes are interpolated to monthly data using the cubic spline method District-specific house price gap is the weighted average of state-specific house price gaps (district boundaries are taken from Chappell et al. (2008)), population shares are used as the weighting scheme	House price index for U.S. states: Federal Housing Finance Agency Resident population: Census Bureau
Regional unemployment rate	Difference between unemployment rate in *i*'s district and national unemployment rate District unemployment rate is the weighted average of state-specific unemployment rates (district boundaries are taken from Chappell et al. (2008)), population shares are used as the weighting scheme	National and state unemployment rate: Bureau of Labor Statistics Resident population: Census Bureau
Failed assets of regional banks	Failed assets of insolvent banks per capita in district *i* District failed assets is the weighted average of price-deflated state-specific failed assets (district boundaries are taken from Chappell et al. (2008)), population shares are used as the weighting scheme	Failed assets: Federal Deposit Insurance Company Resident population: Census Bureau Consumer price index: Bureau of Labor Statistics
Regional coincident index	Index reflects current economic conditions in a state combining nonfarm payroll employment, average hours worked in manufacturing, the unemployment rate, and wage and salary disbursements. The trend for each	Federal Reserve Bank of Philadelphia

	state's index is set to the trend of its gross domestic product (GDP), so long-term growth in the state's index matches long-term growth in its GDP. Index is used as month-over month percentage change. Difference between coincident index in voter *i*'s district and national coincident index District coincident index is the weighted average of state-specific coincident indexes (district boundaries are taken from Chappell et al. (2008)), population shares are used as the weighting scheme	
	National Variables[b]	
National house price gap	Percentage deviation of national house price index from Hodrick-Prescott-based time trend; smoothing parameter for the Hodrick-Prescott filter was set to 1,600; quarterly house price indexes are interpolated to monthly data using the cubic spline method	House price index for the U.S.: Federal Housing Finance Agency
National unemployment rate	National unemployment rate	National unemployment rate: Bureau of Labor Statistics
National inflation rate	Month-over-month percentage change in consumer price index	Consumer price index: Bureau of Labor Statistics
National industrial production gap	Percentage deviation of national industrial production index from Hodrick-Prescott-based time trend; smoothing parameter for the Hodrick-Prescott filter was set to 14,400	Industrial production: Board of Governors
Commodity price index	Quarter-over-quarter percentage change in S&P GSCI Commodity Spot Price Index	S&P GSCI, drawn from Datastream
Exchange rate index	Quarter-over-quarter percentage change in trade weighted nominal dollar exchange rate index; higher values indicate depreciation of the U.S. dollar	Federal Reserve, drawn from Datastream
Inflation forecast	Inflation forecasts are made by professional forecasters published in the quarterly Survey of Professional Forecasters	Inflation forecast: Federal Reserve Bank of Philadelphia
Unemployment rate forecast	Unemployment rate forecasts are made by professional forecasters published in the quarterly Survey of Professional Forecasters	Unemployment rate forecast: Federal Reserve Bank of Philadelphia
Industrial production forecast	Industrial production forecasts are made by professional forecasters published in the quarterly Survey of Professional Forecasters	Industrial production forecast: Federal Reserve Bank of Philadelphia
Previous funds rate	Federal Funds Rate of the Wednesday prior to the FOMC meeting	Federal funds rate: Board of Governors
	Institutional Dummy Variables	
Tape	Dummy variable indicating the date since when FOMC members were aware of the fact that the meetings	FOMC voting *minutes*

	are being tape recorded; equals 1 from 1993M11 thru 2010M9and 0 otherwise	(November, 16 1993)
Meeting	Dummy variable; equals 1 if vote cast at face-to-face meeting, 0 if vote cast at conference call	
Board member	Dummy variable; equals 1 if vote cast by Board member, 0 if vote cast by Bank president	
Volcker	Dummy variable; equals 1 if FOMC chairman is Volcker, 0 otherwise; reference category is the chairmenship of Arthur Miller	
Greenspan	Dummy variable; equals 1 if FOMC chairman is Greenspan, 0 otherwise; reference category is the chairmenship of Arthur Miller	
Bernanke	Dummy variable; equals 1 if FOMC chairman is Bernanke, 0 otherwise; reference category is the chairmenship of Arthur Miller	

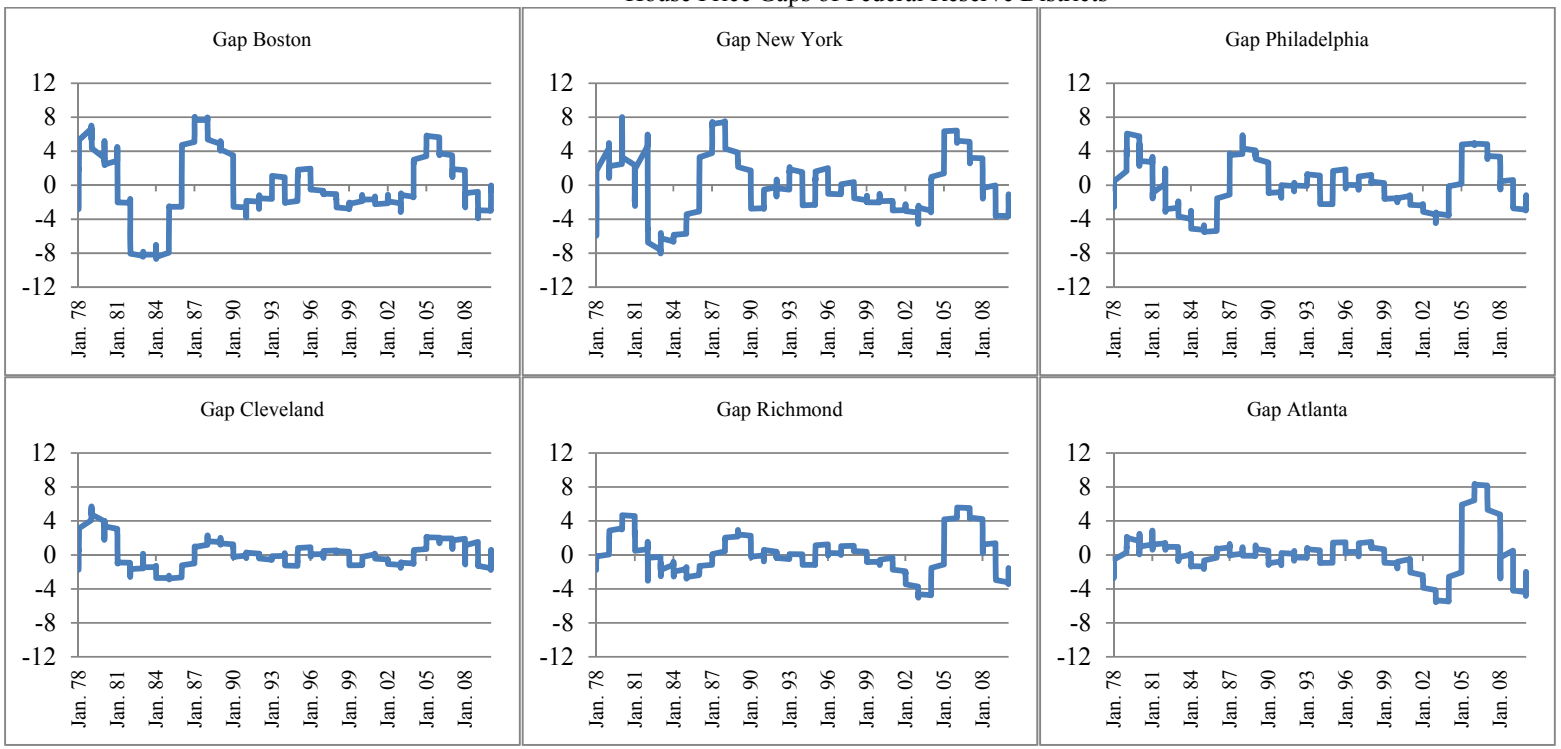
NOTES: [a, b] Regional and national variables are lagged 1 month.

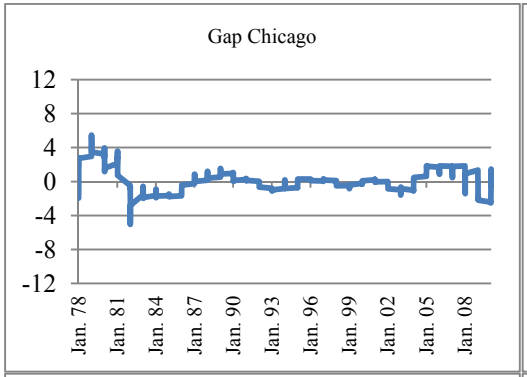
TABLE A2

Descriptive Statistics of Selected Determinants (Full Sample)

Variable	Mean	Std. dev.	Min	Max
Regional house price gap	-0.050	2.744	-9.926	12.527
Regional unemployment rate	-0.157	0.973	-3.182	3.140
Regional failed assets	8.080	52.769	0	1492.325
Regional coincident index	-0.002	0.182	-1.265	1.039
National house price gap	0.207	1.990	-4.162	5.552
National unemployment rate	0.109	2.831	-8.511	10.204
National industrial production gap	0.037	1.436	-7.025	4.468
National inflation	0.373	0.364	-1.803	1.430
Previous funds rate	6.580	4.127	0.110	18.840
Commodity price index	0.265	5.252	-13.086	21.103
Exchange rate index	0.269	1.307	-3.442	3.443
Inflation forecast	3.924	2.263	1.236	9.461
Unemployment rate forecast	6.361	1.426	4	10.1
Industrial production forecast	3.102	2.797	-6.502	8.983

FIGURE 1
House Price Gaps of Federal Reserve Districts

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4
0
-4
-8
-12
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Jan. 81
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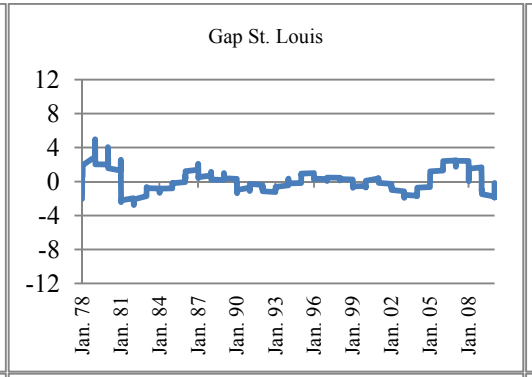
Jan. 93
Jan. 96
Jan. 99
Jan. 02
Jan. 05
Jan. 08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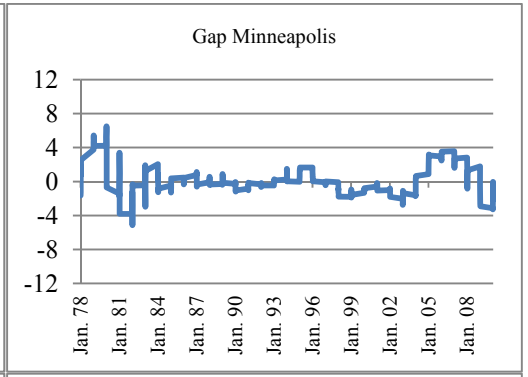
Jan. 02
Jan. 05
Jan. 08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Jan. 05
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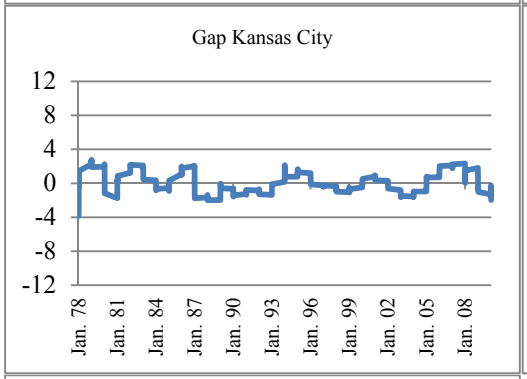
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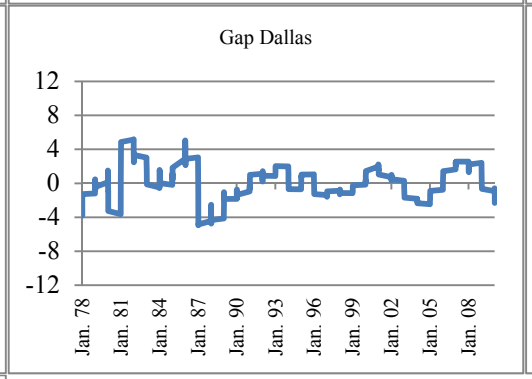
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Jan. 02
Jan. 05
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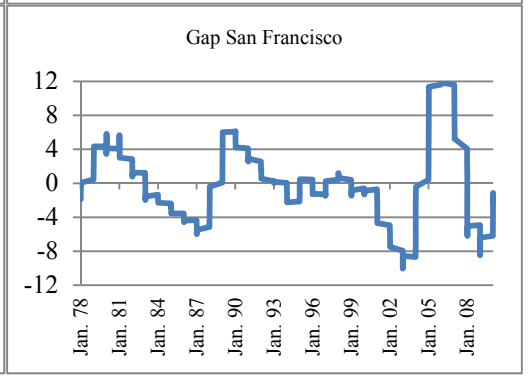
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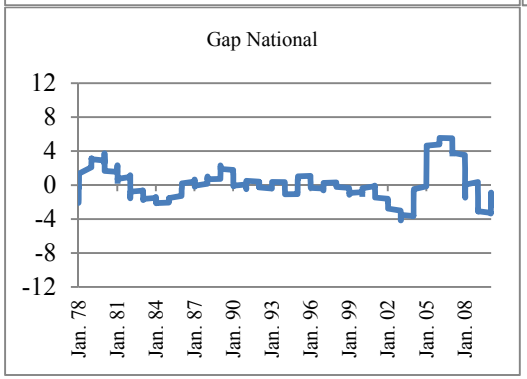
Jan. 02
Jan. 05
Jan. 08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Jan. 93
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Jan. 99
Jan. 02
Jan. 05
Jan. 08