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"Consumer Credit, Liquidity, and the Transmission Mechanism of Monetary Policy"

by

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That the lending channel is alive and well for consumer lending is at first glance a compelling notion given the growth in consumer credit. However, this paper demonstrates with disaggregated monthly and quarterly consumer credit data that the consumer loan-supply effect has diminished over time. Contrary to assumptions motivating the lending channel, households are not constrained in accessing credit from any lender (or in any form) in response to a monetary shock. The findings of this paper have important implications for research on the monetary transmission mechanism beyond the lending channel and for business cycle research in general.

1 Introduction

Despite calls for its obsolesce, the lending channel of the monetary transmission mechanism continues to generate interest among monetary economists. Recently, Den Haan, Sumner and Yamashiro (2007) find the loan-supply effect is evident for consumer lending and real estate loans in data up through 2004. The loan-supply effect, or lending channel, arises in the transmission mechanism if tight monetary policy forces banks to contract the supply of loans independent of a direct interest rate-effect (*i.e.*, the "liquidity effect"), and such a contraction has real effects for bank-dependent borrowers. While some, such as Perez (1998) and Ashcraft (2006), have emphasized the lending channel's lack of relevance for the monetary transmission mechanism, Den Haan, Sumner and Yamashiro's (2007) results support a number of recent papers that offer detailed and disaggregated reasons why the channel is alive and well for certain lenders and borrowers. Kashyap and Stein (2000), for example, identify the lending channel through the lending of small banks relative to large banks, emphasizing a key implication of the lending channel literature—that the lending channel operates through small lenders and small borrowers (Gertler and Gilchrist (1993, 1994) emphasized the role of small firms in the channel; for recent studies see Nilsen (2004), Peek, Rosengren, and Tootell (2003), Kashyap and Stein (1995), and Kishan and Opiela (2000)). Den Haan, Sumner and Yamashiro's (2007) findings suggest that the role of the consumer in the lending channel—a small borrower historically thought to be dependent on small banks—may be deserving of more attention.[1]

This papers asks whether consumer lending is, or has become, a significant component of the lending channel (even if it was not thought crucial in lending channel studies published in the 1990s). Specifically, I take a closer look at the statistical and possible economic significance of the consumer loan-supply effect with disaggregated monthly consumer credit data from both commercial bank and non-bank sources, and for the nonrevolving and revolving components of consumer credit from each source. In addition, I examine disaggregated quarterly consumer loan data from commercial banks, for all banks and separately for both large and small banks (as defined in the manner of

Kashyap and Stein (2000)). From this array of data, spanning 1968 through early 2007, I can consider statistically the key assumptions of the lending channel with respect to consumer lending, and then from that evidence, consider the possible economic significance of the channel.

To examine the consumer lending channel statistically, I use a well-established strategy in the lending channel literature to test the assumptions of the channel on all fronts—that households may be forced to use more expensive non-bank credit as bank credit declines, that a household might switch into more costly revolving credit as installment loans decline, or that households are particularly affected by an attachment to small banks. To do so, I first estimate monthly vector autoregressions (VARs) for the disaggregated consumer loan components mentioned above, with the monthly data spanning 1968 to 2006.[2] In this way, I follow the examples of numerous lending channel studies in two crucial respects. First, I examine disaggregated data to discern evidence of the loan-supply effect.[3] And second, I follow the lending channel literature in assuming short run restrictions to identify the structural VAR and estimate the associated impulse response functions. This close adherence to the VAR tradition with the short-run restrictions is meant to compare as closely as possible the results of this paper to the rich body of lending channel literature.[4] For robustness, this paper also employs Jordà's (2005) linear projection technique, the latter of which provides conditional standard errors to aid in the statistical inference of impulse response functions (see also Jordà (2007), and further discussion in section 3).

In addition, I estimate with quarterly data on installment (nonrevolving) consumer loans and disaggregated data on credit card lines, which includes both credit card balances and data on the "unused portion of credit card lines," which represent the pre-commitments that commercial banks have to credit card lines. This data set, obtained from the Call Reports collected by the Federal Deposit Insurance Corporation (FDIC), provides multiple benefits. First, assessing the quarterly data along side the monthly data provides for more robust inference in identifying the lending channel. This follows explicitly the example of Den Haan, Sumner and Yamashiro (2007).[5] And second, I draw from credit card research to motivate the short-run restrictions used in identifying the structural VAR with the quarterly data set (Gross and Souleles (2002), and Castranova and

Hagstrom (2004) are examples of studies on credit card lines). Given the structural assumptions, one can then control for the unused supply of credit card lines in inferring the statistical and economic significance of the loan-supply effect. And finally, with the quarterly panel data I am able to separate large-bank consumer lending from small-bank consumer lending since 1972 (delineated by asset percentile, as in Kashyap and Stein (1995)). Complete details of the monthly and quarterly applications, including various checks for the robustness of the specifications, are provided in section 3.

In preview of the results, ultimately the consumer credit data analyzed in this paper suggest both the statistical (and by extension, the economic) significance of the consumer loan-supply effect is weak; in the least, the effect has weakened over time. While monthly consumer credit data from commercial banks from 1968 through 2006 substantiates previous research on consumer lending— matching the decline documented by Gertler and Gilchrist (1994) and Den Haan, Sumner and Yamashiro (2007)—after 1984 the responses of both nonrevolving and revolving consumer credit is not consistent with the lending channel. Instead, both series increase, similar to the result found by Den Haan, Sumner and Yamashiro (2007) for commercial lending (in fact, total nonrevolving and revolving consumer credit increase for two years after the monetary shock). Also after 1984, the data does not support the notion that households are forced to rely on credit cards in lieu of access to installment loans, or rely on non-bank sources of credit in lieu of bank credit. The quarterly data help corroborate the inference on the monthly data. Notably, while before 1984 the loan-supply effect is evident for consumer lending from small banks and not large banks (consistent with Kashyap and Stein (2000)), this effect does not appear after 1984. Instead, small bank consumer lending increases for up to two years after the shock along with a slight increase for large bank consumer lending (consistent with the impulses noted for the monthly data for all banks).

Overall, the results of this paper have implications for the transmission mechanism of monetary policy. While combined recent studies on small banks and consumer lending identify a consumer loan-supply effect over the last four decades, this paper notes the statistical significance of this effect has diminished in the last twenty years. Indeed the statistical evidence casts doubt on

the economic significance of the consumer lending channel. While the economic significance of the lending channel has long been uncertain (if not very weak, as noted by Perez (1998), Ashcraft (2006) and others), developments in consumer lending over the last three decades (and the growth of credit card lending, in particular) may suggest to some that the relevance of a consumer loan-supply effect is greater than was considered in the literature only a decade ago. Recent data and empirical studies support a key assumption of the lending channel, that consumers are liquidity-constrained in credit markets, and may have become increasingly constrained over time.[6] The statistical evidence in this paper, however, suggests monetary policy has little real effect on consumers through the lending channel.

In particular, the impulse response functions cited in this paper suggest households are not reliant on one type of lender or type of credit, implying households are not constrained in credit markets, at least not in the aggregate. Instead, the data are consistent with the notion that the expansion of consumer credit markets has alleviated liquidity-constraints for households. If so, households can smooth consumption in the face of policy or economic shocks in general. For monetary policy, this should temper the propagation of monetary shocks, or at least, render less effective efforts by monetary policy to stimulate aggregate demand. The lack of evidence supporting the lending channel for post-1984 data support that possibility.

On two related notes, the analysis on consumer credit data in this paper also calls into question the effectiveness of short run fiscal policy (see Coronado *et al.* (2005), and Johnson *et al.* (2006), for analysis of recent fiscal stimuli), and speaks to the discussion on the "Great Moderation" of the macroeconomy documented by McConnell and Perez-Quiros (1999) and others.[7] While many are quick to associate the moderation with the steady hand of the Federal Reserve, the developments in consumer credit markets, and the data on consumer credit examined here, suggest structural forces are certainly part of the story. In the least, more liquid consumer credit markets, and the associated lack of a consumer lending channel, imply that accommodative aggregate demand policy has less control over short run conditions.

The particulars of these implications are taken up below. The next section outlines first the

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general findings of lending channel literature and its relevancy for households. The latter half of the section then provides descriptive data on consumer credit that suggest the assumptions of the lending channel no longer fit for households. Thereafter, the empirical analysis is presented in detail.

2   The Lending Channel and Consumer Credit

In the lending channel of the transmission mechanism, contractionary monetary policy can force constrained commercial banks (constrained on both sides of their balance sheet) to restrict lending independent of the demand for loans (see Bernanke and Gertler (1995) for a detailed survey). For borrowers dependent on commercial banks, contractionary monetary policy restricts their main source of credit and increases the costs of seeking alternative sources (see Kashyap and Stein (1995), and Gertler and Gilchrist (1993, 1994) for detailed discussions). As such, the most compelling literature on lending effects focuses on the relationship between small banks and small borrowers. Kashyap and Stein (1995, 2000), and Gertler and Gilchrist (1993, 1994) provide a combination of empirical evidence showing that small commercial banks do contract lending after a negative policy shock (while larger banks do not), and small firms are affected by that contraction (see also Kishan and Opiela (2000)). The "small" commercial bank assumption is important, since it is assumed the small borrower relies on a special relationship with the small bank for its credit, and finds it difficult to get credit from larger banks, or from non-bank alternatives.

For households, Gertler and Gilchrist (1994) show that consumer loans decline significantly following a monetary policy shock, while Ludvigson (1998) finds evidence of a loan-supply effect through auto loans. With updated data, Den Haan, Sumner and Yamashiro (2007) find similar results for consumer loans (they find no such lending effect for commercial and industrial loans). These lending channel studies corroborate the assumptions of the lending channel hypothesis that small, liquidity-constrained borrowers suffer when monetary policy forces banks to contract lending. Indeed, the support for the importance of liquidity constraints motivating a consumer loan-supply

effect is well-documented in the consumption literature. As mentioned above, recently, Gross and Souleles (2002) suggest credit card borrowing is indicative of the continued relevance of liquidity constraints. At the same time, households have been traditionally dependent on small, local banks for finance (see Berger *et al.* (1995)). Den Haan, Sumner and Yamashiro's (2007) result, in particular, suggests that consumer lending may be a last viable component of lending channel (as other studies, including Den Haan et al. (2007) have found little to weak evidence for a lending channel for firms—see Ashcraft (2006) and Nilsen (2002), and Peek, Rosengren and Tootell (2003), the latter of which is more supportive of a loan-supply effect for firms).

However, as compelling as the imagery of the liquidity-constrained household may be in invigorating lending channel enthusiasts, the lending channel through consumer lending may have diminished over time. Various strands of economic research suggest that factors such as deregulation, commercial bank consolidation, and other aspects of structural change in financial markets have increased consumer lending to all households (see Athreya (2002)). One implication is that consumer lending from commercial banks has increased overall and is now predominately the province of large, national banks. Credit card lending, for example, requires the economies of scale best handled by a large organization (Peek and Rosengren (1998)). In the least, a glance at consumer credit data suggest the motivating assumptions behind the lending channel do not hold.

2.1 Some descriptive consumer credit data

First, consumer credit data suggest households are not dependent on small commercial banks as the lending channel tradition assumes (or perhaps never were to the extent assumed), nor do households want for non-bank sources of credit (see Peek and Rosengren (1998) for discussion on the first point). With respect to the former, the top five percent of all commercial banks (in total assets) are now primarily responsible for consumer lending, especially credit card lending. By the end of 2002, banks above the 95th percentile in total assets accounted for 90 percent of consumer lending from commercial banks, and 97 percent of credit card lending. Twenty years prior, the same group of banks accounted for approximately 60 percent and 93 percent, respectively (with

the latter category growing from approximately 23 billion dollars to 300 billion dollars).[8]

Moreover, from all lenders, revolving consumer credit (credit card lending) has increased from 25 billion dollars in 1971 to 770 billion dollars by the end of 2006.[9] That represents an increase in the revolving component as a share of total consumer credit of 5 percent to 36 percent, respectively. Figure 1 displays these increases relative to installment bank loans (for total banks, and for large and small banks) along with comparative series for non-bank installment and revolving loans.[10] The increase in credit card lending is dominated by banks, while non-banks have increased their share of installment loans relative to banks.[11] One will also note the decline in installment lending by small banks and the relative increases of both loan categories for large banks.[12]

Figure 1

The growth of credit card lending, in particular, suggests the lending channel may be weaker. Unlike installment consumer loans, a credit card holder has the option of using the unused portion of their credit card line immediately. This liquidity option is not fixed but may increase even as balances increase. As discussed by Gross and Souleles (2002) extensions of credit card limits are typically based on duration since the card was issued, increasing at predetermined intervals or set by other institutional rules. Hence, credit card liquidity may remain well after a negative income shock has occurred (even if the bank eventually curtails its offers of additional cards or lowers existing limits). Therefore, even in the face of tighter monetary policy, credit cards offer households immediate liquidity in the current period and potential liquidity in future periods. This implies that even in the face of tighter monetary policy, households may be able to access the loan before lenders can or will lower the limit. In other words, the constraint only binds once the available liquidity is exhausted. In the lending channel, this would occur if lenders lower the limit to the level of the existing balances, which may or may not occur immediately or at all. This would depend on the lenders likelihood of lowering the limit in the aggregate and to a level where the constraint binds.[13]

Indeed, the amount of available liquidity on credit cards dwarfs the level of balances—as measured on and off bank balance sheets.[14] For example, for the second quarter of 2007 the amount of the unused portion of credit card loans in the aggregate was just over three trillion dollars (constant 2000 dollars), while combined on and off-sheet balances totaled just over seven billion 2000 dollars for the same quarter. This utilization rate of just over twenty percent is consistent since approximately 2000. Figure 2 displays the unused portions of credit card lines and the real balances of credit cards as reported in the Call Reports and collected by the FDIC since 1990. More noteworthy than the growth of credit card balances is the available liquidity.

Figure 2

Based on the smattering of descriptive evidence discussed thus far, it would seem that in the aggregate households are not liquidity-constrained.[15] In other words, the consumer credit data suggest that the lending channel for consumers may have been affected by the expansion of consumer lending. With this in mind, in the next section, I document the consumer lending channel using VAR techniques.

3 Testing for the Consumer Lending Channel

To consider the consumer credit data more formally, I search for evidence of the loan-supply effect by comparing disaggregated bank and non-bank loan data, at both the monthly and quarterly frequency (though the non-bank data are only at the monthly frequency). This follows the general strategies of Gertler and Gilchrist (1993, 1994), Kashyap and Stein (1995, 2000), Ashcraft (2006), and Den Haan, Sumner and Yamashiro (2007). I examine disaggregated consumer credit across bank and non-bank sources, and across the nonrevolving and revolving components of each, and for small and large banks (by assets). In addition, I then compare and contrast the behavior of the disaggregated components across time. Comparing disaggregated loan categories tests the lending channel in the following ways:

1. *Ceteris paribus*, if a bank contracts its supply of installment loans, the revolving component may still increase as consumers rely on those loans to offset the traditional lending channel effect. In this way, the lending channel may have real effects as households typically pay more for revolving credit than installment credit.

2. *Ceteris paribus,* if a bank contracts its supply of either nonrevolving or revolving loans, non-bank loans may increase. This, too, suggests an increase in costs for households which may affect real spending.

3. If non-bank sources of credit are more wide-spread than in the past, or households simply are not dependent on small banks as suggested in section 2, then the lending channel may have less economic (and statistical) significance than in the past.

3.1 The VAR and Sample Selection

I estimate a VAR that includes monthly real consumption expenditures, real nonrevolving consumer credit, real revolving consumer credit, the personal consumption expenditure deflator, and the federal funds rate.[16] Real consumption and the consumer loan components are in log-levels (multiplied by 100), while the deflator and the federal funds rate are in their natural units. All data where relevant are seasonally adjusted and in 2000 constant dollars. The specification is standard in that I include a variable capturing real activity, a price index, a variable representing monetary policy and either aggregate or disaggregate credit variables.[17] Variants on that general specification can be found in what is now a rich monetary literature employing VAR analysis, including Bernanke and Blinder (1992), Gertler and Gilchrist (1993, 1994), Kashyap, Stein and Wilcox (1993), Ludvigson (1998), Christiano, Eichenbaum and Evans (1999), and recently, Den Haan, Sumner and Yamashiro (2007), and Ashcraft (2006). As detailed in Christiano, *et al.* (1999) this combination of literature (as well as the more recent papers) provide a consistent picture of how both real and financial variables respond to monetary policy.

Given the nature of the monthly consumer credit data, the estimated VAR must be modified

by sample (note the quarterly data alluded to earlier, which allows for the bank size comparison, will be discussed later). Hence the samples are selected as follows:

- Commercial bank credit is estimated from 1968 through 2006. Though nonrevolving consumer bank credit begins in 1959, revolving bank credit begins in 1968. Hence I restrict the estimation beginning in 1968.[18]

- Non-bank credit is estimated over the period 1984 through 2006. Nonrevolving non-bank credit, though it begins in 1959, contains a jump in the mid-1970s. And revolving non-bank credit does not begin until December 1984. Hence, the non-bank category is restricted by the latest date. Note, too, that when comparing non-bank to bank credit, the comparison occurs for the 1984 through 2006 period.

- Finally, to compare the behavior of the commercial bank loans across time, I compare the period 1968 through 1983 to 1984 through 2006.

The separation of the sample in 1984 is motivated by a number of factors (in addition to facilitating the comparison with the non-bank loans). First, with respect to consumer credit markets, this break serves to delineate the deregulated consumer credit environment from the earlier period (see the discussion in section 2). In addition, recent research has shown that the macroeconomy overall has been less volatile since the middle of the 1980's than before (see McConnell and Perez-Quiros (1999), and Ahmed, Levin and Wilson (2002)). Corroborating this research, Brady (2008) finds statistical breaks in consumption and its components at various dates in the mid-1980s, and breaks in total and revolving credit in both the mid-1980s and in the 1990s (see Brady (2008) for more details and explanations of those breaks). As a generalization of the breaks found in this research, I split the sample in this paper with the end of 1983 and the first month of 1984. Lastly, one can also interpret this break as signifying a pre-Greenspan era from the Greenspan era at the Federal Reserve, which began in 1987.[19]

Lastly, short run restrictions are assumed in order to identify the structural VAR. In practice

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this is achieved by recursive identification through a Cholesky decomposition with the variables ordered as listed above. In making this assumption, I follow what has been a standard identification practice with VARs in the credit channel literature. Since the purpose of this paper is to consider the implications of consumer credit within that tradition of evidence, I adhere closely to the practice of that literature. A lag length for estimating each VAR is chosen by the corrected-AIC (which is a modified version of the AIC—see Hurvich and Tsai (1989)). A lag length of four proved sufficient for the general specification (regardless of the particular loan categories included).[20]

Note that for robustness, I estimate impulse response functions by two related methods: the first with a standard VAR, and the second by the local projection method of Jordà (2005). Though the two methods will prove to offer similar estimates for the impulse response functions reported below, the latter method allows one to report both unconditional and conditional standard error bands for each impulse response function (where the former are from the estimation of the standard VAR). In particular, Jordà (2007) provides the insight that the typical standard error bands (i.e., the $\pm 1.96 \times$ standard error) reported along with impulse response functions may be misleading. These standard error bands assume that individual coefficients that make up the impulse response function are uncorrelated. In fact, as Jordà (2007) notes, the coefficients have a natural temporal ordering with the period t's realization dependent on the realization of the function up to that point. While reporting typical standard error bands—what are the unconditional standard errors around each coefficient at each horizon h—provides an approximation, such bands ignore the conditional nature of the coefficient estimates. In other words, the typical 95 percent confidence band may over-estimate the confidence interval for the impulse response function. Hence, Jordà (2007) provides conditional standard error bands which, given the temporal ordering of the impulse response functions, are constructed from a Cholesky decomposition of the Newey-West corrected variance-covariance matrix estimated for the impulse response coefficients. These bands define the region for $\hat{\beta}_i$, given the prior $\hat{\beta}_j$'s.[21] In the interest of brevity I refer the reader to Jordà (2005) and Jordà (2007) for details of the local projection method.

The figures that follow display the impulse response functions calculated from the linear pro-

jection method along with the unconditional standard error bands, and the conditional standard error bands, referred to from here on in as the conditional confidence bands. The impulse response functions calculated from the linear projections prove to match closely those calculated from the standard VAR, hence, the discussion of the results focuses on the former.[22]

3.2 Results for monthly consumer credit

Figure 3a displays the responses of nonrevolving bank credit and revolving bank credit across the sample. The first panel displays the response for nonrevolving bank credit from 1968 through 2006, and for the split samples to a one-standard deviation shock to the Federal Funds rate. From 1968 through 2006, the nonrevolving component reaches a trough at about two years and remains below zero for almost another two years. With the unconditional standard errors bands the series is statistically significant for up to thirty months, while the conditional confidence bands suggest statistical significance up to 48 months. The response of nonrevolving consumer loans for this period is consistent with the credit channel literature cited above, in particular, with the recent finding by Den Haan, Sumner and Yamashiro (2007) for their sample from 1960 through 2003.[23] Moreover, Figure 3b displays the results for the additional regressors. The impulse response functions are similar to those found in the lending channel literature. Consumption declines in response to the shock and the behavior of the price deflator is also consistent with the literature for the entire sample (though the "price puzzle" disappears in the latter part of the sample).

The shorter time period, up through 1983, offers a similar picture as the full sample, though in the former the statistical significance lasts for, at most, 29 months. However, this result does not hold after 1983. The impulse response function for nonrevolving consumer loans after 1983 is positive for up to two years, with the conditional confidence bands statistically significant up to that point as well (though the traditional standard error bands show weak statistical significance). Though this result stands in contrast to the earlier part of the sample, it is consistent with Den Haan, Sumner and Yamashiro's (2007) result for commercial and industrial loans (but not, of course, their result for consumer loans), suggesting that consumer lending, too, is not consistent

with the lending channel after 1983.[24]

Figure 3

The impulse response functions for the revolving component of bank consumer loans displayed in the second row of Figure 3a matches the general behavior of the nonrevolving component for the full sample. The decline in the series from 1968 through 2006 is statistically significant for at least 32 months, and as long as 52 months (for the traditional standard error bands and the conditional confidence bands, respectively). For the 1968 through 1983 sample, however, the response is statistically significant for approximately up to 11 months, though the loan category increases for up to about six months and then series declines thereafter. This may suggest a substitution occurring into the revolving component. This possibility disappears, however, over the 1984 through 2006 time period. Similar to the nonrevolving component, the revolving series increases for more than two years and is at least statistically significant for about 15 months.

In conjunction, looking at these two consumer loan components offers little support for the lending channel after 1983. The diminished lending channel story is made more compelling by considering non-bank sources of consumer credit for the 1984 to 2006 sample (again, analysis for the non-bank components are restricted by the lack of data before 1984). Figure 4 displays the responses for nonrevolving non-bank credit and revolving non-bank credit. Contrary to bank nonrevolving credit over this period, the nonrevolving component declines immediately and reaches a trough three years after the shock. However, similar to bank revolving credit, non-bank revolving credit increases, and is statistically significant for up to approximately 18 to 20 months.[25] Figure 4 also displays the two sources of credit aggregated, along with total consumer credit (which includes all possible sources including credit unions, for example). The response of the combined bank and nonbank data is essentially zero of up to two years, while the total series responds similarly. Ultimately, the behavior of either series does not support the lending channel after 1983; there does not appear to occur a substitution into non-bank finance.[26]

Figure 4

3.2.1 Implications for the Lending Channel

With the picture(s) thus formed, we can summarize the implications for the bank lending channel:

1. Recall, if a bank contracts its supply of installment loans, the revolving component may still increase as consumer rely on those loans to offset the traditional lending channel effect. Both nonrevolving credit and revolving bank credit respond similarly across the sample period. In the early sample, it is less likely households could easily offset the decline in installment loans with a credit card loan, so this result is not surprising. In the 1984 to 2006 sample, both categories show a positive response. In the least, the contrast between the two split samples shows very little support for the bank lending channel.

2. Recall, if a bank contracts its supply of either nonrevolving or revolving loans, non-bank loans may increase. There is little evidence of such a substitution occurring. In fact, non-bank installment loans show more of a decline than bank installment loans in the 1984 through 2006 sample. This would suggest that loan demand is behind the decline as opposed to a supply effect. And similar to the bank revolving loans, non-bank loans increase following the shock.

3. If the changes in consumer credit discussed briefly in section 2 have affected both how consumers receive credit and use credit, the lending channel effect will die out over time. This seems evident in the split-sample comparison. This positive behavior for consumer lending matches the response of commercial and industrial loans documented by Den Haan, Sumner and Yamashiro (2007), consumer loans increase for up to a year in the latter sample.

The data for both bank and non-bank consumer loans suggest the lending channel operating through consumer lending has weakened. While for the overall sample, the data match previous

literature, if we compare the pre and post 1983 samples, the lending channel appears diminished. This is consistent with recent literature on the "Great Moderation," (see McConnell and Perez-Quiros (1999), and Ramey and Vine (2005) for examples). In particular, the response of consumer lending in the face of a monetary shock is consistent with consumption smoothing evidence documented in Brady (2008), and supports the argument of Dynan, Elmendorf and Sichel (2006) that developments in credit markets help explain the decline in macroeconomic volatility. Moreover, this evidence for consumer lending is consistent with the findings of Perez (1998) and others that find the lending channel is not likely a significant channel—statistically or economically—in the transmission mechanism any longer.

3.3 Quarterly Consumer Lending and Credit Card Liquidity

For additional robustness, in the next two sub-sections I consider further the loan-supply effect by focusing on quarterly data on consumer lending. The quarterly data allows three additional perspectives on the loan-supply effect. First, this follows the example of Den Haan, Sumner and Yamashiro (2007) in examining multiple data sets (both monthly and quarterly) in considering the lending channel. Second, as part of that effort, the quarterly data allow me to incorporate data on aggregate credit card balances and data on the available liquidity from credit cards, together which make up aggregate credit card lines. And third, the quarterly data allow me to compare consumer lending from both large and small banks. This distinction, as noted in Section 2, is found to be important in lending channel research.

The data are from the Call Reports of all insured commercial banks in the United States (made available by the FDIC). This panel data set (aggregated for the estimation) includes, in addition to consumer installment loans, credit card balances and the portion of credit card lines that have yet to be used, defined appropriately as the "unused portion of credit card lines." This variable may be useful to consider in the context of the lending channel since it captures the liquidity option of credit cards and may help one distinguish between demand and supply in response to a contractionary monetary policy shock.

This is based on the simple conjecture that one can identify and infer a loan-supply effect with narrative evidence on the institutional rules governing credit card limits. As discussed briefly in section 2, Gross and Souleles (2002) find that limit changes are predominately based on institutional rules and only a small portion of limit changes are from borrower request (and the latter is typically associated with a request for an *increase* in the limit). In other words, any decline in the response of the unused portions to a contractionary monetary policy shock likely represents a supply-side effect. Of course, one cannot completely rule out the possibility that borrowers request the decline to avoid temptation or for some other reason.[27] However, the narrative evidence suggests that assuming limit changes are predominately at the behest of the lender is a reasonable structural assumption. That is, this posits that the unused portion series is not affected by a change in the level of balances in the current period (in other words, in a VAR, the unused portions are ordered ahead of the balances).

For this sub-section, I estimate a specification with the quarterly data on consumer installment loans (nonrevolving loans), credit card balances (revolving loans) and the unused portion of credit card lines. Following the section 3, the specification also includes data on real consumption balances, the personal consumption expenditures deflator, and the Federal funds rate (with the variables transformed in logarithms and multiplied by 100, where appropriate). Since the series on the unused portions only begins in 1990, I first estimate a five-variable specification that includes the nonrevolving and revolving loan components from 1984 through the first quarter of 2007 (analogous to the monthly results displayed in Figure 3). Then I estimate including the unused portions from 1990 through the first quarter of 2007 including only the credit card loans. Lastly I include the nonrevolving loans in the specification. Similar to section 3, Figures 5 through 7 display the impulse response functions calculated from the linear projection method along with standard error bands.[28]

Figure 5 displays the impulse response functions for quarterly nonrevolving installment and credit card loans. The quarterly impulse response functions are similar to their monthly counterparts displayed in Figure 3 for the same post-1984 sample. The quarterly functions are more

muted, though both loan components show a similar pattern—an anemic to zero response for approximately two years after the shock followed by a decline (while the for the monthly impulse response functions both loan components increase for about two years, then decline thereafter). At least by the metric of judging the lending channel by comparing the consumer loan components, the quarterly does not dispel the general finding from the monthly data that after 1984 the loan-supply effect is weak or not evident.

Figure 6 displays the impulse response functions for credit card loans and the unused portions. For this specification the response of credit card loans is noticeably positive (relative to the more anemic response in Figure 5), increasing for up to a year after a shock. The conditional standard errors support the statistical significance of the function (less so the unconditional traditional standard errors). The unused portions do not decline in response to the contractionary shock, but instead are positive for the length of the horizon (with statistically significant conditional and unconditional standard errors).

Figure 7 displays the impulse response functions with the nonrevolving component, credit card loans and unused portions. The unused portions show a smaller increase following the shock, while the consumer loan components show similar pattern to those displayed in Figure 5. The function for nonrevolving loans shows a small negative response in this case but is not statistically different from zero for most of the horizon. The function for credit card loans is similar to its counter part in Figure 5, though with the negative decline beginning earlier in Figure 7.

Given the responses for both credit card balances and for nonrevolving consumer loans, there does not appear to be a substitution into credit card loans. And relative to the data on the unused portions, the decline in credit card balances does is not matched by a reduction in the supply of credit. Hence, on balance the quarterly data set provides corroborative evidence with respect to the inference drawn from section 3.

Why we see an increase in the unused portions in response to an increase in the Federal funds rate is uncertain. The response may reflect that the limit remains relatively unchanged while the balances decline. In Figure 6, this would only make sense, however, later in the horizon when

balances actually decline. One explanation may be that this aggregate response reflects lenders shifting their credit card portfolios towards more credit-worthy borrowers while contracting the limits or accounts of more marginal borrowers. This may lead to a net increase in unused portions even as borrowers increase the demand for balances (if, for example, more qualified card holders receive larger increases in their limits, *ceteris paribus*, than the decline in the limit for the marginal borrower).[29] This is merely conjecture at this point, but such a distributional effect at the level of the limit among credit card holders may be an interesting area for additional research to consider.

3.4 Quarterly Consumer Lending and Bank Size

While the unused portions data offer a new perspective on the lending channel, the quarterly Call Report data are exploited to examine the lending channel hypothesis that the loan-supply effect should be more evident for small banks (as noted in Section 2). Large bank lending should be less-affected by a policy shock that small lenders (where large banking institutions are able to insulate their balance sheets from a policy shock—see Kashyap and Stein (2000) for discussion). We consider that hypothesis here in the context of consumer lending.

Figure 8 displays the results for both large banks and small banks (for both the nonrevolving and revolving loan categories) since the fourth quarter of 1972 through the first quarter of 2007. Bank size is defined by the Call Report variable "total assets." Large banks are defined as all banks at and above the 95th percentile while small banks include all banks below the 95th percentile (in line with the definition used by Kashyap and Stein (2000)).[30] For the 1972 to 2007 sample, the relative responses of small and large bank lending are suggestive of the lending channel (and consistent with Kashyap and Stein's (2000) finding). Both types of loans from small bank decline following the shock, while large bank nonrevolving and revolving loans (credit card loans) show essentially a zero response, if not positive, for up to eight quarters after the shock.

For the 1972 through 1983 sample, the relative responses are similar to the long sample (though the sample size is small for the pre-1984 sample). After 1984, the evidence for the lending channel is less compelling. Most notably, while the large bank loan categories respond similarly as in

the full sample, the impulse responses for small bank nonrevolving and revolving loans are positive (though only the nonrevolving function is statistically significant for a notable length of time). This positive response is consistent with the overall results found with the monthly data displayed in Figure 3 (note that in Figure 5 the impulse response function for nonrevolving loans from large and small banks combined is essentially a muted version of function for large banks in Figure 8—offset slightly by small banks, which make up a small share of consumer lending as discussed in Section 2).[31]

Overall, while the loan-supply effect for small bank lending appears evident in the overall sample (and the early sample), this effect is not evident in the latter part of the sample. Moreover, the general implications from the data for small bank and large bank lending are consistent with the monthly data and other quarterly analysis discussed earlier in the paper.

4   Conclusion

Though the lending channel has proved to be an interesting area of research, the findings of this paper suggest that consumer lending data is no longer consistent with a loan-supply effect. At first glance households and consumer lending seem to fit well with the assumptions driving the lending channel, especially when a long-term perspective is considered. Given the growth of consumer credit over the last two decades, the economic significance of the channel may be greater than in the past. Upon closer inspection, however, disaggregated consumer credit data across bank size, across revolving and nonrevolving consumer loans, across bank and non-bank lenders, and finally, across time, reveal the assumptions of the lending channel for consumer lending are not substantiated in the data after 1983. In other words, monetary policy does not appear to have any real effect on consumer lending, at least through the bank lending channel.

The findings of this paper raise important issues with respect to consumer behavior in general and with respect to the monetary transmission mechanism. On consumer behavior in general, economists certainly have linked developments in consumer credit and the importance of liquidity-

constraints for households. In addition to Gross and Souleles (2002), Attanasio *et al.* (2004) and Wakabayashi and Horioka (2005) both provide recent evidence of liquidity constraints with data on consumer durables and Japanese household data, respectively (see also Zinman (2003) and Telyukova (2006)). The evidence in this paper, however, suggests that in the aggregate liquidity constraints for households are not economically significant—at least not to a degree to motivate the lending channel. The positive impulse responses of credit card loans after 1983, in particular, may be indicative of this liquidity.

Finally, while greater credit access may have weakened the lending channel, this same ease may suggest additional implications for the monetary transmission mechanism. Monetary policy may still force a household's hand by affecting the cost of consumer debt and thus strengthening the balance sheet channel. That is, an increase in the Federal Funds rate may have more economic significance for households holding more expensive revolving debt. With a greater number of households fitting that description, this may affect the accelerator affect discussed by Bernanke, Gertler and Gilchrist (1996). Also, the relative behavior of bank and non-bank sources of consumer credit documented in this paper suggest additional topics to explore, such as the effect of a monetary policy shock on non-bank lenders, or the relevance of small banks in the transmission mechanism at all (given their diminished share of consumer lending). Such possibilities may be interesting areas for further research.

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Notes

[1]Den Haan, Sumner and Yamashiro's (2007) paper confirms and updates the findings for consumer lending from earlier lending channel research, including Gertler and Gilchrist (1993) and Ludvigson (1998). Note, too, this paper leaves the implications of Den Haan, Sumner and Yamashiro's (2007) finding for real estate loans for other research.

[2]The monthly data set is from the Federal Reserve Board's G.19 release and is discussed further in sections 2 and 3.

[3]This follows Kashyap and Stein (1995, 2000) and Gerter and Gilchrist (1993, 1994). The former exploit the distinction between small and large banks and the latter focus on small and large firms to identify the lending effect. Also, Ashcraft (2006) focuses on holding company affiliation, while, Den Haan, Sumner and Yamashiro (2006) compare the behavior of commercial and industrial loans to real estate and consumer loans to discern the lending effect.

[4]One might also estimate with alternative identification schemes, such as employing long-run restrictions (see Favero (2001)). This paper, however, is not meant to be a referendum on the methodology, but to consider new data within that methodology.

[5]Den Haan, Sumner and Yamashiro (2007) provide a cogent discussion on the difference between the two sources—the G.19 data release and the Call Reports—as well as the usefulness in using both data sets for making robust inference.

[6]Some point to the increase in credit card use as indicative of liquidity constraints (see Gross and Souleles (2002)). The 2004 Survey of Consumer Finance, for example, reveals that 74 percent of households have a credit card and approximately 50 percent of those carry a balance on their primary credit card from month to month. Also, the mean balance increased from $2,800 in 1989 to approximately $5,100 by 2004 (in 2004 dollars). See section 2 for further discussion.

[7]See also, Campbell (2005) and Ramey and Vine (2005) for further discussion and analysis of the "Great Moderation." See Ahmed *et al.* (2002) for a summary of possible explanations. Dynan *et al.* (2006), for example, emphasize financial innovations in explaining the moderation.

[8]Based on author's calculations from the data set described in section 4 (the Call Reports of all commercial banks). All figures are in 2000 dollars and seasonally adjusted.

[9]Consumer credit series are available from the Federal Reserve Board, statistical release H.19. Series are seasonally adjusted and deflated using the personal consumption expenditures deflator (2000 = 100). Revolving credit includes bank card type credit cards, department store cards, and American Express and Discover cards.

[10]The non-bank component includes finance companies and nonfinancial business. These categories include department store credit and financing companies associated with auto dealerships, to name two examples. The Federal Reserve Board's G.19 release also includes data on credit unions, savings and loans, and even student loans. However, in this paper I focus on the dominant sources of non-bank finance from direct lenders (or once dominant, in the case of nonfinancial business).

[11]These series are generally highly correlated over time, as one might expect, though the correlations change a bit over time. For the monthly data, nonrevolving and revovling bank credit have a correlation coefficient close to 0.8, but this declines to 0.59 after 1984. After 1984, nonrevolving bank credit is correlated with non-bank nonrevolving credit at 0.70, though is only correlated with non-bank revolving credit at 0.20. Revolving credit from the two sources are highly correlated at 0.88.

[12]For the bank classes, nonrevolving lending from small banks is negatively correlated with large bank nonrevolving lending with a correlation of −0.89. Large and small bank revolving credit, however, are positively correlated at 0.50. Also, large bank nonrevolving and revolving credit are positively correlated at 0.97, though small bank revolving credit is negatively correlated with small bank nonrevolving credit at −0.46.

[13]This, of course, is a conjecture based on the observed credit card data. Building a model of bank behavior in the context of the lending channel is not the objective of this paper. Stein (1998) provides such an exposition. In terms of credit card lines, one can refer to Castronova and Hagstrom (2004). In the context of the transmission

mechanism, modeling the demand and supply of credit card lines is certainly worthy of continued research, a point which is touched on in the conclusion of this paper.

[14]This information is taken from the FDIC's "Graph Book" available at http://www2.fdic.gov/QBP/Index.asp. In particular, see the FDIC's Graph Book tables, "Expansion of Commerical Bank Credit Card Lines" and "Utilization Rates of Loan Commitments."

[15]For a different perspective, the 2004 Survey of Consumer Finances (SCF) reveals that credit card use is distributed across income, age and education level; that average balances increase with income and education and are highest for households with a head aged 35 to 54; and that since 1989, average balances have increased along all demographic delineations.

[16]Again, the data on consumer credit is from the Federal Reserve Board's G.19 release, which includes disaggregated data across bank and non-bank sources. Data on consumption and the deflator are available from the Bureau of Economic Analysis while the series for the federal funds rate is available from the Federal Reserve Board.

[17]It is common practice to include a price index for commodities in the VAR. Doing so had been found to solve the "price puzzle" common to this analysis—the increase in the regular price index following an increase in the federal funds rate. However, similar to Den Haan *et al.* (2007), I found that for more recent data the inclusion of this variable makes little difference for the results. In the interest of parsimony, I leave that variable out of the VAR.

[18]Extending the sample back to 1959 with only the nonrevolving component does not change the estimated impulse response functions discussed for the samples beginning in 1968 to any noticable degree.

[19]I also compared the results considering different break dates (for example, beginning with Greenspan's tenure) and across decades. The qualitative results did not change by any degree of note. Hence, here I only report the results with the break separating the broad periods.

[20]Note that the results discussed in this section are robust if real disposable income is used in place of consumption (as in Den Haan, Sumner and Yamashiro (2007)) or nonfarm payroll employment is included. Note, too, the results are robust to using a block recursive structure. The results are also robust to the inclusion of a time trend, to additional lag lengths (2, 6, 8 and 12 lags were also considered) and to ordering the federal funds rate ahead of the other variables. These variations did not change the impulse response functions to a notable degree so are not reported here. The interested reader can see the author's website for figures displaying the impulse response functions calculated under these alternative specifications.

[21]Jordà (2007) also provides a joint test of the impulse response function coefficients, and a test of the cumulative significance of the coefficients. These additional metrics did not add much to the inference in this paper, nor facilitate the comparison of the results to previous lending channel research. A previous version of this paper includes these metrics and can be found on the author's website.

[22]However, for thorough comparison, the impulse response functions calculated from the VAR can be found on the

author's website.

[23]Replication of Den Haan, Sumner and Yamashiro's (2007) was performed though is not reported here. Specifically, I calculated the responses of the system variables to both a monetary and non-monetary shock as defined by Den Haan *et al.* (2007). I thank Steven Sumner for the code to carry out this estimation. Figures for the responses of the consumer credit series to the monetary shock relative to shocks to consumption expenditures and real disposable income (separately) are available on the author's website.

[24]One will also note the weak response of consumption in Figure 3b. One possibility for the difference in results before and after 1983 is a difference in the size of the shock. However, the inference is not changed if an identical one percent shock of the federal funds rate is applied to each sample period. Results with the one percent shock can be found on the author's website.

[25]The results are similar if bank and non-bank loan components are estimated jointly in a seven-variable specification (see Figure 5 in the working paper version on the author's website).

[26]While the data are not consistent with the traditional lending channel assumptions, the decline in nonbank nonrevovling credit (while commercial bank lending is positive) raises questions on the evolution of the monetary transmission mechanism. How a policy shock affects non-bank lenders relative to bank lenders may be an interesting area of further inquiry, which we leave for further research.

[27]For example, borrowers might seek a lower limit out of preference for a stable ratio between balances and the limit. Evidence of this sort of preference has been documented by Gross and Souleles (2002) and Castranova and Hagstrom (2004).
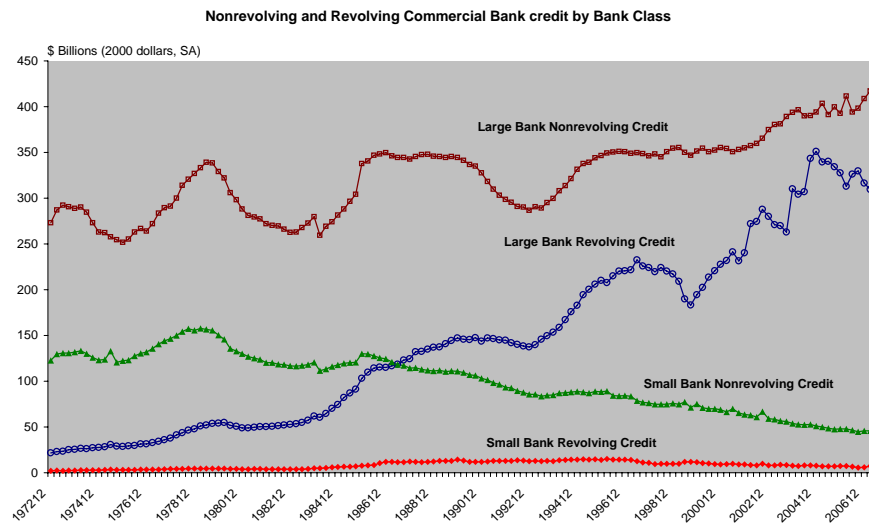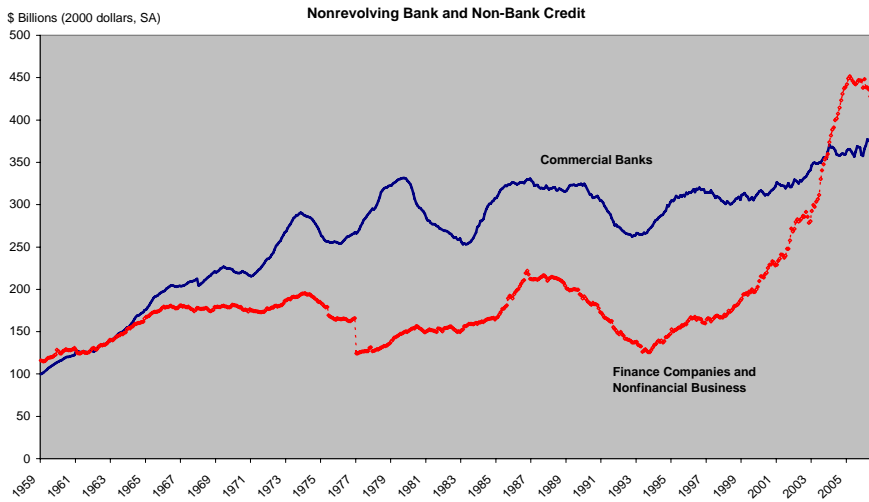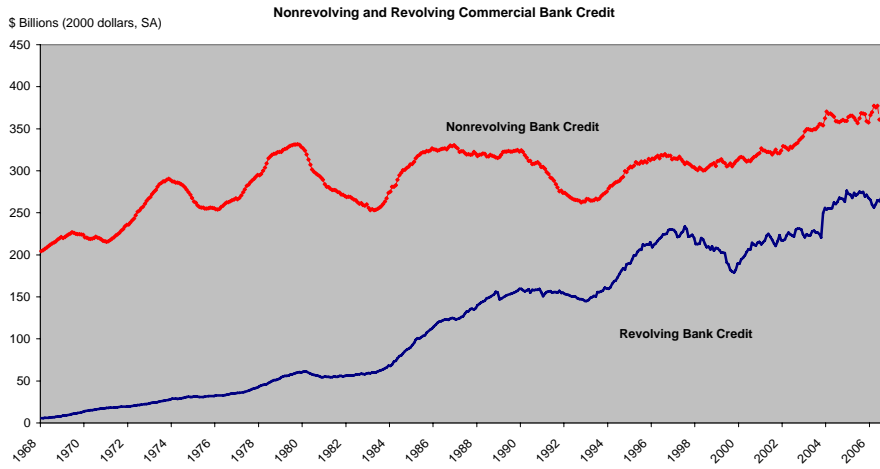
[28]The corrected-AIC chose lag lengths of two for the estimation reported here. The results are robust to a lag lengths of one and generally a length of three, though at higher lag lengths the degrees of freedom with the quarterly data (on the shorter samples) becomes an issue. The results are also robust to including real GDP instead of consumption.

[29]That may be the case since the institutional rules governing limit extentions certainly favor long-term card holders with a good credit history and so forth (see Gross and Souleles (2002)).

[30]The Call Report data is available on the FDIC's "Statistics on Depository Institutions" website by quarter back to 2001. All other quarters back to the fourth quarter of 1972 are availalbe in .csv format by request from the FDIC.

[31]Given the sample sizes with the quarterly data, we estimate for each bank class separately (as displayed in Figure 8). If we include all four loan categories together in one specification, the results are less-supportive of the lending channel for the 1972 to 2007 and pre-1984 samples (though the estimation suffers from less degrees of freedom with seven varariables in the specification).

Figure 1: Commercial Bank and Non-Bank Consumer Credit Loans

Nonrevolving and Revolving Commercial Bank Credit

$ Billions (2000 dollars, SA)

Nonrevolving Bank and Non-Bank Credit

$ Billions (2000 dollars, SA)

Nonrevolving and Revolving Commercial Bank credit by Bank Class

$ Billions (2000 dollars, SA)

Notes: Monthly consumer credit series for the top two panels are from the Federal Reserve Board's G.19 release. The data has been deflated using the personal consumption expenditures deflator (Bureau of Economic Analysis) and seasonally adjusted. Quarterly data for the bank classes are from the FDIC (large banks at or above the 95th percentile in total assets; small below the 95th). The non-bank component includes finance companies and nonfinancial business.

Figure 2: Commercial bank Credit Card Balances and Liquidity: Unused Credit Card Lines

$ Billions (2000 dollars, SA)
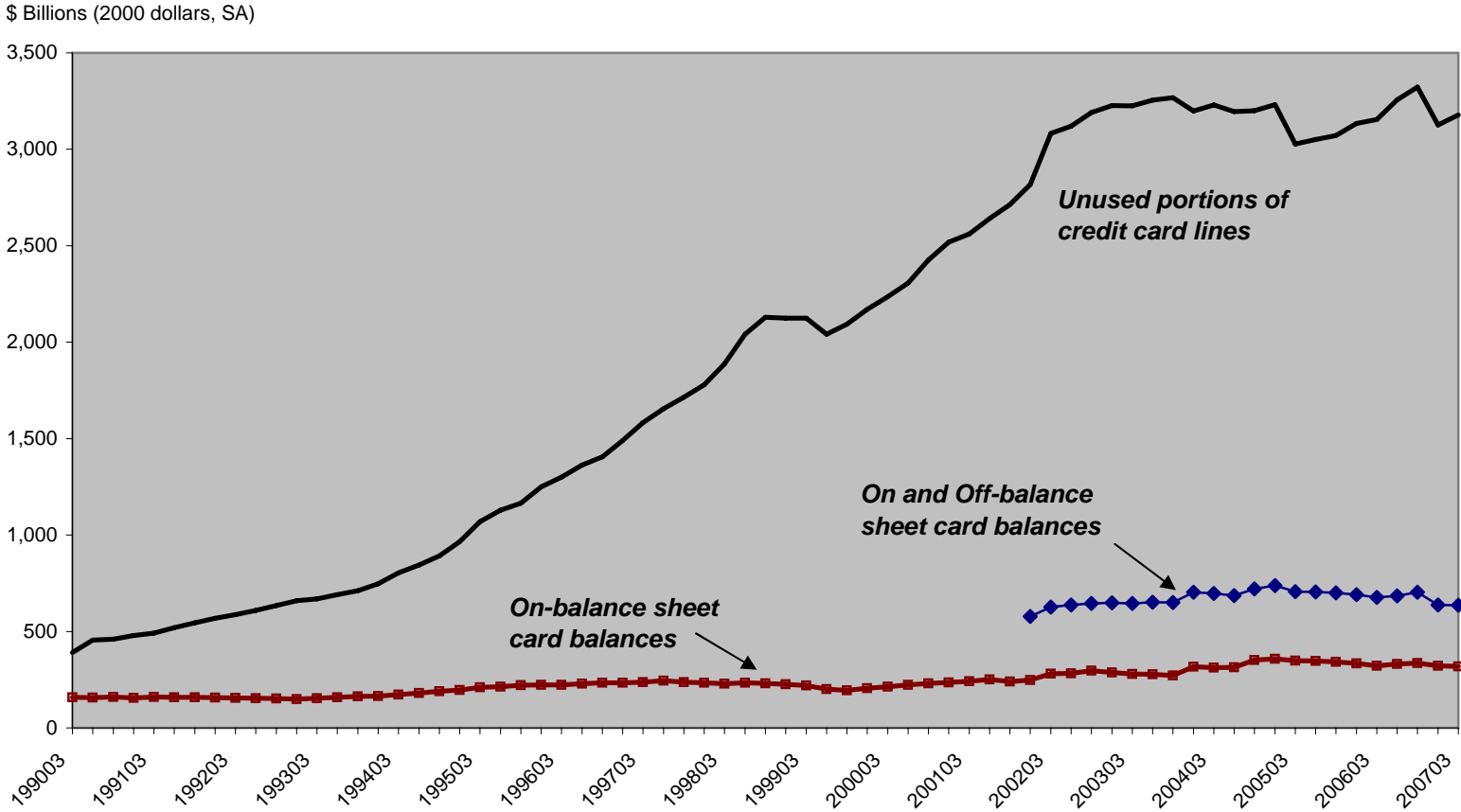
Notes: Data series are calculated from the Call Reports for all FDIC-insured commercial banks (and made available by the FDIC). The series are deflated by the personal consumption expenditures deflator and seasonally adjusted. The off-balance sheet series is available through www.fdic.gov.

Figure 3a: Impulse Response Functions in response to a shock to the Federal funds rate: Monthly Consumer Bank Credit

Commercial Bank Nonrevolving Credit

1968 through 2006   1968 through 1983   1984 through 2006

Commercial Bank Revolving Credit

1968 through 2006   1968 through 1983   1984 through 2006

forecast horizon (months)
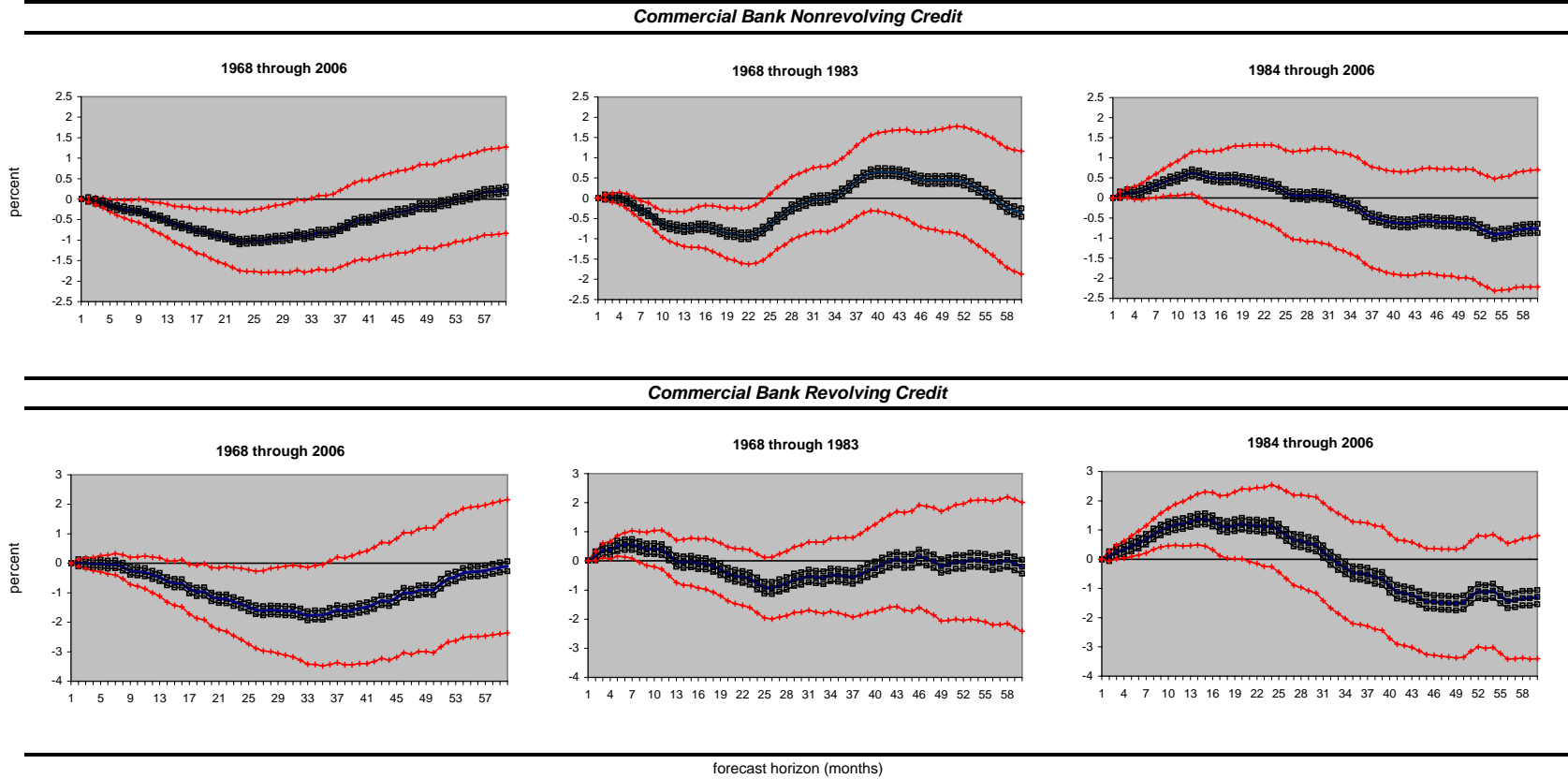
Notes: The Impulse response functions are estimated from a five-variable specification using Jorda's (2005) linear projection technique (with the variables ordered as listed in the text). The wide bands represent the plus and minus two-standard errors calculated at each horizon. The narrower bands represent the conditional standard error bands estimated at each horizon given the previous horizons' estimates (see Jorda (2007)). The shock is one-standard deviation shock to the Federal funds rate. Consumer credit series are from the Federal Reserve Board's G.19 release, and are in seasonally adjusted constant dollars.

Figure 3b: Impulse Response Functions in response to a shock to the Federal funds rate: Additional Regressors

Consumption

PCE Price Deflator
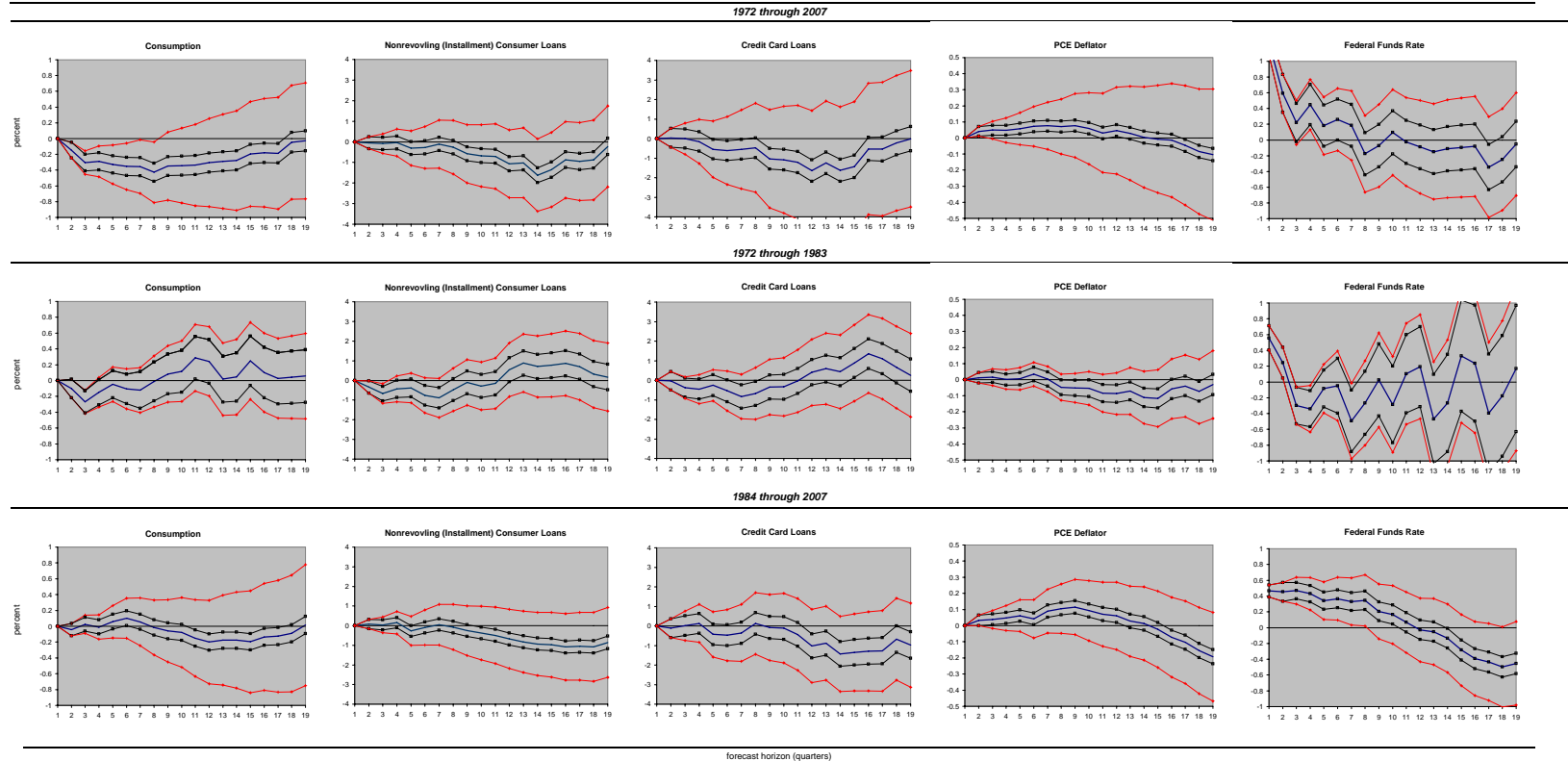

Federal Funds Rate

forecast horizon (months)
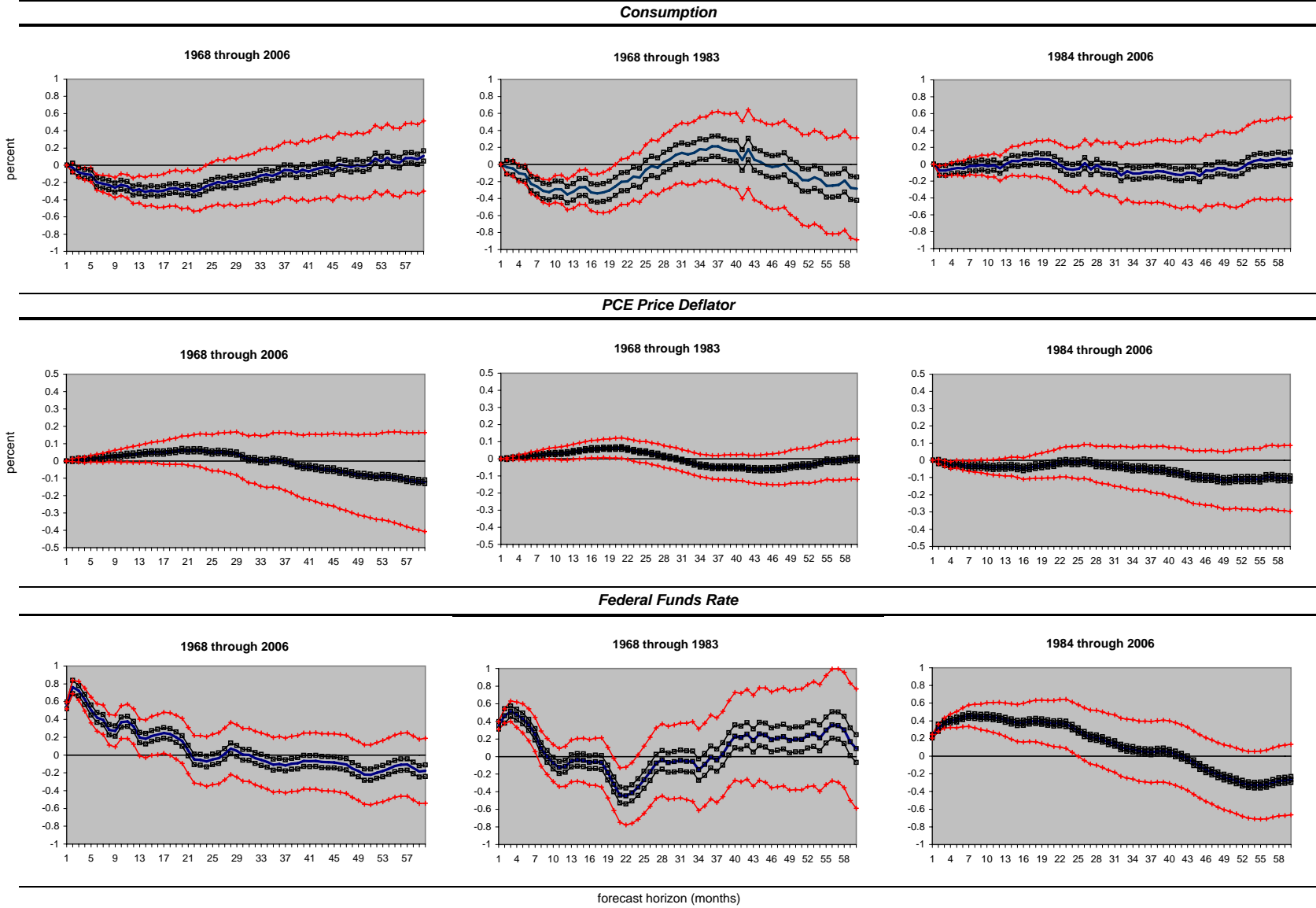
Notes: *See* notes to Figure 3a.

Figure 4: Impulse Response Functions of monthly Non-Bank consumer credit to a shock to the Federal funds rate

1984 through 2006

Non-Bank Nonrevovling Credit

Non-Bank Revolving Credit

Non-Bank + Bank Credit 1984 through 2006

Non-Bank + Bank Nonrevovling Credit

Non-Bank + Bank Revolving Credit

Total Consumer Credit 1984 through 2006

Total Nonrevovling Credit

Total Revolving Credit
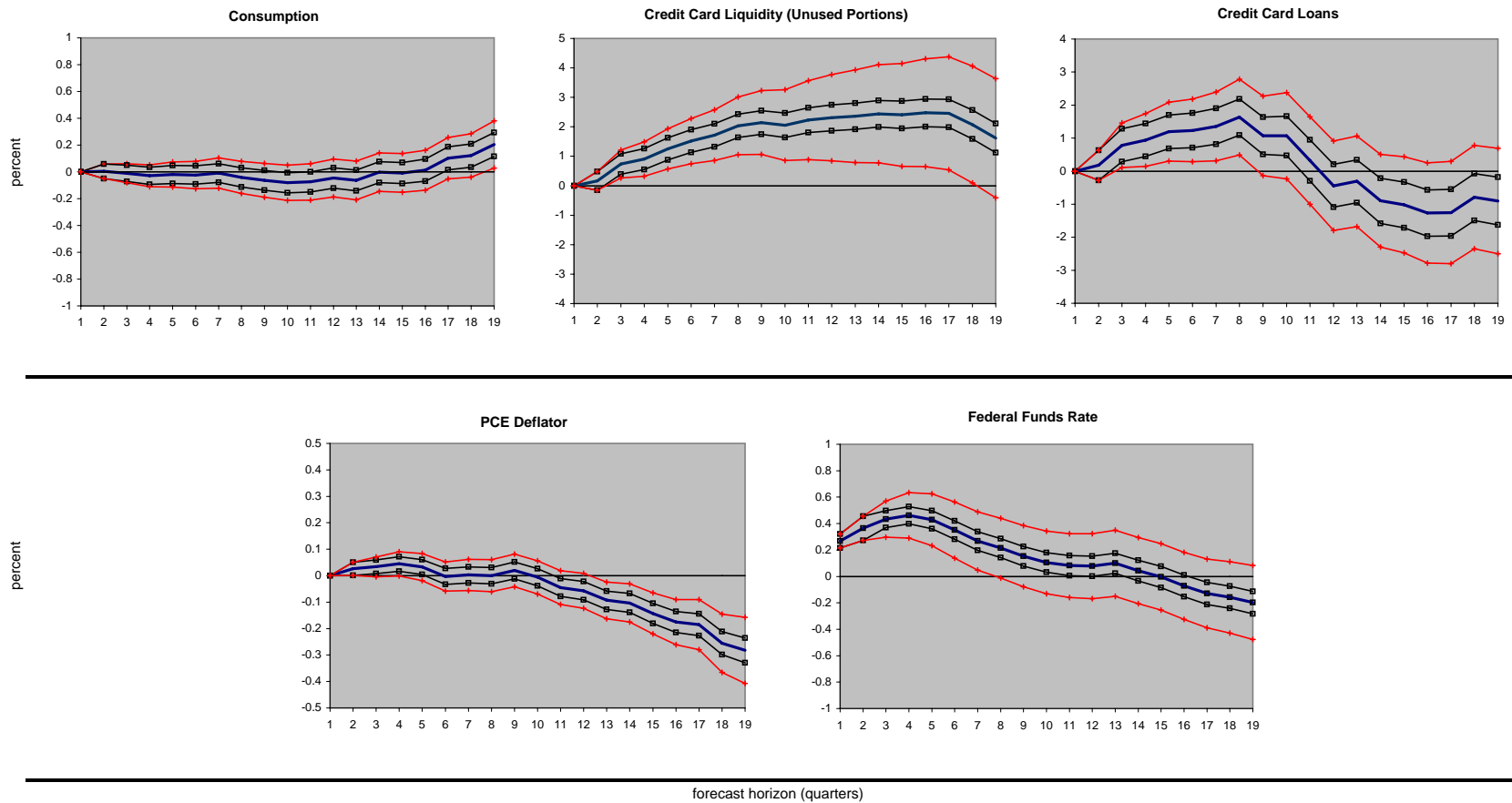
forecast horizon (months)
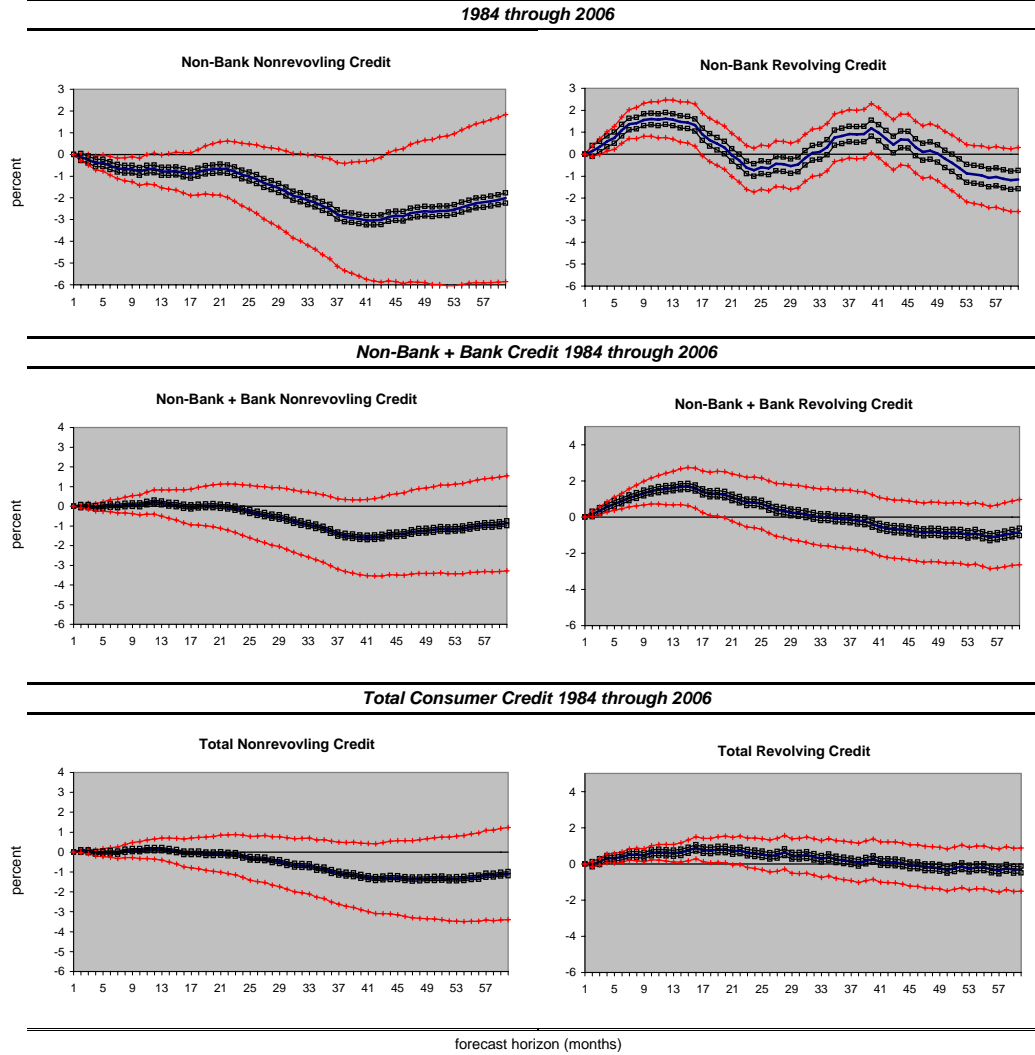
Notes: See notes to Figure 3. Non-Bank includes finance companies and non-financial business. Total consumer credit includes in addition to banks, finance companies and non-financial business, savings and loans, credit unions and other sources listed in the Federal Reserve Board's G.19 release.

Figure 5: Impulse Response Functions in response to a shock to the Federal funds rate: 1972 to 2007 (Quarterly)

1972 through 2007

1972 through 1983

1984 through 2007

forecast horizon (quarters)

Notes: *See* notes to Figure 3. Quarterly data collected from the FDIC. The data are seasonally adjusted and expressed in constant 2000 dollars.

Figure 6: Impulse Response Functions in response to a shock to the Federal funds rate: 1990 to 2007 (Quarterly) Credit Card Balances and Unused Portions

Consumption

Credit Card Liquidity (Unused Portions)

Credit Card Loans

PCE Deflator

Federal Funds Rate

forecast horizon (quarters)

Notes: *See* notes to Figure 3. Data on the unused portions of credit card lines and credit card balances were collected from the FDIC, the latter series being first reported in the Call Reports in 1990. The data are seasonally adjusted and expressed in constant dollars.

Figure 7: Impulse Response Functions in response to a shock to the Federal funds rate: 1990 to 2007 (Quarterly) all Consumer loans and unused portions of Credit Card lines
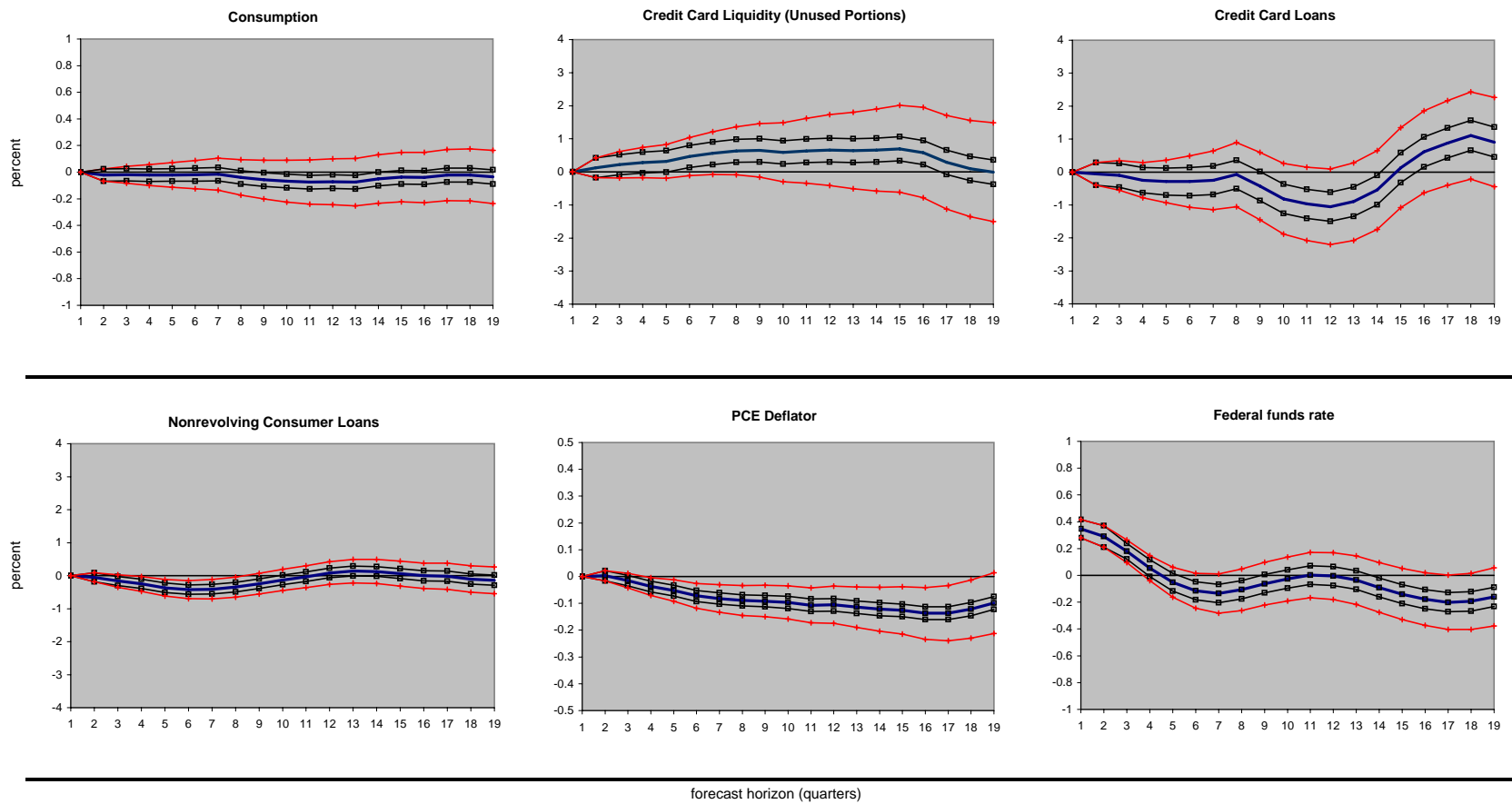
Notes: *See* notes to previous Figures. The results displayed are for a quarerly seven-variable specification estimated with both the non-revolving and revovling componentsand the unused portions.

Figure 8: Impulse Response Functions in response to a shock to the Federal funds rate: Large and Small Banks from 1972 through 2007

1972 through 2007: Large Banks (95th percentile in total assets and above)

1972 through 2007: Small Banks (Below the 95th percentile in total assets)

1972 through 1983: Large Banks (95th percentile in total assets and above)

1972 through 1983: Small Banks (Below the 95th percentile in total assets)

1984 through 2007: Large Banks (95th percentile in total assets and above)

1984 through 2007: Small Banks (Below the 95th percentile in total assets)

forecast horizon (quarters)

Notes: *See* notes to previous Figures. Large banks are defined as all banks at or above the 95th percentile in total assets. Small banks are those below the 95th percentile.