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The Behavior of Small and Large Firms during Business Cycle Episodes and during Monetary Policy Episodes: A Comparison of Earlier and Recent Periods

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Abstract

I provide more evidence on the behavior of small and large firms, employing the Flow of Funds data, the QFR data and other sources. The empirical test to examine behavior of small and large firms is conducted in two ways: (1) by different episodes, tight monetary policy episodes and business cycles episodes and (2) by different time periods, Pre-1990 periods and Post-1990 periods. First, I find that a monetary shock and an NBER recession shock *differently* affect firms' short-term financing behavior. During recent periods, after a contractionary monetary shock, large firms *increase* their short-term debt more than small firms, whereas after an NBER recession shock, large firms *decrease* most balance sheet variables (including short-term debt) more than small firms. These findings suggest that small firms are more credit-constrained after a monetary policy shock, whereas large firms are more credit-constrained after an NBER recession shock. Second, I find that, after a contractionary monetary shock, during earlier periods, large firms *decrease* their short-term debt *less* than small firms, whereas during recent periods, large firms *increase more* than small firms. Although these findings appear to be contradictory, they are consistent in that small firms have continued to be more credit-constrained than large firms after contractionary monetary policy—at the time when demand for loans increases.

Keywords: monetary policy shock, business cycle shock, small firms, large firms,
JEL Classification: E32, E 51, E52

I. Introduction

When it comes to the topic of the business cycle, economists puzzle over how a small adverse shock—either a real shock or a monetary shock—can produce large fluctuations in an economy. One of the explanations proposed by a number of economists is a "financial accelerator" mechanism. An adverse shock to the economy may be enhanced by worsening credit-market conditions while it produces *interactions* between credit-market conditions (i.e., financial factors) and real economic activities (i.e., real factors). Continuous changes in credit market conditions play a critical role in business cycle fluctuations by amplifying and propagating the effect of the initial shock (Bernanke & Gertler, 1989; Bernanke, Gertler, & Gilchrist, 1996; Gertler & Gilchrist, 1993, 1994). In a standard macroeconomic theory, such changes in credit-market conditions play no role in business cycle fluctuations because the standard theory simply assumes perfect capital markets, separating financial factors from real factors. However, according to the financial accelerator mechanism, changes in credit-market conditions are essential to the propagation of business cycle because financial factors, which continuously interact with real factors, act as a catalyst in amplifying the effect of the initial shock.

In previous research, economists found some evidence of this mechanism, putting a special emphasis on *small firms* (see Bernanke & Gertler, 1989; Bernanke et al., 1996; Gertler & Gilchrist, 1993, 1994). An adverse monetary shock is found to have a stronger negative impact on small firms than on large firms because small firms are more credit-constrained than large firms after a restrictive monetary shock. For example, following an adverse monetary shock, small firms, which undergo more severe exacerbation of balance sheet conditions, are likely to encounter higher costs of external finances than large firms in credit markets. Moreover, since small firms may not be able to obtain credit elsewhere—because they do not have access to public markets—if they are discriminated against by banks when seeking credit, they should cut

back on their short-term debt more than large firms. Accordingly, small firms should also curtail their business operations more quickly and significantly than large firms in the economy.

Specifically, employing Quarterly Finance Report (QFR) data and "Romer dates" as an indicator of tight monetary policy, Gertler and Gilchrist (1994) examine the behavior of small and large firms after tight monetary policy. They find that tight monetary policy *differently* affects the behavior of small and large firms; the "inventories" and "short-term debt" of small firms drop substantially more than those of large firms. In particular, after a monetary policy shock, although large firms initially increase inventories and short-term debt much more than small firms, after a brief period, small firms decrease sharply more than large firms. They interpret this result as the supporting idea that large firms, which experience *easier* access to credit, may be able to finance inventories with short-term debt after tightening monetary policy; thus, large firms initially increase short-term debt more than small firms. In contrast, small firms, which experience *difficulty* accessing credit, are unable to borrow to carry inventories. Likewise, employing the Dun & Bradstreet Corporation data, Birch (1979) finds that small establishments with 100 or fewer employees accounted for 81.5% of all new jobs created in the U.S. during 1960-1976; large establishments with 100 or more employees accounted for only 18.5% of all new jobs created (Birch, 1979, Table 4-2). Employing the Business Employment Dynamic (BED) data, Sahin, Kitao, Cororaton, and Laiu (2011) find that small firms shed more jobs than large firms during the 2007-2009 downturn.

Recently, however, new research findings raise questions about the role of small and large firms during periods of tight credit conditions.[1] New evidence has shown that an adverse macroeconomic shock (i.e., a business cycle shock) is found to have more serious negative effects on *large firms* than on small firms during period of recession. Large firms curtail their business operations such as employment, short-term debt, sales, and inventories substantially

[1] Such tight credit conditions can originate from a monetary policy shock or from other shocks that make credit more expensive and less available.

more than small firms (see Chari, Christiano, & Kehoe, 2007; Kudlyak, Price, & Sánchez, 2010; Moscarini & Postel-Vinay, 2008, 2009, 2012). Particularly, Chari et al. (2007) investigate the behavior of small and large firms after a business cycle shock, rather than a monetary policy shock that previous research focused on.[2] Their research is somewhat different from previous studies because other macroeconomic shocks, not including monetary shocks, also perform an essential role in causing recessions—that is, recessions are created by not only monetary policy shocks but also "other shocks" in the economy.[3] Recent research, therefore, has focused on business cycle episodes rather than monetary policy episodes in examining the behavior of small and large firms.

In particular, Chari et al. (2007) employ the same QFR data set as Gertler and Gilchrist (1994) and incorporate more business cycle episodes into their analysis. After including more episodes, they find that the sales of small and large firms respond roughly the *same* to a business cycle shock, a *different* result from Gertler and Gilchrist (1994). Furthermore, some other recent studies observe the *opposite* of past results. Using both Census Bureau's Business Dynamic Statistics (BDS) and the BED data, Moscarini and Postel-Vinay (2008, 2009, 2012) find that the employment of large firms is more sensitive to the business cycle conditions than that of small firms. Along the same lines, employing the same QFR data set and methodology as Gertler and Gilchrist (1994), Kudlyak et al. (2010) find that the sales and inventories of large firms decreased more than those of small firms during the recent 2007-2009 recession.

Synthesizing empirical evidence presented so far, scholars have found different empirical results, depending on their data sets and methodologies. Such mixed results have motivated me

[2] In earlier work, Gertler and Gilchrist (1994) examine the behavior of small and large firms after a tight monetary shock (i.e., a Romer date), focusing recessions caused by a macroeconomic monetary policy shock. Recently, researchers have investigated the behavior of small and large firms after an adverse shock (i.e., the date for peak of the business cycle), concentrating recessions brought about by a shock other than a monetary policy shock.

[3] For example, "other shocks" may occur when the price of commodities or natural resources increases sharply, when cataclysmic natural disasters or wars occur, and when dot-com or housing bubbles burst.

to examine further the behavior of small and large firms. Three natural questions arise from these mixed results: Why do earlier findings show different results from recent findings? Do such different results arise from the fact that different scholars use *different episodes*, tight policy episodes versus business cycles episodes, in their analysis? Do such different results arise from the fact that different scholars use *different time periods*, earlier periods versus recent periods, in their datasets?

In my research, the empirical tests to examine the behavior of small and large firms are performed in two ways: (1) by different episodes, monetary policy episodes and business cycles episodes, and (2) by different time periods, earlier periods and recent periods. First, I examine the behavior of small and large firms by comparing "monetary policy episodes" to "business cycle episodes." In this analysis, we presume that "monetary policy episodes" arise from *monetary policy* shocks, which are produced by the Federal Reserve to fight against inflation. On the other hand, "business cycle episodes" originate from shocks that *occur outside of monetary policy* and that *are naturally produced* in the economy. For our purposes, we call these other shocks "NBER recession shocks." Although previous studies employ "Romer dates" as a measure of monetary policy shocks, this research paper uses "Adrian dates" as a measure of those shocks because "Romer dates" have not been updated since 1988. As will be explained in Section II, Adrian and Estrella (2008) identify the "*end* dates for monetary tightening cycle" as a measure of a (tight) monetary policy shock.[4] Additionally, this research paper uses the "dates for peaks of business cycles" as an indicator of business cycle shocks, following Chari et al. (2007) and Kudlyak et al. (2010).

Second, I examine the behavior of small and large firms by comparing "earlier periods" to "recent periods." The data of earlier periods extend from 1960 Q1 to 1989 Q4,[5] and the data of

[4] Although this study employs "Adrian dates" rather than "Romer dates" in the analysis, it finds that the results of "Adrian dates" are not materially different from those of "Romer dates" in earlier-period episodes.

recent periods range from 1990 Q1 to 2011 Q2. To make use of all available data to date, this research paper has employed four different data sources: (1) the Flow of Funds, (2) the Quarterly Finance Report, (3) the Senior Loan Officer Opinion Survey, and (4) the Business Employment Dynamics. In particular, among these four data sets, only the flow of funds data are available for both earlier periods and recent periods, whereas the other three data sets are on hand only in recent periods.[6] Because of the limited availability of the other three data sets, a comparison between earlier periods and recent periods is made by the flow of fund data.[7]

By analyzing different "episodes" and different "time periods," this research paper adds some more evidence to the existing literature about the role of small and large firms. During *earlier* periods, similar to what the earlier researchers found, I find that, after a monetary policy shock, small firms decrease their inventories, total short-term debt, and bank debt more than large firms, using the flow of funds data. During *recent* periods, on the other hand, I find some interesting results that support recent research by using the flow of funds and the QFR data. First, the behavior of large firms is, in general, more sensitive than that of small firms—to either a monetary policy shock or an NBER recession shock. In particular, after an NBER recession shock, large firms *sharply decrease* most of their balance sheet variables—sales, total short-term debt, short-term bank debt, mortgages, other debt, and trade debt—more than small firms. However, after a restrictive monetary shock, although large firms *decrease* some of their balance sheet variables—sales, inventories, mortgages, and trade debt—more than small firms, they *increase* their short-term debt, such as total short-term debt and short-term bank debt, more than small firms. Second, it appears that a monetary policy shock influences the short-term debt

[5] I divide earlier periods and recent periods by 1990 because previous researchers conducted their studies before 1990 and recent scholars have done them after 1990.

[6] For the QFR data, although the data of earlier periods are available by purchasing them from the private institutions, the data of recent periods are available to the public without any cost. Thus, recent periods of the QFR data are used in this analysis.

[7] Furthermore, it is worthwhile to carefully examine the flow of funds data and the SLOOS data in our study since previous research does not take into account these data. Although the QFR and the BED data are used in previous research, more recent data are incorporated in this analysis.

of firms *differently* than an NBER recession shock does. All firms *increase* their short-term debt after a restrictive monetary shock, whereas they *decrease* after an NBER recession shock. Furthermore, large firms increase short-term debt more than small firms after a monetary policy shock, and they also decrease more than small firms after an NBER recession shock.

For these empirical results, some questions arise. Why does the short-term debt of firms *increase* after a tight monetary shock but *decrease* after an NBER recession shock? Why is the short-term debt of large firms more sensitive to both a monetary shock and an NBER recession shock than that of small firms? Some plausible explanations to these questions are also suggested in this paper.

The remainder of this paper is organized as follows: Section II describes four different data sources and the key dates of analysis employed in this study; Section III applies the method of previous researchers to the recent data set of the QFR. Section IV reports the empirical results of the study; Section V discusses two explanations as to why the short-term debt of large firms shows more sensitive behavior than that of small firms after an adverse shock; Section VI summarizes and concludes the work.

II. Data Description and Some Key Dates of Analysis

A. Data Description

1. The Flow of Funds Data

The Federal Reserve has released the quarterly data of the *flow of funds accounts of the United State*s since 1952. The flow of funds accounts are a set of financial accounts used to measure sources and uses of funds for the economy as a whole and by sector. They contain the aggregate balance sheets of each sector of the economy—i.e., a household sector, a nonfinancial business sector, a financial business sector, a government sector, and the rest of the world. "The nonfinancial business sector" comprises three subsectors: nonfarm nonfinancial corporate business, nonfarm noncorporate business, and farm business.

In this nonfinancial business sector, "nonfarm nonfinancial corporate business" can be thought of as large firms because it involves all large private businesses that exclude farm business and financial institutions, S-corporations, and so on. On the other hand, "nonfarm noncorporate business" can be thought of as small firms because it includes somewhat small firms such as partnerships, limited liability companies, and sole proprietorships—which do not have access to capital markets and thus mainly make use of intermediated loans. Nonetheless, some of the partnerships included in "nonfarm noncorporate business" (i.e., small firms) are in fact large corporations. This is because the distinction between "nonfarm nonfinancial corporation business" and "nonfarm noncorporate business" is made simply on the basis of tax-paying method rather than according to the firm sizes. For this reason, small firms in the flow of funds data (i.e., nonfarm noncorporate business) are considered somewhat larger than small firms in the QFR data (i.e., below the 30th percentile in sales distribution) as described below.

2. The Quarterly Finance Report Data

The U.S. Census Bureau has released the quarterly data on the *Quarterly Finance Report for Manufacturing, Mining, Trade, and Selected Service Industries* (QFR) since 1982. Prior to 1982, the QFR was published by the Federal Trade Commission (FTC) and Security and Exchange Commission (SEC). Based on a sample survey, the QFR publication presents the statistical data on a quarterly balance sheet and income statement for manufacturing, mining, trade, and selected service industries. [8, 9]

[8] While historical data from before 1987 Q4 are available from the private institutions by purchase, the data of recent periods are available to us without any cost at the U.S. Census Bureau' internet Website. http://www.census.gov/econ/qfr/historic.html In this study, because of limited availability of the QFR data, I have only used the data set, which covers the periods from 1987 Q4 to 2011 Q3.

[9] The data of manufacturing industry contains information about firm sizes, while the data of mining, trade, and selected service industries do not include such information. Thus, only the data of the manufacturing industry are used to examine the behavior of small and large firms.

Specifically, the QFR includes estimated statements of income, retained earnings, balance sheets, and related financial and operating ratios for manufacturing corporations with the assets of $250,000 and over. The data of manufacturing corporations are classified by eight asset sizes. The reported size classes are made up of corporations: those with assets of (1) less than $5 million, (2) $5 to $10 million, (3) $10 to $25 million, (4) $25 to 50 million, (5) $50 to $100 million, (6) $100 to $250 million, (7) $250 million to $1 billion, and (8) more than $1 billion. The merit of the QFR data is that they include relatively small firms compared to the Compustat data. While Compustat data cover the relatively large firms whose equities are traded in the public market, the QFR data covers both the publicly traded large firms and the privately held small firms.

Following Gertler and Gilchrist (1993, 1994), in this research, I define small firms as those at or below the 30th percentile in total sales distribution and large firms as above the 30th percentile. According to Gertler and Gilchrist (1993, 1994), the firm size categories of the QFR data that are constructed in nominal terms are not a desirable measure of firm sizes. This is because firms can drift between categories over the sample periods due to inflation. For more detailed explanation about the 30th percentile method, refer to Appendix A.[10]

3. The Senior Loan Officer Opinion Survey

The Federal Reserve has released the quarterly data on the *Senior Loan Officer Opinion Survey on Lending Practice* (SLOOS) since 1964. It conducts a survey on the lending conditions of businesses and households over the past 3 months, pursuing qualitative information about changes in the bank lending practices in the U.S. credit markets. The respondents to the survey consist of up to approximately 60 large domestically chartered banks

[10] The simplest way to divide the data set into two size classes is to *eliminate* group 5 and group 6 that may be situated in a transition area between small and large groups. Then, we can refer to groups 1, 2, 3, and 4 as small firms and groups 7 and 8 as large firms. On the other hand, following Oliner and Rudebusch (1996), another way to divide the data set into two is by using the 15th percentile in capital stocks distribution instead of the 30th percentile of sales distribution.

and up to 24 U.S. branches and agencies of foreign banks. The senior loan officers at respondent banks are asked about changes in terms and standards of banks' lending and about the position of business and household demand for loans. Usually, they are also questioned about other issues of current interest.

In particular, three questions in the survey pay special attention to the role of small firms and large medium-size firms in regard to commercial and industrial loans (C&I loans). In this research, small firms are defined as firms with annual sales of less than $50 million, and large and medium-size firms are defined as those with annual sales of $50 million or more. The questions are as follows: (1) "Over the past 3 months, how have your bank's credit standards for approving for C&I loans or credit lines to large and medium-size firms and small firms changed?"; (2) "For applications for C&I loans from large and medium-size firms and small firms that your bank currently is willing to approve, how have the terms of those loans—with respect to spread between loan rates and banks' costs of funds—changed over the past 3 months?"; (3) "Apart from normal seasonal variation, how has demand for C&I from large and medium-size firms and small firms changed over the past 3 months?"[11]

4. The Business Employment Dynamics Data

The Bureau of Labor Statistics (BLS) has released the quarterly data on *Business Employment Dynamics* (BED) since 1992. The BED keeps track of *components* of the quarterly net employment change (job flows) such as gross job gains and gross jog losses in the private sector of the U.S economy. Such components of the net employment change help us to understand the underlying dynamics of the U.S. job market. The data to construct the statistics of gross job gains and losses are obtained from the Quarterly Census of Employment and Wages (QCEW). The QCEW extracts data from unemployment insurance (UI) records in 98%

[11] The data for first two questions have been available since 1990 Q2 and the data for third question have been available since 1991 Q4. The data release can be downloaded today at the Federal Reserve's internet website. http://www.federalreserve.gov/datadownload/Choose.aspx?rel=SLOOS

of nonfarm payroll business, where all employers who are subject to State unemployment insurance (UI) laws are required to submit quarterly reports about their employment and wages.

Gross job gains and gross job losses data are also available for 9 firm sizes. These firm sizes are classified according to the number of employees: size class 1 (1 to 4 employees), size class 2 (5 to 9 employees), size class 3 (10 to 19 employees), size class 4 (20 to 49 employees), size class 5 (50 to 99 employees), size class 6 (100 to 249 employees), size class 7 (250 to 499 employees), size class 8 (500 to 999 employees), and size class 9 (1000 or more employees). Because dividing the data set into small and large firms can be an issue that may affect empirical results, I aggregate those categories into small firms versus larger firms in three different ways: (1) 1 to 49 employees and 50 and more employees, (2) 1 to 99 employees and 100 or more employees, and (3) 1 to 499 employees and 500 or more employees.

B. Some Key Dates of Analysis

A monetary policy shock is an important source of disturbance that influences aggregate demand, and it can trigger recessions. However, not only a monetary policy shock but also "other shocks"—what we call business cycle shocks or NBER recession shocks—are disturbances that influence aggregate demand, and they can contribute to recessions as well.

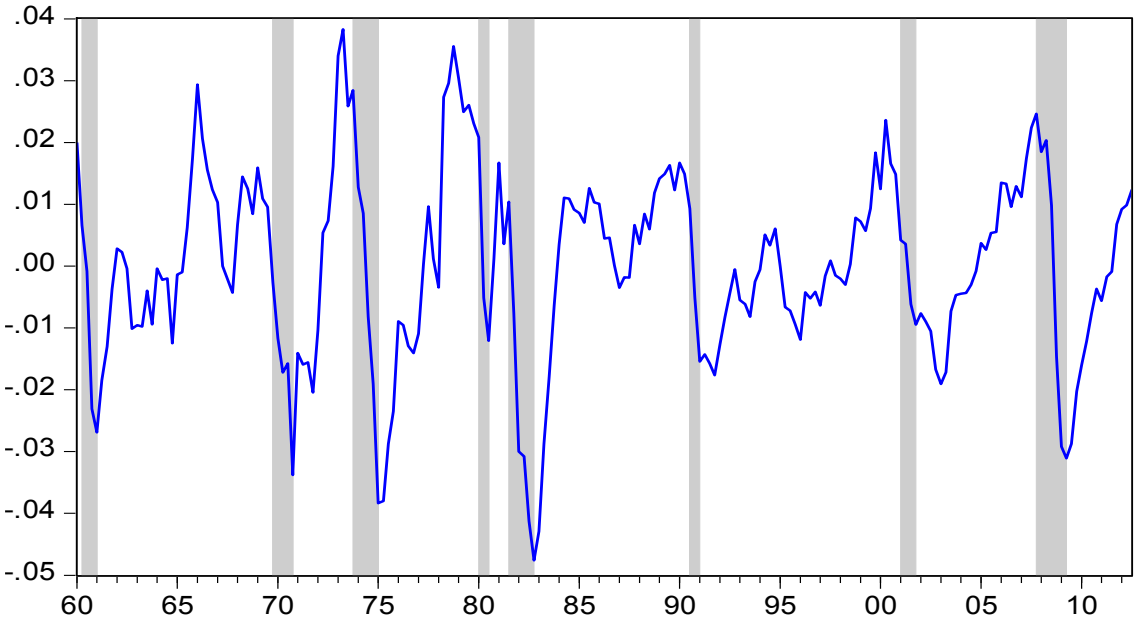
To examine the behaviors of small and large firms by different episodes, our first step is to identify monetary policy shocks and business cycle shocks. Following Chari et al. (2007), I have used the "dates of business cycle peaks" as an indicator of business cycle shocks. The dates of business cycle peaks can be easily identified because the beginning dates of the recessions, which are announced by the National Bureau of Economic Research (NBER), are widely accepted and used. However, identifying the dates of the (exogenous) monetary policy shocks is somewhat controversial among economists. Following Romer and Romer (1989), previous research frequently had used "Romer dates" as an indicator of monetary policy shocks. Yet, Romer dates are not updated since 1988. Recently, however, Adrian and Estrella (2008)

have provided the "end dates for monetary tightening cycles," which can be used as a measure of monetary policy. In this analysis, therefore, I have employed Adrian dates as an indicator of monetary policy shocks.

1. Dates of Business Cycle Peaks

Figure 3.1 reports the result of de-trended U.S. GDP over 5 decades. The log of seasonally adjusted U.S. GDP is filtered by using the Hodrick-Prescott (HP) method to remove the trend, following Chari et al. (2007). The shaded areas are NBER recessions and indicate the starting dates (i.e., peaks of business cycles) and end dates (i.e., troughs of business cycles) of NBER recessions.

In this empirical analysis, I have used the *starting* dates of NBER recessions as a measure of business cycle shocks in causing recessions. As shown in Figure 3.1, the starting dates of NBER recessions are 1960 Q2, 1969 Q4, 1973 Q4, 1980 Q1, 1980 Q1, 1981 Q3, 1990 Q3, 2001 Q1, and 2007 Q4. The starting dates of NBER recessions are usually observed a few quarters after "CCK dates" of business cycle peaks, which are named after Chari, Christiano, and Kehoe (2007).



Shaded areas indicate the NBER recessions

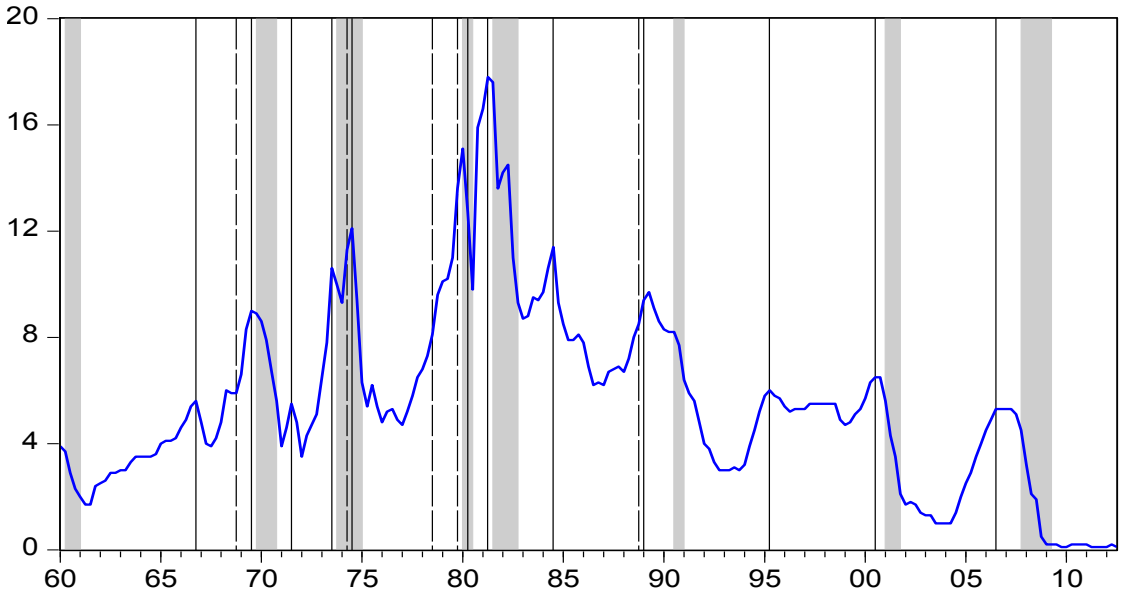
Figure 3.1 Log Deviation of U.S. GDP from HP Trend

CCK dates of business cycle peaks are 1960 Q1, 1966 Q1, 1969 Q1, 1973 Q2, 1978 Q4, 1981 Q1, 1990 Q1, 2000 Q2, and 2000 Q4. Chari et. al (2007) used these CCK dates as a measure of business cycle shocks in their analysis. In this study, only the results of NBER dates are reported because the results produced from "CCK dates of business cycle peaks" are not materially different from results from NBER dates.

2. Dates of Monetary Policy Shocks

Figure 3.2 shows two different types of monetary policy shocks: Romer dates and Adrian dates. Romer and Romer (1989) carefully read the past minutes of the Federal Open Market Committees (FOMC) and picked out the beginning dates of restrictive monetary policy that were considered (exogenous) monetary policy shocks to fight against inflation. These "Romer dates" are the vertical dotted lines in Figure 3.2: 1968 Q4, 1974 Q2, 1978 Q3, 1979 Q4, and 1988 Q4.

"Adrian dates" are also used to identify monetary policy shocks. These "Adrian dates" are the vertical solid lines in Figure 3.2: 1966 Q4, 1969 Q3, 1971 Q3, 1973 Q3, 1974 Q3, 1980 Q2,



Vertical dotted lines indicate Romer Dates; Vertical solid lines indicate Adrian Dates; Shaded areas indicate the NBER recessions.

Figure 3.2 Effective Federal Funds Rate

1981 Q2, 1984 Q3, 1989 Q1, 1995 Q3, 2000 Q3, and 2006 Q3. Because "Romer dates" have not existed since 1990, "Adrian dates" are employed for the long historical data of my analysis. Adrian and Estrella (2009) provide the "end dates of monetary tightening cycles" from 1955 to 2007. They defined the "end dates of monetary tightening cycles" in the following manner:

> We consider tightening cycles since 1955 and assume a cycle ends when either one of these criteria is met: (1) the federal funds rate is higher than at any time from 12 months before to 9 months after and is at least 50 basis points higher than at the beginning of this period, or (2) the federal funds rate is higher than at any time from 6 months before to 6 months after and is 150 basis points higher than the average at these endpoints. (Adrian & Estrella, 2009, p. 1)

There is a difference between "Romer dates" and "Adrian dates" when we consider the timing of monetary policy shocks. As shown in Figure 3.2, "Romer dates" are identified when the federal funds rate *was increasing* over the course of the upturn of the federal funds rate cycles, whereas "Adrian dates" are identified when the federal funds rate *has reached* its highest point, i.e., peaks of the federal funds rate. "Romer dates" can be considered the *beginning dates* of restrictive monetary policy because the Federal Reserve determined to

increase the interest rate to slow inflation at the expense of unemployment. “Adrian dates” can be considered the *end dates* of restrictive monetary policy because the Federal Reserve terminated its restrictive monetary policy by reducing the interest rate shortly. From 1960 Q1 to 1980 Q4, Adrian and Estrell (2009) tend to identify more occurrence of restrictive monetary policy than Romer and Romer (1989). Nonetheless, the beginning dates of restrictive monetary policy (i.e., Romer dates) overall agree with the chronology of the end dates of restrictive monetary policy (i.e., Adrian dates). In Figure 3.2, we can see that “Romer dates” are directly followed by “Adrian dates,” with an exception that two consecutive Romer dates (i.e., 1978 Q3 and 1979 Q4) are matched with one Adrian date (i.e., 1980 Q2).

III. Applying the Method of Previous Researchers to the Recent Data of the QFR

This section describes the procedure of data transformation to reproduce the results of previous research. In this explanation of the data, I focus on the QFR data rather than the flow of funds data. This is because, while the flow of funds data provide two separate variables for small and large firms (i.e., nonfarm nonfinancial corporate business and nonfarm noncorporate business) without requiring us to construct two variables, the QFR data require us to construct the data to produce the variables for small versus large firms.

Following the method of Gertlter and Gilchrist (1994), as discussed in Section III, I construct each variable of small and large firms that are based on the 30th percentile of total sales distribution. Then, I deseasonalize the data. Figure 3.3 shows the growth rates of sales for small versus large firms. Since the data take the log-differenced form to create the growth rates of each firm, the 0.1 fluctuation can be interpreted as 10% growth rate of sales. In this graph, we notice that the sales growth rates of large firms fluctuate apparently more than those of small firms—especially in the neighborhood of 1998 and 2007.

By accumulating the growth rates in Figure 3.3 of small and large firms, we arrive at the results in Figure 3.4. After setting the initial condition to zero, Figure 3.4 shows the cumulative growth rates of small and large firm sales. While large firms show the upward trend of 2

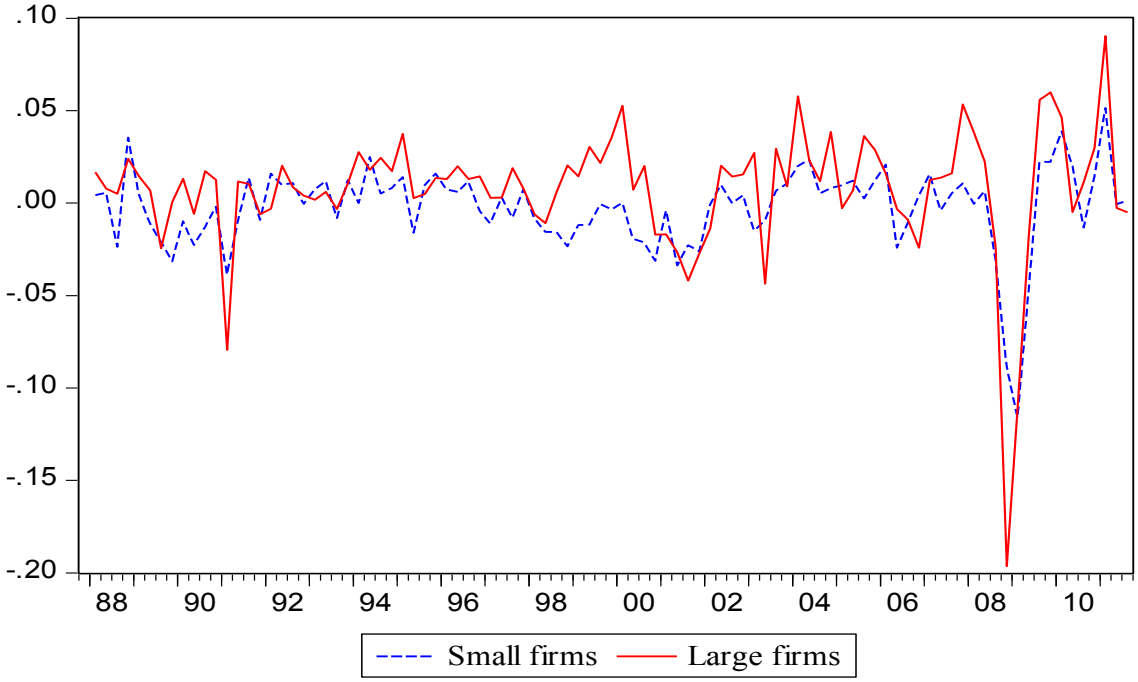


Figure 3.3 Growth Rates of Sales

decades—increasing by 80% from the initial point to the end point —small firms show the somewhat downward trend, decreasing by 40% from the initial point to the end point. [12]

By removing the trends in Figure 3.4 of two size groups, we produce Figure 3.5. That is, Figure 3.5 displays the deviation (of cumulative growth rates) of the sales from the trend after Hodrick-Prescott (HP) filter is applied to each group of firms. In Figure 3.5, notice that, in the 2

[12] It is somewhat surprising that small firms show a declining pattern of behavior over time. One possible explanation is related to the characteristics of a manufacturing industry in the QFR data. Neumark, Wall, and Zhang (2008) suggest that there are different growth industrial structures and growth patterns between new and mature industries. A new industry grows fast and comprises a large share of employment growth because many new (and thus small) firms enter and exist in the industry. Conversely, a mature industry grows slowly and constitutes a small share of job growth because many small firms go out and a greater number of large firms survive in the industry. According to their suggestion, we can reason that, because the manufacturing industry is a *mature* industry where the role of small firms continues to decrease, small firms may exhibit such a declining pattern.

most recent decades, the sales of large firms show more of a fluctuating pattern than those of small firms.[13]

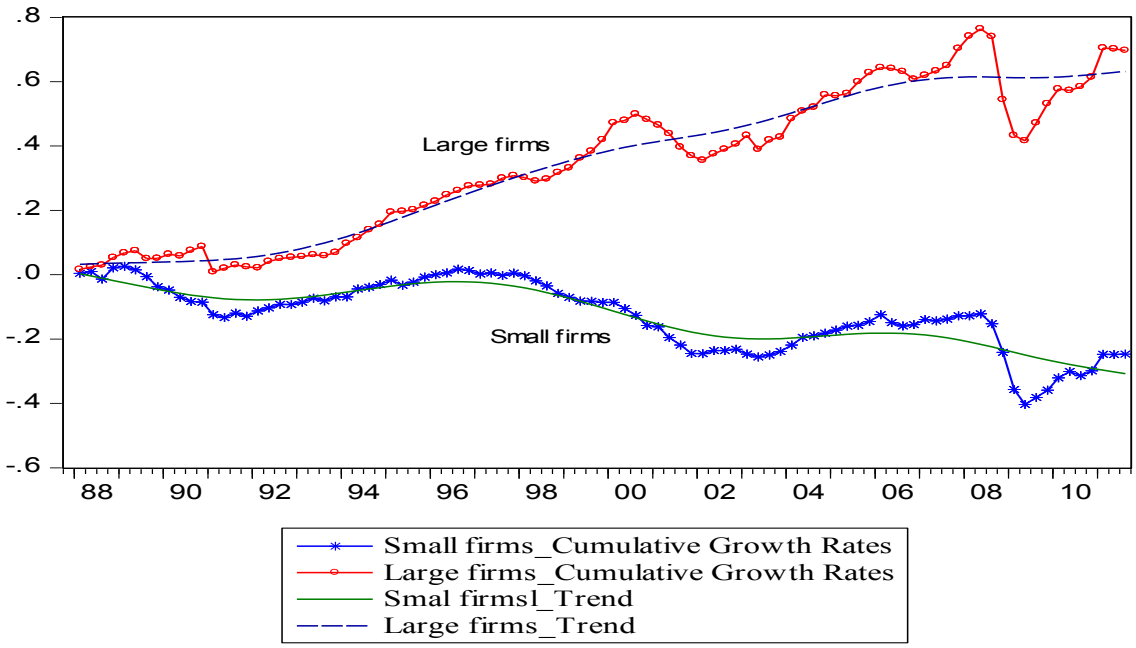


Figure 3.4 Cumulative Growth Rates of Sales

Gertler and Gilchrist (1994) investigate the behavior of small and large firms' sales by producing a worm chart (Figure II). The worm chart draws the log deviation of small and large firms' sales from their respective value at the dates of tight monetary policy. Chari, Christiano, and Kehoe (2007) reproduce Gertler and Gilchrist's (1994) worm chart, employing a business cycle shock instead of a monetary policy shock. Following the method of Gertler and Gilchrist (1994) and Chari, Christiano, and Kehoe (2007), I investigate the sales of small and large firms after either a business cycle shock or a monetary policy shock. Therefore, the cumulative growth rates of small and large firms' sales in Figure 3.5 are normalized by zero at the date of a monetary policy shock or at the date of a business cycle peak. Then, we can produce a worm chart in the same manner as previous research.

[13] To check the robustness of the result, I divided the data in two different ways. First, I used the *nominal cutoff* of eight groups that are made according to the nominal asset sizes. That is, small firms are the aggregation of groups 1 to 4 and large firms are aggregation of groups 7 and 8. Second, following Oliner and Rudebusch (1995), I used the *15th percentiles in capital stock distribution*, instead of the 30th percentile in sales distribution. All results show that large firms are more volatile than small firms during the last 2 decades. See Appendix B.

Figure 3.6 shows the sales of small and large firms after NBER recession shocks of recent periods: 1990 Q3, 2001 Q1, and 2007 Q4. The vertical axis indicates the cumulative growth rates of sales, and the horizontal axis indicates the time periods. After an NBER recession shock, on

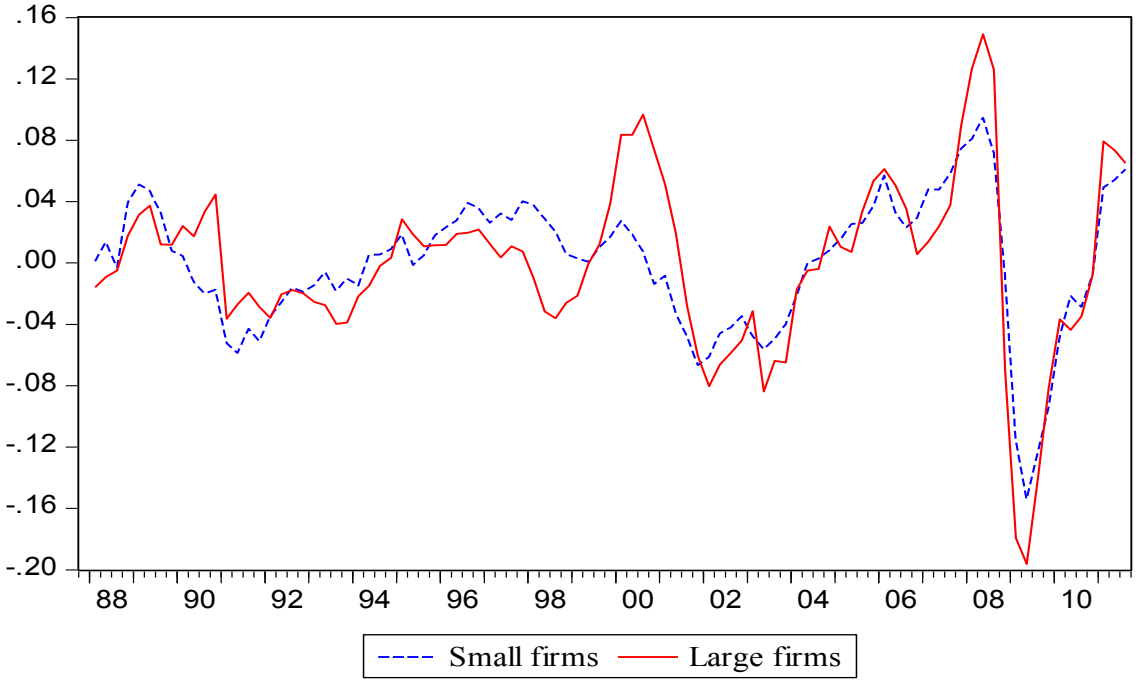


Figure 3.5 Cumulative Growth Rates of Sales after HP Filtering

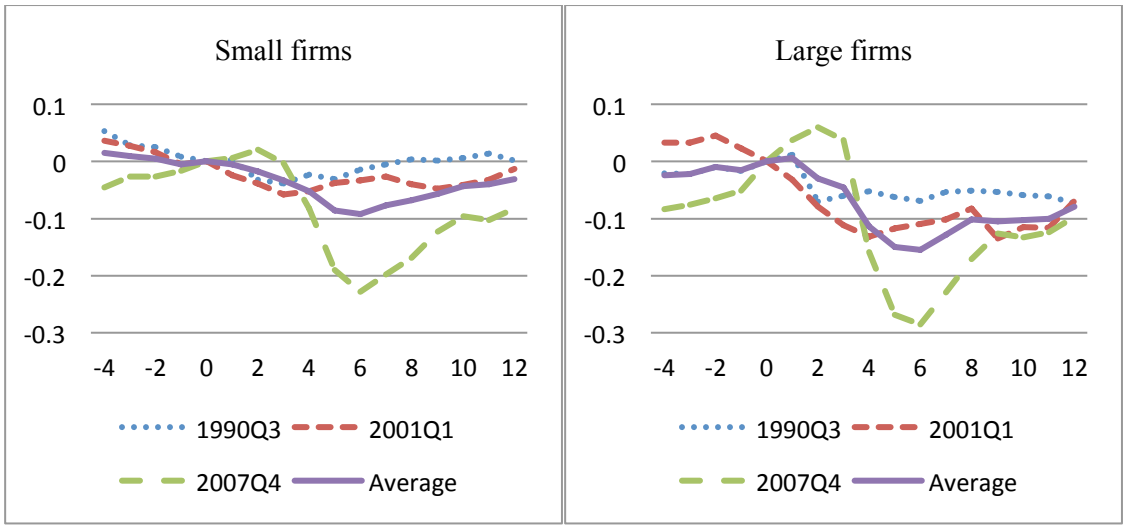


Figure 3.6 Sales of Small and Large Firms After an NBER Recession Shock

average, the sales of large firms reduce substantially more than those of small firms. In particular, after an NBER recession shock of 2007 Q4, small firms reduce their sales by 20%, whereas large firms reduce by 30%. Figure 3.7 exhibits the sales of small and large firms after monetary policy shocks of recent periods: 1995 Q2, 2000 Q3, and 2006 Q3. Particularly, after a monetary policy shock of 2003 Q3, large firms reduce their sales substantially more than small firms. Yet, after a monetary policy shock of 2006 Q3, large firms increase substantially more than small firms for a period of 6 quarters and then decrease sharply more than small firms.

Figure 3.8 shows the average sales of small and large firms after an NBER recession shock or a monetary policy shock. On average, the sales of small firms are compared to those of large firms. During *recent* periods, large firms decrease their sales substantially more than small firms after either an NBER recession shock or a monetary policy shock. Such sensitive behavior of large firms (during *recent* periods) is different from the findings of Gertler and Gilchrist (1994) (during *earlier* periods), whose study shows that small firms decrease their sales more than large firms after monetary policy shocks.

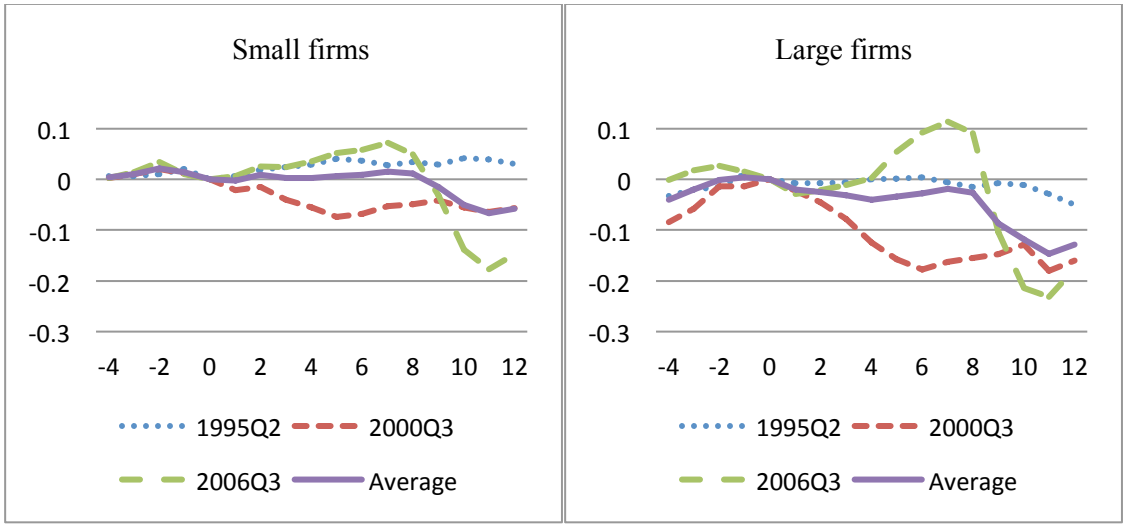


Figure 3.7 Sales of Small and Large Firms After a Monetary Policy Shock
(Adrian Dates)

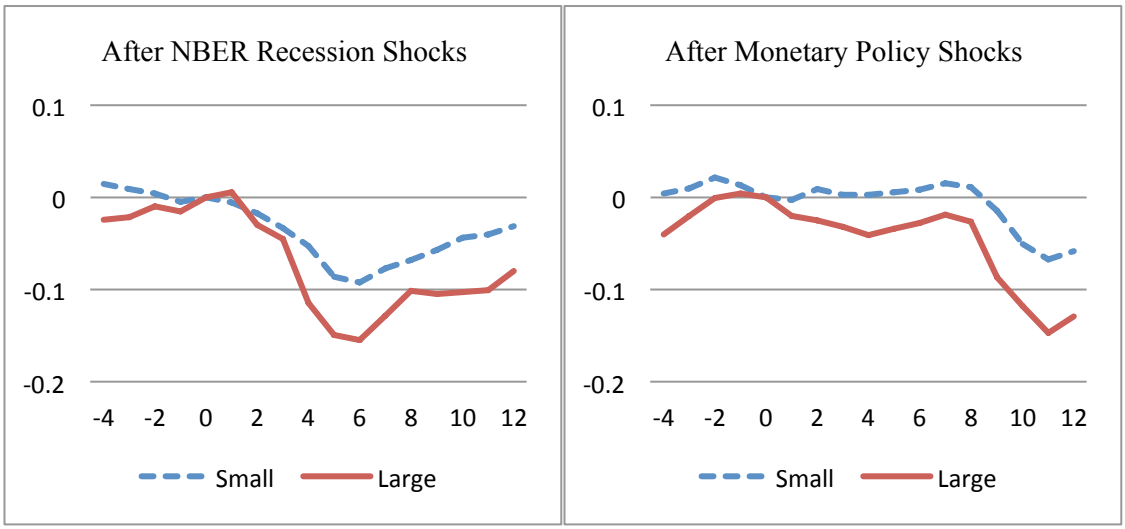


Figure 3.8 Average Sales of Small and Large Firms After Either an NBER Recession Shock or a Monetary Policy Shock

IV. Empirical Results

This section examines the behavior of the aggregate data in some balance sheet variables (sales, inventories, trade debt, and total short-term debt) and the behavior of the components of aggregate debt (bank debt, mortgages, commercial papers and other debt).[14, 15] By using these variables, the behavior of small and large firms is explored by different episodes, business cycle

[14] Total short-term debt includes short-term bank debt, commercial papers, and short-term other debt excluding trade debt.

[15] The QFR data provide the components of *short-term debt* (i.e., short-term bank debt, commercial paper, and short-term other debt) and component of long-term debt (i.e., long-term bank debt and long-term other debt), while the flow of funds data provide only components of *aggregate debt* without the distinction between short-term and long-term debt (i.e., bank debt, mortgages, commercial papers and other debt).

episodes and monetary policy episodes, and by different periods, earlier periods and recent periods.

I report empirical results by different episodes. Empirical results of each episode cover the comparison of small and large firms' behavior between earlier periods (1960 Q1─1989 Q4) and recent periods (1990 Q1─2011 Q3).[16] In particular, the comparison of these two periods is made based on the flow of funds data because only the flow of funds data are available for this long historical time period (1960 Q1─2011 Q3) among four data sets described in Section II—the flow of funds data, the QFR data, the SLOOS data, and BED data.

A. The Responses of Small Versus Large Firms to the NBER Recessions

I examine the behavior of small and large firms during business cycle episodes by using four different sources of data: the flow of funds data, the Quarterly Finance Report (QFR) data, the Senior Loan Officer Opinion Survey (SLOOS) data, and the Business Employment Dynamics (BED) data. The results are reported in the order of data sets.

1. The Flow of Funds Data and the QFR Data

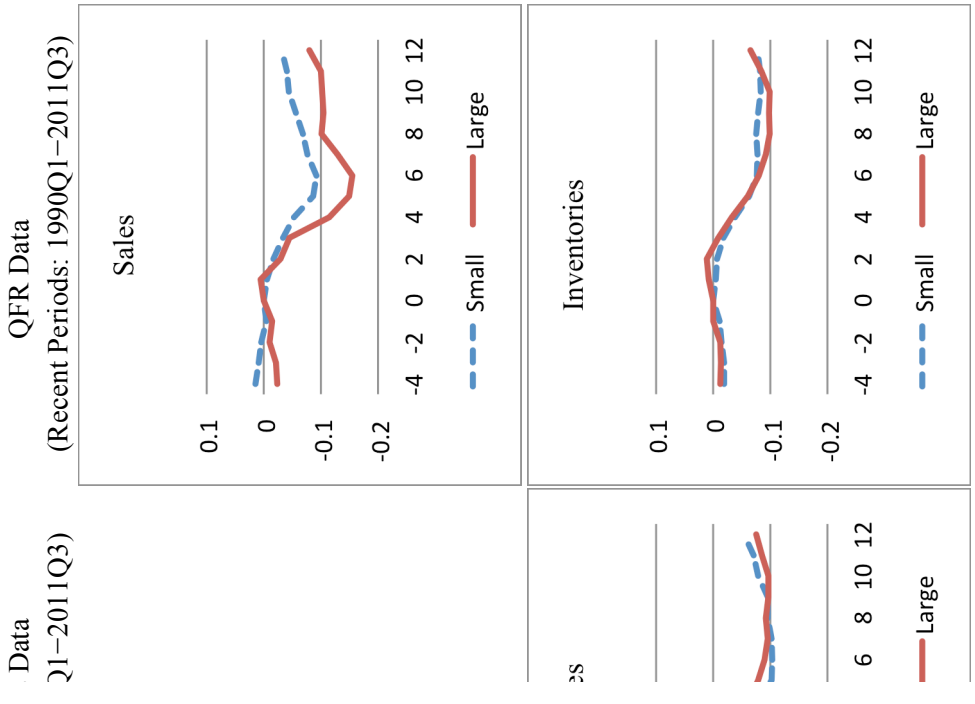
Employing the flow of funds data and the QFR data, Figure 3.9 shows the average changes in some balance sheet variables and in components of aggregate debt after an NBER recession shock. In particular, Figure 3.9 exhibits the outcome of the same exercise of the previous Figure 3.6 and 3.7 in terms of some balance sheet variables and the components of aggregate debt. For parsimony, I report only the *average* behavior of small and large firms after an NBER recession shock, as in Figure 3.8.

Employing the flow of funds data, the first two columns in Figure 3.9 show the average behavior of small and large firms during earlier periods (pre-1990 periods) and recent periods (post-1990 periods). Employing the QFR data, the third column shows the average behavior of

[16] Earlier periods start in 1960 Q1 because the data for total short-term debt are only available from 1960 Q1.

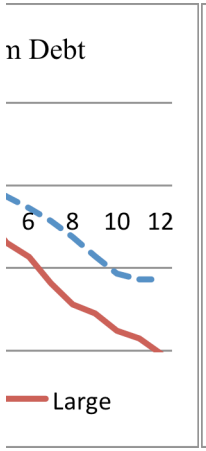
small and large firms during recent periods (post-1990 periods). I report partly the results of "sales," "short-term bank debt," and "mortgages" because these variable are available only either for the flow of fund data or for the QFR data.

During *recent* periods in the QFR data (the third column), the sales of large firms decrease drastically more than those of small firms after an NBER recession shock. For a period of 6 quarters after an NBER recession shock, the sales of large firms decline by roughly 15%, but small firms decline by roughly 10%. During *earlier* periods in the flow of funds data (the first column), the inventories of small and large firms show somewhat different responses after an NBER recession shock. Large firms tend to decrease their inventories more slowly than small firms after an NBER recession shock.

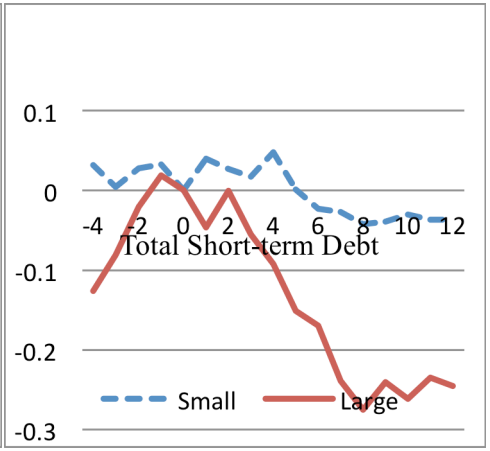


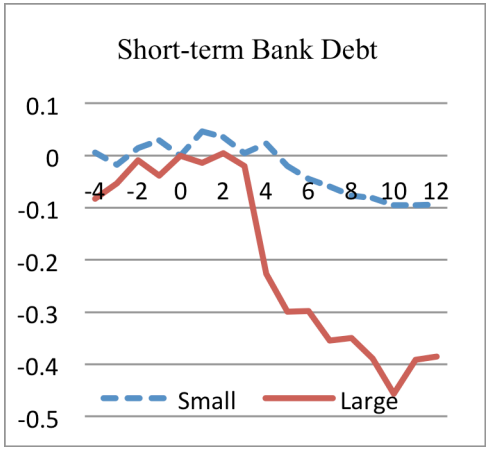
Data
)1−2011Q3)

n Debt



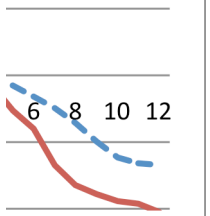
QFR Data
(Recent Periods: 1990Q1−2011Q3)



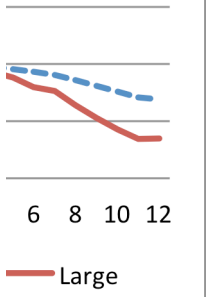


Data
)1−2011Q3)

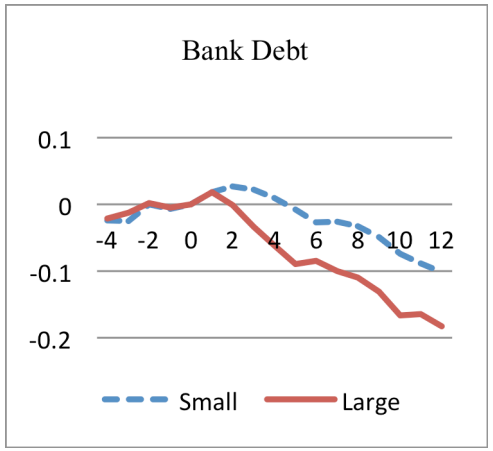
bt



es

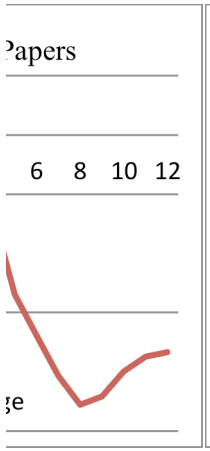


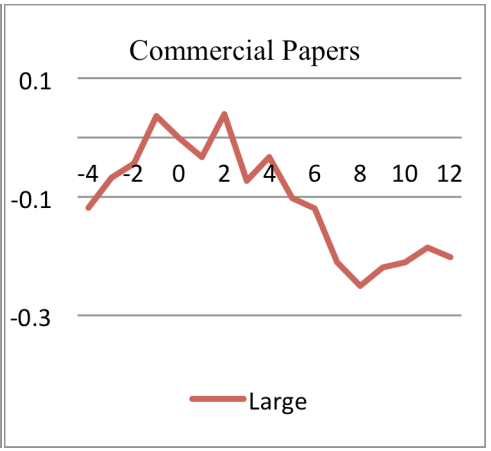
QFR Data
(Recent Periods: 1990Q1−2011Q3)

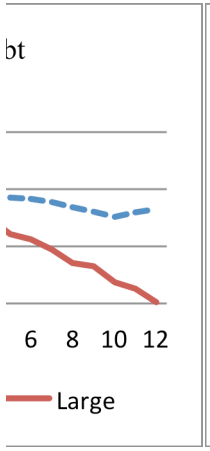


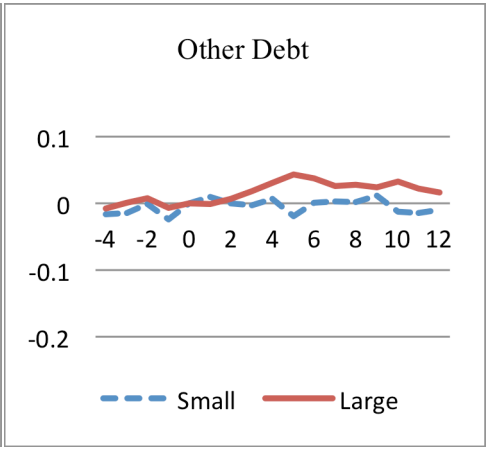
Data
1−2011Q3)

QFR Data
(Recent Periods: 1990Q1−2011Q3)

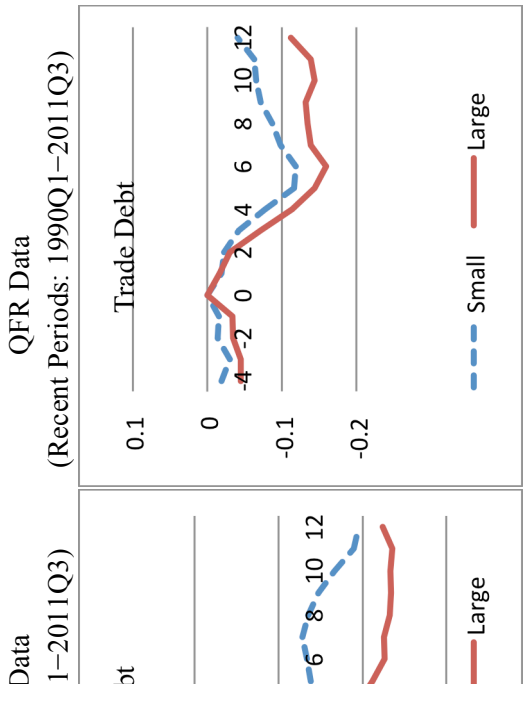








a similar way by less than 10 percent. Yet, during *recent* periods in the flow of fun



However, during recent periods in the flow of funds and the QFR data (second and third columns), the inventories of small and large firms show almost the same responses after an NBER recession shock. For a period of 6 quarters after an NBER recession shock, both small and large firms decrease their inventories by roughly 10%.

During *earlier* periods in the flow of funds data (the first column), the total short-term debt of small and large firms exhibits somewhat similar responses after an NBER recession shock. Both small and large firms slowly decrease their total short-term debt in a similar way by less than 10%. Yet, during *recent* periods in the flow of funds and the QFR data (the second and third columns), the total short-term debt of large firms drops substantially more than that of small firms. In particular, in the flow of funds data, large firms reduce their total short-term debt

by roughly 18% for a period of 10 quarters after an NBER recession, but small firms reduce it by 10%. Such substantial reduction of short-term debt in large firms is more pronounced in the QFR data than in the flow of funds data. In the QFR data, large firms decline their total short-term debt by roughly 25% for a period of 10 quarters after an NBER recession shock, but small firms reduce it by roughly 5%.[17]

The components of aggregate debt exhibit a similar pattern to total short-term debt, depending on different time periods. During earlier periods, both small and large firms reduce total short-term debt comparably, whereas during recent periods, large firms reduce total short-term debt substantially more than small firms. Likewise, during earlier periods, both small and large firms, in general, similarly reduce the components of aggregate debt, while during recent periods, large firms reduce the components of aggregate debt substantially more than small firms.

During earlier periods in the flow of funds data (the first column), the components of aggregate debt show somewhat similar responses after an NBER recession shock. The bank debt of small firms decreases slightly more than that of large firms; the mortgages and other debt of small firms decrease slightly less than those of large firms. However, during recent periods in the flow of funds data and the QFR data (the second and third column), the components of short-term debt shows that the bank loans, mortgages and other debt of large firms—except the other debt of the QFR data—decrease substantially more than those of small firms after an NBER recession.

When the components of aggregate debt during earlier periods are compared to those during recent periods in the flow of funds data (the first and second columns), the bank loan, mortgages, commercial papers, and other debt of large firms during recent periods (the second

[17] During recent periods, such substantial reduction of large firms is more clearly shown in short-term bank debt of the QFR data. Large firms decrease short-term bank debt by about 45%, but small firms decrease by about 10%.

column) decrease substantially more than those of large firms during earlier periods (the first column). In particular, the commercial papers of large firms decrease during recent periods considerably more than during earlier periods. For a period of 8 quarters after an NBER recession shock, large firms reduce the commercial papers by around 5% during earlier periods, but reduce them by around 35% during recent periods.

During recent periods (the second and third columns), when the flow of funds data are compared to the QFR data for all applicable variables, all variables except other debt (i.e., inventories, total short-term debt, bank debt, commercial and trade debt) display similar results. Generally, large firms reduce these variables significantly more than small firms. The other debt of small firms shows somewhat different behavior between the flow of funds and the QFR data.[18] The trade debt of large firms decreases more than that of small firms in all datasets and in all different periods (the first, second, and third columns).

The main finding is that during recent periods, in general, some balance sheet variables and components of aggregate debt in large firms decrease substantially more than those of small firms after an NBER recession shock. In particular, total short-term debt reflects this phenomenon very well. The declining pattern of total short-term debt in large firms is more pronounced in the QFR data than in the flow of funds data.

2. The Senior Loan Officer Opinion Survey Data

The Senior Loan Officer Opinion Survey (SLOOS) data are other sources of data we can use to examine the behavior of small and large firms. As stated in Section II, the Federal

[18] The different behavior of other debt in small firms—between the flow of funds and the QFR data during recent periods—may result from the somewhat different characteristics of other debt in each set of the flow of funds and the QFR data. Other debt is defined as the *residual* of total debt after subtracting the components of debt from the total debt in each set of data. Because the components of debt in the flow of fund data are different from those in the QFR, other debt in the flow of funds data is different from that in the QFR data. In the flow of funds, other debt includes foreign debt, debt from saving institutions and credit unions, finance companies and so on (Federal Reserve, 2000). However, short-term other debt in the QFR data includes mortgages, nonbank financial institutions' debt, and so forth. Notice that mortgages are categorized as other debt in the QFR, whereas they are not categorized as other debt in the flow of funds data.

Reserve conducts surveys to find out how the senior loan officers (at each respondent banks) feel about their lending practices—such as changes in the standards and terms of bank loans—in the credit market over the past 3 months. For the questions that examine banks' lending standards and banks' lending terms,[19] respondents (i.e., senior loan officers at banks) can answer the questions with one of the five given choices: (1) Tightened considerably, (2) tightened somewhat, (3) remained basically unchanged, (4) eased somewhat, and (5) eased considerably. Also, for the question about the state of business demand for loans,[20] respondents can answer the questions with one of the five given options: (1) Substantially stronger, (2) moderately stronger, (3) about the same, (4) moderately weaker, and (5) substantially weaker.

Figure 3.10 shows the net percentage of domestic respondents that report a tightening of loan *standards* for commercial and industrial (C&I) loans. The net percentage tightening here is

[19] To reiterate, the question about banks' lending standards is "How have your credit standards for C&I loans to small firms and large and medium-size firms changed over the past 3 months?" The question about banks' lending terms is "How have the terms of C&I loans to small firms and large and medium-sized firms—with respect to spread of loan rates over banks' costs of funds—changed over the past 3 months?"

[20] The question about the state of business demand for loans is "Apart from normal seasonal variation, how has demand for C&I loans from large and medium-size firms and small firms changed over the past 3 months?"

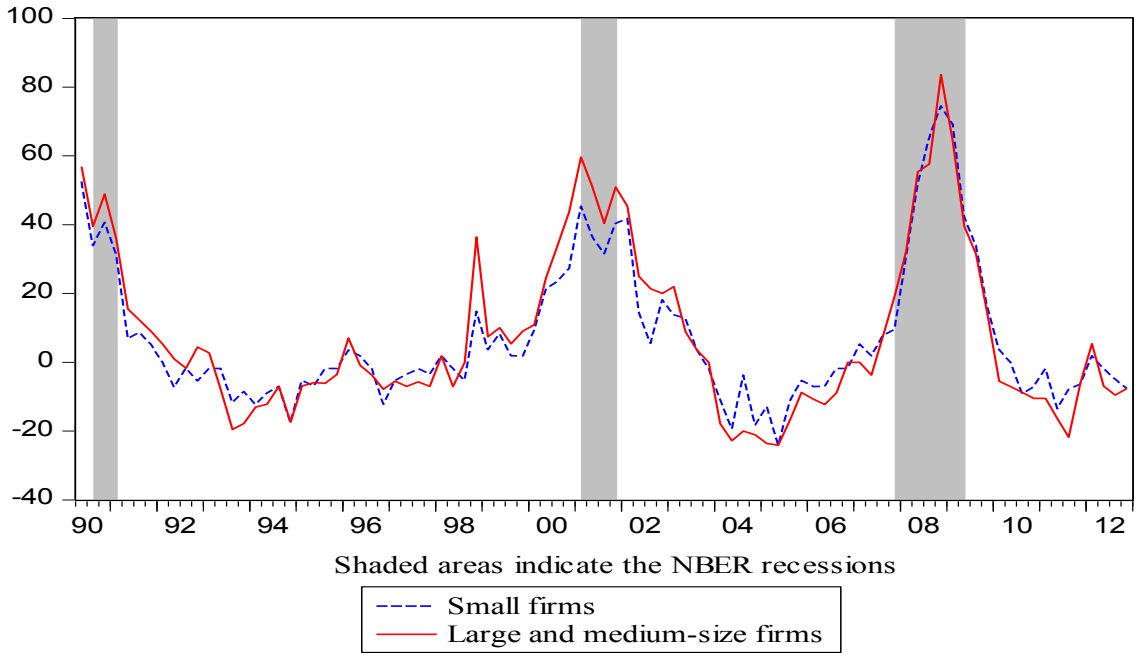


Figure 3.10 Net Percentage of Domestic Respondents Tightening Standards for C&I Loans

defined as the number of loan officers reporting tightening standards ("tightened considerably" or "tightened somewhat") minus the number

reporting easing ("eased considerably" or "eased somewhat") divided by the total number reporting. Although a tightening of loan standards in "small firms" and "large and medium-size firms" tends to rise and fall in a similar way over the sample periods, senior loan officers report that they increase their loan standards to large and medium-size firms more than to small firms during *all* three NBER recessions. In particular, during the 2001 recession, banks increased their standards to large and medium-size firms *substantially* more than to small firms. Yet, during the recessions of 1990 to 1991 and of 2007 to 2009, they increased to large and medium-size firms *slightly* more than to small firms.

Figure 3.11 shows the net percentage of domestic respondents that report an increase in loan *spreads* between loan rates and banks' cost of funds for C&I loans. A wider spread of loan rates over cost of funds indicates that a bank tightens its lending practices, and a narrower spread indicates that a bank eases its lending practices.

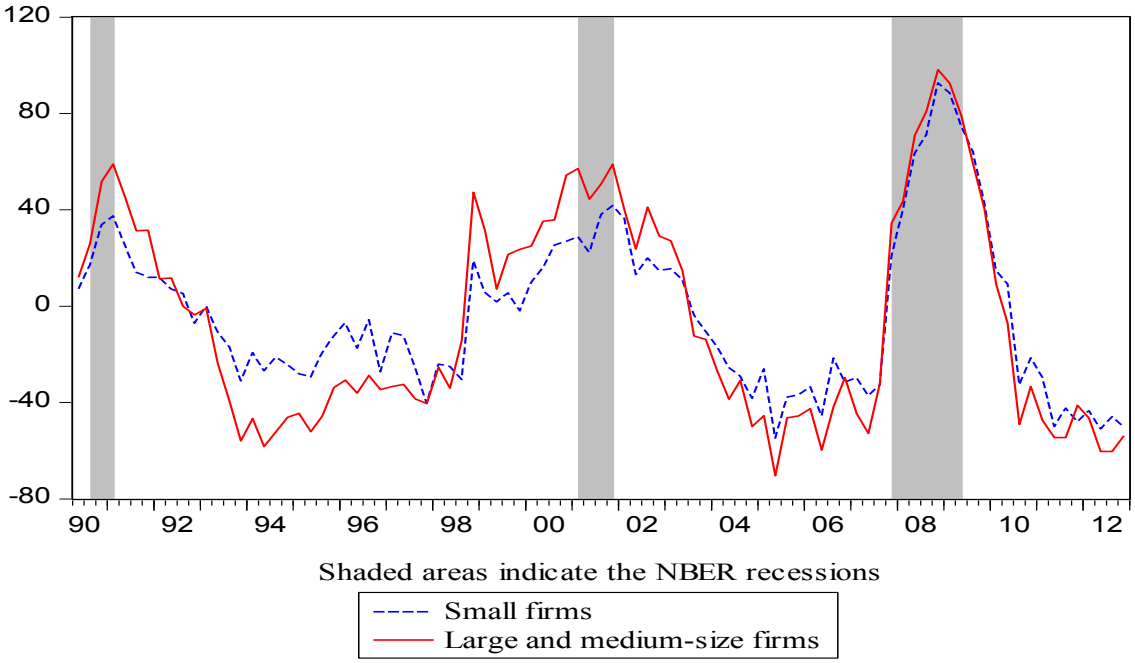


Figure 3.11 Net Percentage of Domestic Respondents Increasing Spreads of Loan Rates over Banks' Cost of Funds

Similarly, the net percentage spreads are defined as the number of loan officers reporting an increase in loan spreads ("tightened considerably" or "tightened somewhat") minus the number reporting an decrease in loan spreads ("eased considerably" or "eased somewhat") divided by the total number reporting. Increases or decreases in loan spreads to large and medium-size firms are noticeably more volatile than the correspondence to small firms over the business cycles. Such different fluctuations suggest that during a contraction, banks increase their loan spreads to large and medium-size firms substantially more than to small firms; during an expansion, they also decrease to large and medium-size firms significantly more than to small firms. While banks increased very similarly their loan spreads between these two kinds of firms during the recession of 2007 to 2009, they nevertheless increased their loan spreads to large and medium-size firms considerably more than to small firms during the recession of 1990 to 1991 and the 2001 recession.

Figure 3.12 shows the net percentage of domestic respondents that report a stronger *demand* of businesses for C&I loans. Likewise, the net percentage demand is defined as the number of

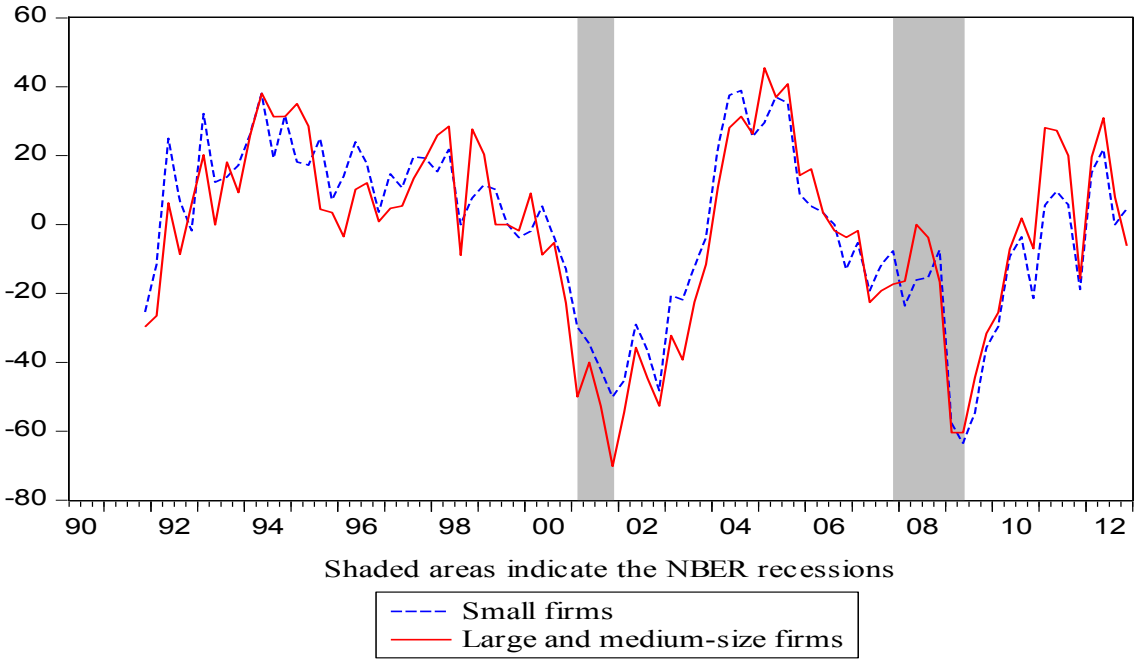


Figure 3.12 Net Percentage of Domestic Respondents Reporting Stronger Demand for C&I Loans

loan officers reporting a stronger demand of business ("substantially stronger" or "moderately stronger") minus the number reporting a weaker demand of business ("substantially weaker" or "moderately weaker") divided by the total number reporting. We can observe a similar pattern in loan demand of businesses from what happen to the banks' lending standards and terms. A stronger loan demand to large and medium-size firms tends to fluctuate more than the equivalence to small firms over the sample periods. Such variations suggest that during a contraction, large and medium-size firms increase their demand for credit more than small firms; during an expansion, they decrease their demand for credit more than small firms. In particular, banks perceive that "small firms" and "large and medium-size firms" decrease very comparably their demand during the recession of 2007 to 2009, but banks perceive that large and medium-size firms decrease their demand significantly more than small firms during the 2001 recession—the data of the 1990 recession are not available in this net percentage demand.

3. The Business Employment Dynamics Data

The BED data also can be used to examine the behavior of small and large firms in terms of employment. Although Birch (1979) finds that small businesses account for a particularly large share of new jobs created in the U.S economy (reporting that establishments with 100 or fewer employees create 81.5% of net new jobs between 1960 and 1976), a number of researchers cast doubt on his finding. They suggest that his finding is somewhat overestimated for the role of small firms in job creation. Armington and Odle (1982) find that, when they classify business sizes by the number of employees working for *firms* (i.e., a firm basis) rather than the number of employees working at each location (i.e., an establishment basis),[21] firms with 100 or fewer employees generate only 39% of net jobs between 1978 and 1980. Brown, Hamilton, and Medoff (1990) find that 40% of jobs possessed by small businesses in 1980 had disappeared after 6 years, which implies that small businesses tend to produce short-lived jobs. They claim that small businesses are not responsible for such a large share of jobs when we pay attention to jobs that are not short-lived. Furthermore, Davis, Haltiwanger, and Schuh (1998) criticize Birch's methodology of classifying businesses into size categories because Birch's approach produces an upward bias in the contribution of small firms to job growth. They point out that, when Birch uses base-year employment in the denominator in the calculation of job growth rate, the base-year employment leads to a statistical pitfall, which indicates that employment growth is stemming from small firms. This is known as the "regression fallacy" or "regression-to-the-mean" bias.

To deal with some of the problems described above, the BED begins providing the data of business size categories in a different way. Business sizes are classified by the *firm* level (instead of the establishment level), and an alternative method, known as "a dynamic-sizing method," is used (instead of the base-year method) when the BED classifies businesses into size

[21] "An establishment is typically defined as an economic unit, such as a factory or store, which produces goods and provides services. An establishment is a physical location and is engaged in one, or predominantly one, type of economic activity. In contrast, a firm is defined as an aggregation of establishment under common ownership by a corporation parent" (Okolie, 2004, p. 4).

classes. In addition to providing more accurate data, the BED also provides the decomposition data of net employment growth, which allow us to understand the dynamics of the job market in more depth. In the quarterly BED data series, the net employment change is decomposed mainly into "gross job gains" and "gross job losses." Gross job gains are divided furthermore into business openings and expansions. Gross job losses are divided additionally into business closings and contractions.

Based on the BED data from 1992 Q2 to 2011 Q4, Table 3.1 displays the quarterly average of gross job gains, gross job losses, and net changes by firm sizes. The job gains, job losses, and net changes are reported basically in three different ways: level (panel A), share (panel B), and growth rate (panel C). As shown in panel A, the employment level data show that the economy, on average, created a total of 251,000 jobs each quarter over the sample periods. Such employment increase is the net result of two factors: the jobs created by business openings and expansions and the jobs lost by business closings and contractions. Opening and expanding businesses created an average of 6.3 million jobs each quarter, whereas closing and contracting businesses lost an average of 6.1 million jobs. Each of these figures is much large than the net employment figures, 251,000. These statistics indicate the substantial number of job *churning* that happens in the U.S economy every quarter.

More specifically, as to gross job gains, employment expanding businesses increased by an average of 5.3 million jobs per quarter, and employment opening businesses increased by an average of 1 million jobs. Expanding businesses, consequently, account for about 84% of gross job gains each quarter (5.3 million jobs/6.3 million jobs), and opening businesses account for remaining about 16% (1 million jobs/6.3 million jobs)—on average over the sample period. On the other hand, regarding gross job losses, employment contracting businesses decreased by an average of 5.1 million jobs, and employment closing businesses decreased by an average of 1 million jobs. Contracting businesses, hence, account for about 84% of gross job losses, and closing businesses account for the residual about 16%—on average over the sample period.

These statistics indicate that it is expanding and contracting businesses that constitute a majority of gross job gains and losses in the labor market, not opening and closing businesses.

Table 3.1 Average Quarterly Level, Share, and Growth Rate of Gross Job Gains and Gross Job Losses by Firm Size (seasonally adjusted, 1992 Q3 to 2011 Q4)

Categories	Size Classes (Number of Employees)										
	(1) 1 to 4	(2) 5 to 9	(3) 10 to 19	(4) 20 to 49	(5) 50 to 99	(6) 100 to 249	(7) 250 to 499	(8) 500 to 999	(9) 1000 or more	(10) Total	(11) Aver -age
A. Level (in Thousand)											
Gross Job Gains	944	739	761	904	572	612	369	302	1,130	6,333	—
Expansions	379	573	643	809	533	586	359	296	1,122	5,301	—
Openings.	565	166	117	95	39	26	10	6	8	1,032	—
Gross Job Losses	925	727	743	874	547	578	347	285	1,058	6,082	—
Contractions	389	569	630	779	505	546	333	276	1,049	5,075	—
Closings	536	158	113	95	42	32	14	8	10	1,007	—
Net Change	19	13	18	30	25	34	22	17	72	251	—
B. Share (Percent of the Categories) [1]											
Gross Job Gains	15	12	12	14	9	10	6	5	18	100	—
Expansions	7	11	12	15	10	11	7	6	21	100	—
Openings	55	16	11	9	4	3	1	1	1	100	—
Gross Job Losses	15	12	12	14	9	9	6	5	17	100	—
Contractions	8	11	12	15	10	11	7	5	21	100	—
Closings	53	16	11	9	4	3	1	1	1	100	—
Net Change	8	5	7	12	10	14	9	7	29	100	—
Cumulative Share of Net Change	8	13	20	32	42	56	64	71	100	—	—
C. Growth Rate (Percent of Total Employment) [2]											
Gross Job Gains	17.3	11.3	9.4	7.7	6.5	5.5	4.8	4.2	2.9	—	7.7
Expansions	6.9	8.8	7.9	6.9	6	5.3	4.7	4.1	2.9	—	5.9
Openings	10.3	2.5	1.4	0.8	0.4	0.2	0.1	0.1	0	—	1.8
Gross Job Losses	16.8	11.1	9.1	7.4	6.1	5.1	4.5	3.9	2.7	—	7.4
Contractions	7.1	8.7	7.7	6.6	5.7	4.9	4.3	3.8	2.6	—	5.7
Closings	9.8	2.4	1.4	0.8	0.5	0.3	0.2	0.1	0	—	1.7
Net Change	0.4	0.2	0.3	0.3	0.3	0.4	0.3	0.3	0.2	—	0.3

[1] Share measures the percent of the categories—i.e., gross job gains, expansions, contractions etc.—represented by each firm class.
[2] Growth rate measures the gross job gains, gross job losses, expansions, openings, contractions and openings as a percentage of average of the previous and current total employment.
†Source: An author' calculations based on Bureau of Labor Statistics' Business Employment Dynamics dataset. Some percentages do not total 100 due to rounding.

As previously reported, the economy has experienced gross job gains, averaging a gain of 6.3 million jobs each quarter. A natural question arises: "Which firm size group accounts for the most job gains?" Panel B answers this question. Firms with fewer than 50 employees contributed an average of 53% of gross job gains (15+12+12+14), and firms with fewer than 100 employees contributed 62% (53+9). On the other hand, the economy has experienced gross job losses, averaging a loss of 6.1 million jobs each quarter. Firms with fewer than 50 employees had a 53% share of gross job losses (15+12+12+14), and firms with fewer than 100 employees had a 62% share of gross job losses (53+9). Subtracting gross job losses from gross job gains produces an average *net gain* of 251,000 jobs. Firms with fewer than 50 employees contributed about 32% of average net job change, and firms with fewer than 100 employees contributed 42%. To understand whether small firms create more jobs than large firms, it is required to compare the share of small firms in total job creation to the share of their *total employment*. The comparison of these two shares reveals that the share of these firms in total job creation is greater than the share of their total employment. Firms with fewer than 50 employees made up 30% of total employment (but contributed 32% of net job creation), and firms with fewer than 100 employees made up 37% (but contributed 42%)—the share of total employment is not shown in Table 3.1.[22] These statistics suggest that small firms contributed a larger share of new jobs over the past 2 decades[23]—nonetheless, a larger share of their new jobs is still open to question over the phase of the business cycle, especially during a recession.

[22] The share of total employment (not shown in Table 3.1) is based on the establishment level, not the firm level, from the data of Business Dynamic Statistics (BDS).

[23] Brown et al. (1990) suggest that we should not conclude from this result—the larger contribution of small firms to new jobs—that small firms grow faster than larger ones. Indeed, the mortality rate for small firms is much higher than that of large firms. Such high mortality rate influences the faster growth rates of small firms among survivors. "If calculation [of growth rate] is extended to include all firms

The very large firms, those with 1000 or more employees, made up 18% of gross job gains, the highest share among the nine size firms. The next largest share appears with the size class 1 to 4 employees, with 15% of gross job gains. These two size groups also had the largest quarterly share of gross job losses, 17% and 15%, respectively. The business openings and closings took place mostly in smaller size groups. In the size class of 1 to 4 employees, the average share of gross job gains was 55% each quarter, and the average share of gross job losses was 53%. Notice that this share decreases as firm size increases.

As shown in panel C, the growth rates show that the economy has experienced about 7.7% of average gross job gain rate and about 7.4% of average gross job loss rate over the sample periods. These figures mean that the jobs created by opening and expanding businesses account for average 7.7% of the *total* number of jobs during a quarter; similarly, the job lost by closing and contracting businesses comprise average 7.4% of *total* number of jobs. The difference of 3% between these two statistics is an average of net employment growth rate during a quarter. In this analysis, we will pay special attention to the net employment growth measured as a *rate*, rather than an employment level, because using an employment growth rate permits us to compare changes in the behavior of small and large firms more reasonably. To understand better the underlying dynamics of the net employment growth rate, we need to turn to the components of the net employment growth measured as rates—a gross job gains rate and a gross job losses rate.

Figure 3.13 shows gross job gain (job creation) rates and gross job loss (job destruction) rates between small and larger firms. In this graph, small firms are defined as firms with 1 to 49 employees, and large firms are defined as those with 50 or more.[24, 25] Over the past 2 decades,

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existing in the initial year, and not just those that survived, small businesses declined faster than large ones" (p. 24).

[24] I report only the results produced by this definition of small and large firms because other two definitions—which indicate small firms as those with 1 to 99 employees and those with 1 to 499 employees—produce similar results.

we can see a striking difference of job creation rates and destruction rates between small and large

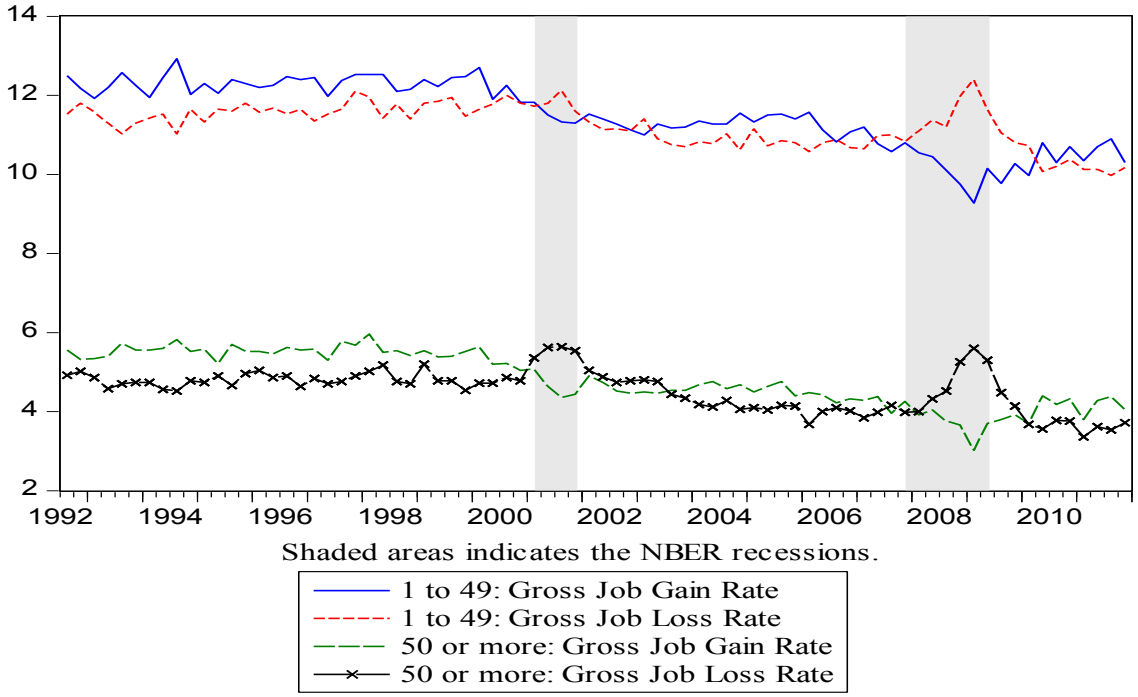


Figure 3.13 Gross Job Gain Rates and Gross Job Loss Rates

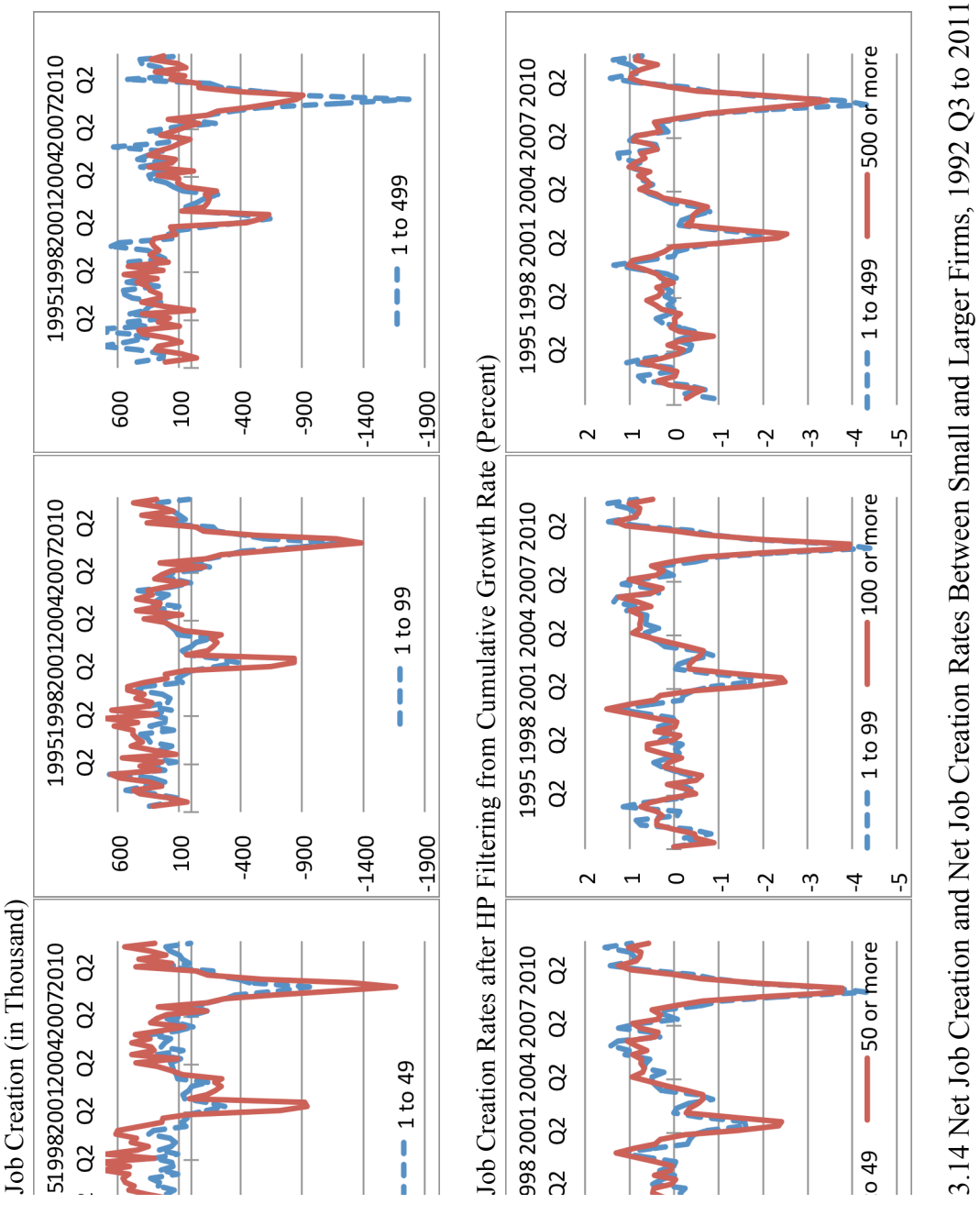
firms. Both the job creation rates and job destruction rates of small firms are very high, ranging from 9 to 13%. In contrast, these two statistics of large firms are somewhat low, ranging from 3 to 6%. Such a different tendency suggests that small firms create and also destruct jobs at a fast rate, while large firms create and also destruct jobs at a slow rate.[26] Because an important statistic we must focus on is the difference between job creation rates and destruction rates, this

[25] Job gain rates are measured by averaging the job gain rates of each size classes of small and large firms according to the definition of each group of firms. For example, when small firms are defined firms with 1 to 49, I first calculate the job gain rates of each of the first four size classes. Then, I divide the sum of the job gain rates of these four size classes by 4, i.e., (the rate of size class 1 + of size class 2 + of size class 3 + of size class 4)/4.

[26] Although I did not report expansion rates, contraction rates, opening rates, and closing rates, the behavior of these components reflects a pattern of job creation rates and job destruction rates between small and large firms. That is, existing small firms tend to expand and contract jobs at the higher rate than existing large firms do; small firms tend to open and close their businesses at a greater rate than large firms do.

leads us to investigate *net* job creation rates, a more accurate measure of job creation in the economy.

Figure 3.14 shows the behavior of both the net job creation (levels) and the net job creation rate between small and large firms from 1992 Q3 to 2011 Q4. To examine the behavior of small and large firms more thoroughly in terms of net job creation, small and larger firms are defined in three different ways, as stated in Section II: (1) small firms are a group that hires 1 to 49 employees, and larger firms are a group that hires 50 or more employees; (2) small firms are a



3.14 Net Job Creation and Net Job Creation Rates Between Small and Larger Firms, 1992 Q3 to 2011 Q4

Panel A in Figure 3.14 displays the "net job creation" measured as an employment level. In

group that hires 1 to 99 employees, and larger firms are a group that hires 100 or more employees; and (3) small firms are a group that hires 1 to 499 employees, and larger firms are a group that hires 500 or more employees.

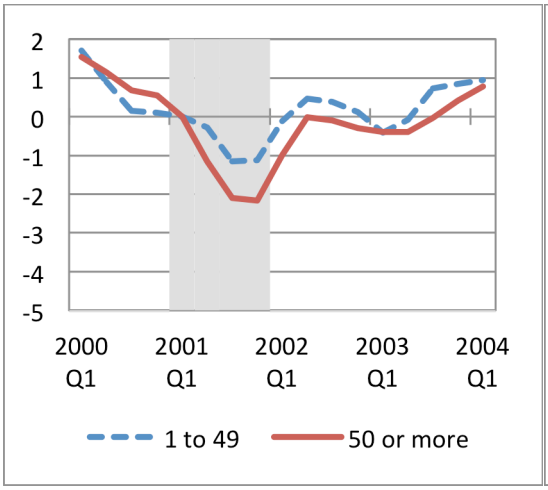
the first two definitions of small and large firms (the first two columns), the net job creation of larger firms is more volatile than that of small firms during 2001 recession and the 2007-2009 recession. Yet, in the third definition (the third column), the situation is reversed; the net job creation of small firms is more variable than that of large firms, particularly when we look at the 2007-2009 recession. This is partly because, I believe, when the net job creation is measured by the employment *level*, the fluctuations of small firms tend to change depending on how we classify small firms. For example, if small firms are defined to include *more* firm size classes, they are likely to show *more* net change in employment levels due to an increase in their population.

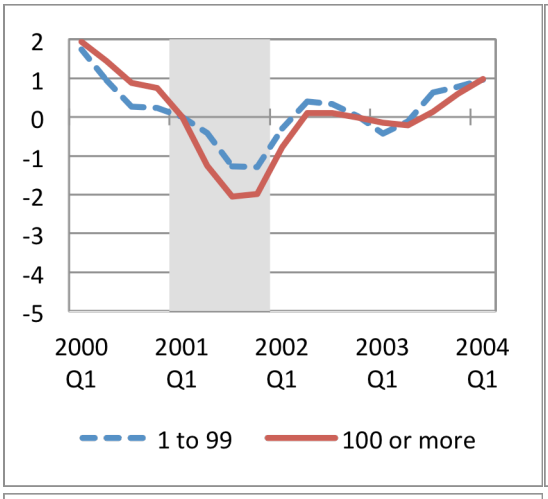
To address this issue, panel B in Figure 3.14 displays net job creation *rates*, rather than the employment level. Net job creation rates compare the contribution of job creation between small and large firms more accurately because they show a portion of the total number of jobs. As in Section II, the growth rates of net job creation are reported hereafter I remove a trend from cumulative growth rates by using Hodric-Prescott (HP) filter. Notice that, when net job creation rates are used in panel B, the difference of the behavior between small and large firms is less dramatic than when the net job creation (levels) are used in panel A. During the 2001

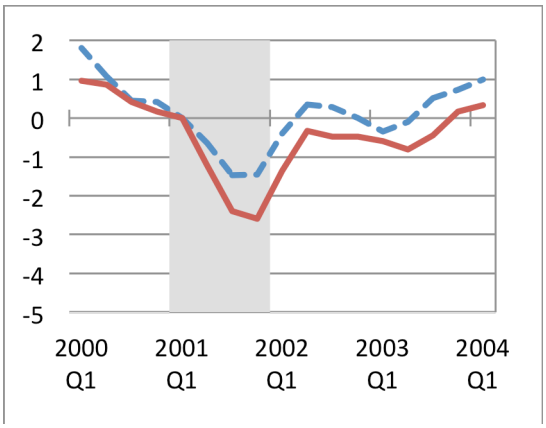
recession, the net job creation rates of larger firms are somewhat more volatile than those of small firms in all three definitions of small and large firms. Yet, during the 2007-2009 recession, the net job creation rates of small firms are slightly more variable than those of larger firms in all three definitions. To examine the behavior of small and large firm between the 2001 and the 2007-2008 recessions more closely, the cumulative growth rates of net job creation are normalized by zero at the start date of the NBER recession, as in Section II.

Figure 3.15 shows that, during the 2001 recession, the net job creation of large firms decreased substantially more than that of small firms in all three definitions (the left three columns). These results are consistent with the results produced from the SLOOS data set. Remember that senior loan officers report that, during the 2001 recession, they increased their loan standards and loan spreads to large and medium-size firms substantially more than to small firms (Figure 3.10 and 3.11) and that they also perceived large and medium-size firms increase their loan demand significantly more than small firms (Figure 3.12). On the other hand, during the 2007 to 2009 recession, the net job creation of small firms declines almost to the same extent as that of large firms (the first two columns in the right) or decrease slightly more than that of large firms (the bottom right column). These outcomes are also generally consistent with the outcomes produced from the SLOOS data. Recall that senior loan officers report that, during the 2007-2009 recession, they increased their loan standards and loan spreads to a very *similar* degree between small and large and medium-size firms or increased these two elements to large and medium-size firms slightly more than small firms (Figure 3.10 and 3.11), and that they see these two kinds of firms decrease their loan demand to almost the same extent (Figure 3.12).

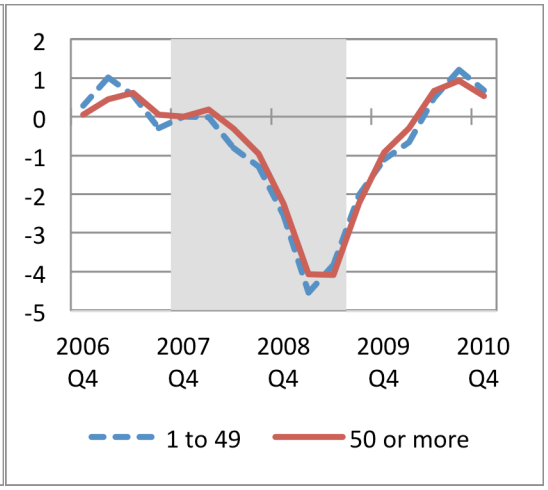
The 2001 Recession

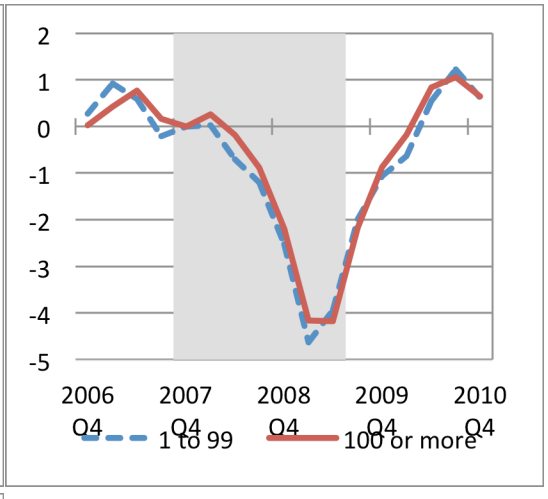


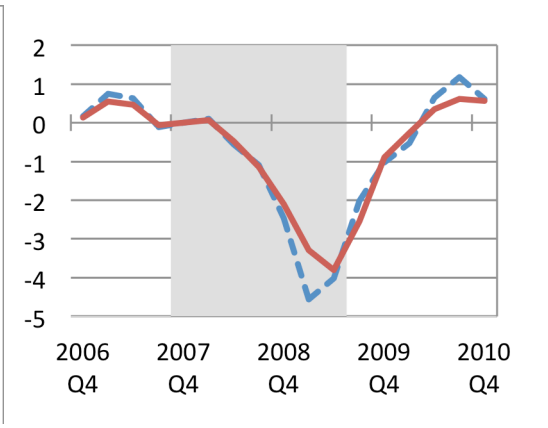




The Recession of 2007 to 2009







B. The Responses of Small Versus Large Firms to Monetary Policy

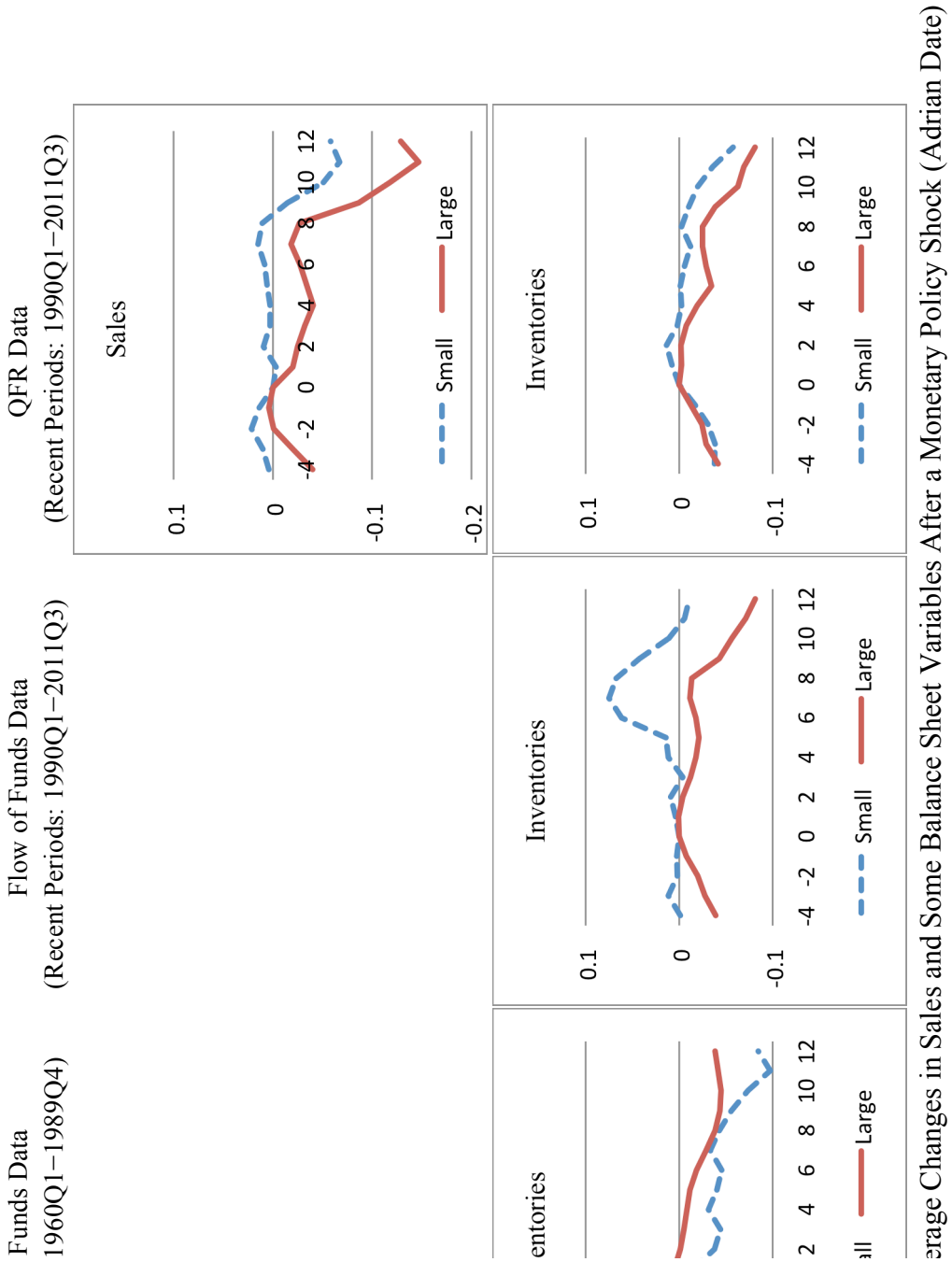
1. The Flow of Funds Data and the QFR Data

I examine the behavior of small and large firms during monetary policy episodes by using two different sources of data: the flow of funds data and the Quarterly Finance Report (QFR) data. In this analysis, two types of monetary policy shocks—"Romer dates" and "Adrian dates"—are used. As mentioned in Section II, "Romer dates" are available only for earlier periods (pre-1990 periods) while "Adrian dates" are available for long historical sample periods (1960 Q1 – 2011 Q3). Although I have employed two types of monetary policy shocks, only the results produced by using "Adrian dates" are reported in this subsection. This is because "Adrian dates" allow us to make a comparison between earlier periods and recent periods. Nonetheless, the results produced by using "Romer dates" are also reported in Appendix C.

Employing the flow of funds data and the QFR data, Figure 3.16 shows the average changes in some balance sheet variables (sales, inventories, trade debt and total short- term debt) and in components of aggregate debt (bank debt, mortgages, commercial papers, and other debt) after a tight monetary policy shock. I also report only the *average* behavior of small and large firms after a tight monetary shock. Employing the flow of funds data, the first two columns show the average behavior of small and large firms during earlier periods (pre-1990 periods) and recent periods (post-1990 periods). Employing the QFR data, the third column shows the average behavior of small and large firms during recent periods (post-1990 periods). In addition, I report partly the results of "sales," "short-term bank debt," and "mortgages" for either the flow of

funds data or the QFR data because these variables are available only for one of the two data sets.

During recent periods in the QFR data (the third column), the sales of small firms hover around zero up to 8 quarters after a monetary policy shock and afterward start to decline; the sales of large firms begin to decline slightly after a monetary policy shock and then recover until 8 quarters have passed. Finally, they decline sharply. In particular, the sales of small and large firms in Figure 3.16 exhibit a very similar pattern to the sales of small and large firms in Figure 3.9,



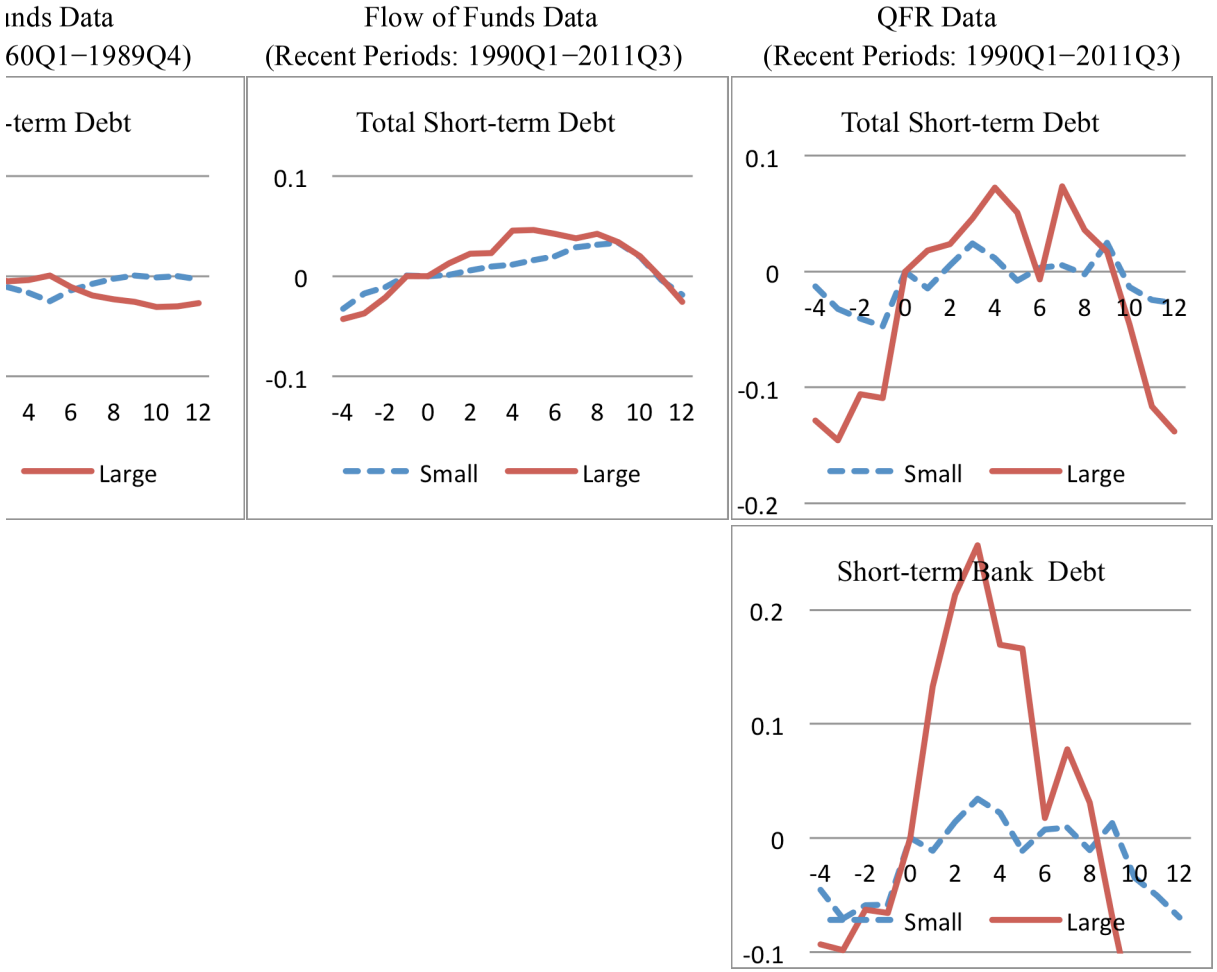


Figure 3.16 Continued

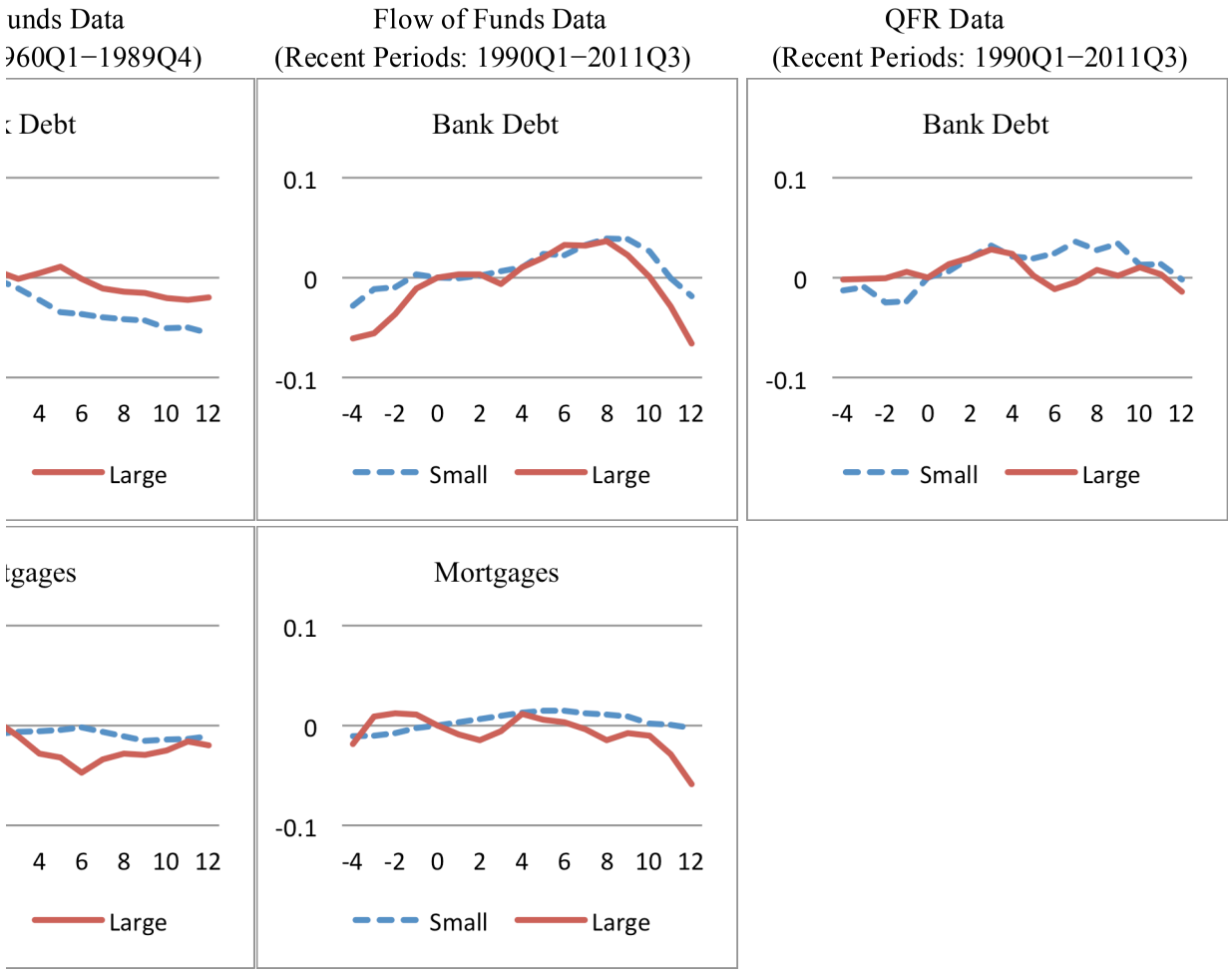


Figure 3.16 Continued

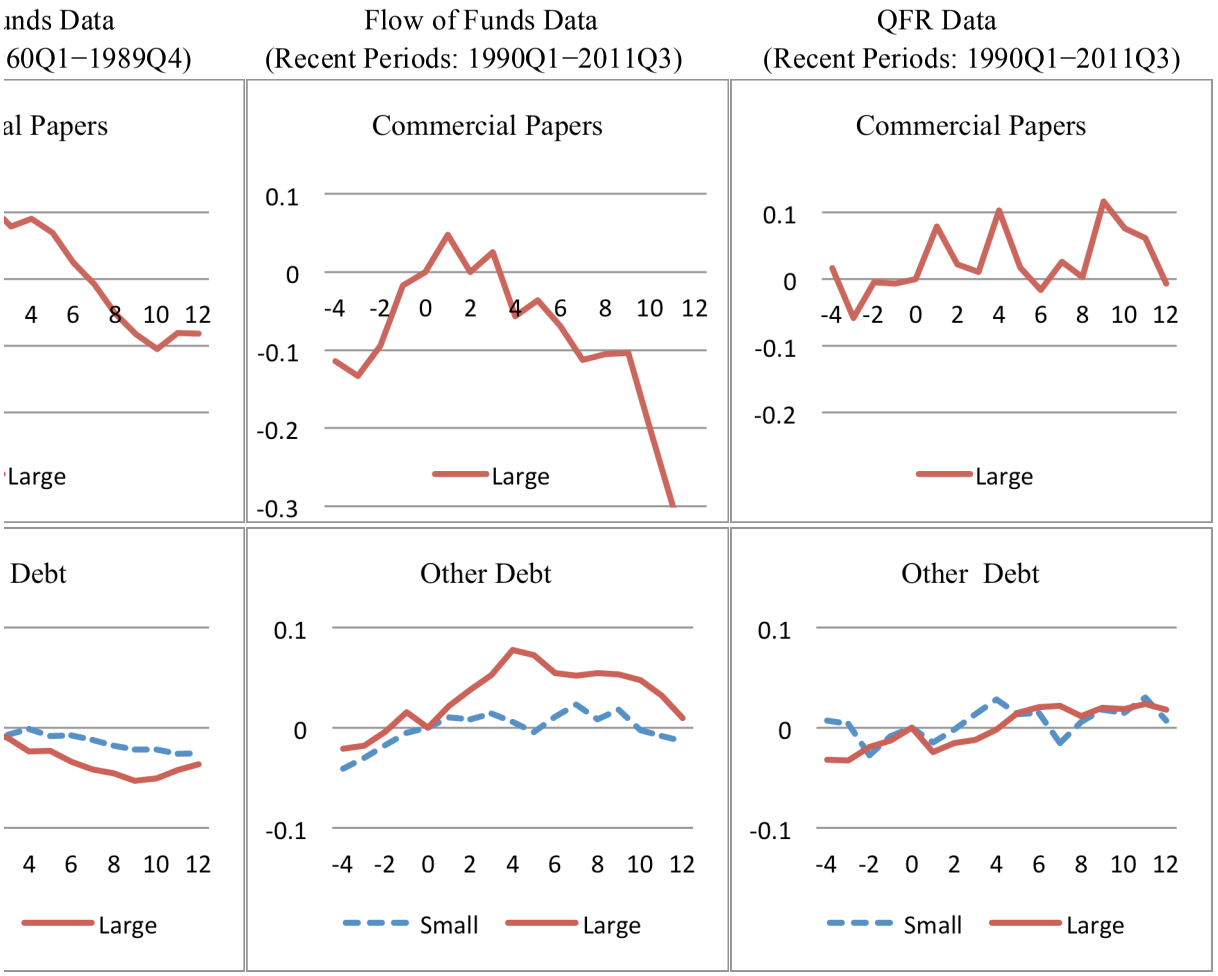


Figure 3.16 Continued

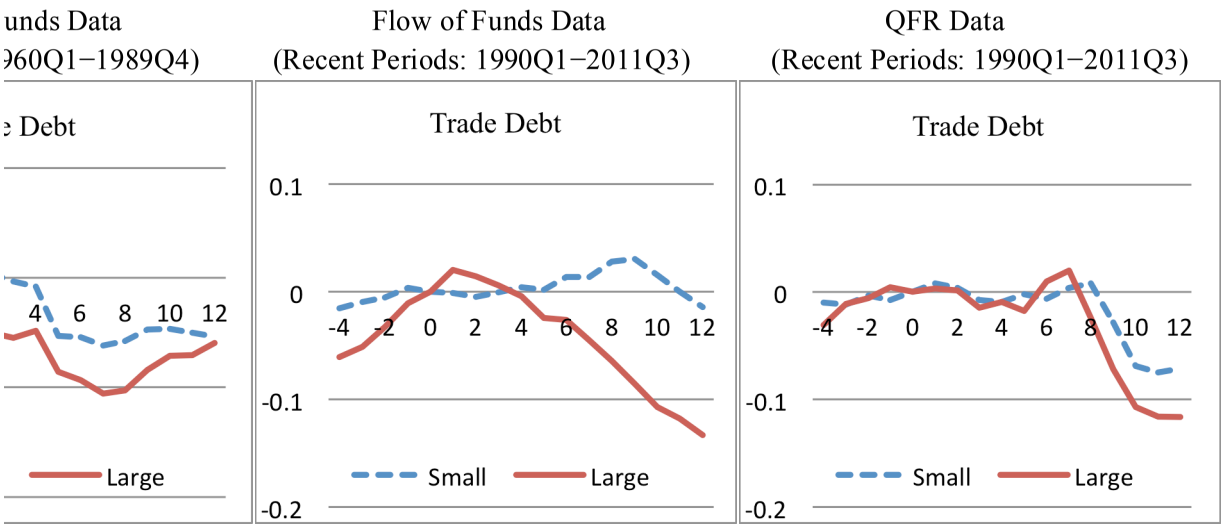


Figure 3.16 Continued

which are produced after an NBER recession shock. Just as large firms decrease sales substantially more than small firms after an NBER recession shock, their sales decrease significantly more than small firms after a monetary policy shock. However, a monetary policy shock has a weaker impact on the sales of small and larger firms than an NBER recession shock. During earlier periods in the flow of funds data (the first column), the inventories of small firms drop slightly more than those of large firms. Yet, during recent periods in the flow of funds and the QFR data (second and third columns), this pattern tends to change; large firms decrease their inventories more than small firms.

During earlier periods in the flow of funds data (the first column), the total short-term debt of small and large firms behaves similarly after a monetary policy shock, showing virtually flat-shaped responses. Yet, during recent periods in the flow of funds and the QFR data (the second and third column), both small and large firms tend to *increase* their total short-term debt after a monetary policy shock. The total short-term debt of small and large firms shows a *rising-and-falling* pattern (an inverse U shape) during periods of tight monetary policy. This result is consistent with the results produced from past research.[27] In particular, recent periods of those

[27] Employing the QFR data, Gertler and Gilchrist (1994) find that after tightening monetary policy, the behavior of total short-term debt mirrors the behavior of inventories for small and large firms. Following tight monetary policy, large firms tend to *increase* both inventories and total short-term debt, whereas small firms tend to *decrease* both inventories and total short-term debt. Gertler and Gilchrist interpreted

two data sets reveal that, after a monetary policy shock, large firms increase their total short-term debt somewhat more than small firms. Such behavior of large firms is more pronounced in the QFR data than in the flow of funds data.

The components of aggregate debt do not show a consistent pattern after a monetary policy shock. During recent periods, bank debt and other debt of small and large firms display a rising-and-falling pattern in the flow of fund data (the second column), but they show an ambiguous behavior in the QFR data (the third column). Similarly, it is very difficult to find a consistent pattern in the other components of aggregate debt.

During earlier periods in the flow of funds data (the first column), the trade debt of large firms tends to decrease slightly more than that of small firms. During recent periods in the flow of funds data (the second column), large firms decrease their trade debt immediately after a monetary policy shock, but small firms are initially unaffected and start to increase slightly after 5 quarters. During recent periods in the QFR data (the third column), small and large firms show a similar response; they hover around zero until 6 quarters and afterward begin to decline.

The main finding is that, during recent periods, the total short-term debt of small and large firms tends to increase after a monetary policy shock. In particular, large firms increase their total short-term debt more than small firms. Such behavior of large firms is shown more clearly in the short-term bank debt of the QFR data. Moreover, during recent periods, some balance

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these results as support for the notion that large firms may borrow total short-term debt more than small firms to smooth the impact of a recession—at the time that the need for external finances rises to carry inventory accumulations. Gertler and Gilchrist's interpretation works well during earlier periods. In other words, the inventories and bank debt of large firms increase more than those of small firms during earlier periods in the flow of funds data (the first column).

Although Gertler and Gilchrist's interpretation works well in the earlier-period flow of funds data, it does not fit into the recent-period flow of funds and QFR data. During recent periods, I find that the short-term debt of large firms increases more than that of small firms, consistent with Gertler and Gilchrist' (1994) findings. However, the inventories of large firms tend to *decrease*, not increase, whereas the inventories of small firms sharply increase or are unaffected for some periods. The question is "Why do large firms still increase total short-term debt in spite of a decrease in their inventories?" One possible explanation is that, since large firms experience the decline in sales (the first row) and thus a decline in cash flow, they may still need to borrow more short-term debt to finance operating costs rather than inventory costs.

sheet variables and components of debt of larger firms generally show more sensitive behavior than those of small firms following a monetary policy shock.

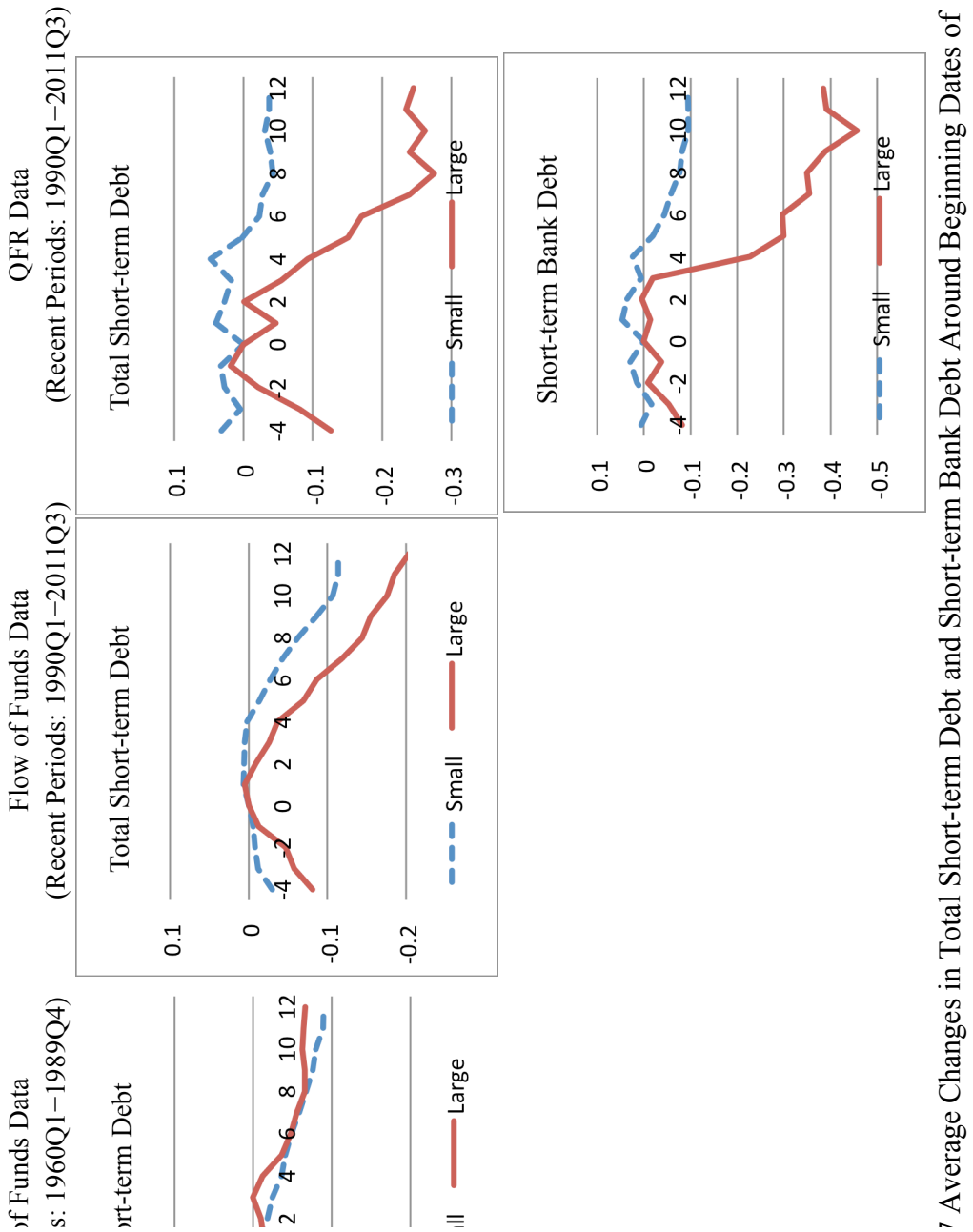
When the NBER recession episodes (in Figure 3.9) are compared to the tight monetary episodes (in Figure 3.16), an NBER recession shock shows a substantially stronger impact on the behavior of firms than a monetary policy shock. During the NBER recession episodes, the behavior of firms is usually captured in the vertical axis that ranges from 1 to –2. During tight monetary episodes, the behavior of firms is typically captured in the vertical axis that ranges from 1 to –1. In addition, during recent periods, when the flow of funds data are compared to the QFR data for the total short-term debt and (short-term) bank debt, large firms show much more sensitive behavior than small firms, as shown in Figure 3.9 and 3.16.

C. Is a Monetary Policy Shock Different from an NBER Recession Shock?

Figure 3.17 and 3.18—which are extracted from Figure 3.9 and Figure 3.16, respectively—show the average changes in "total short-term debt" and "short-term bank debt" after either an NBER recession shock or a monetary policy shock. The comparison of these results suggests that a monetary policy shock is somewhat different from an NBER recession shock in that it affects a short-term financing pattern of firms *differently* in recent periods. As shown in Figure 3.17 and 3.18, in recent periods (the second and the third column), both small and large firms tend to *decrease* total short-term debt and short-term bank debt after an NBER recession shock, while they tend to *increase* these debts after a monetary policy shock.[28] In particular, it is important to notice that large firms show much more sensitive behavior than small firms—after either an NBER recession shock or a monetary policy shock. Large firms decrease short-term bank debt substantially more than small firms after an NBER recession shock; likewise, they increase short-term bank debt significantly more than small firms after a monetary policy shock.

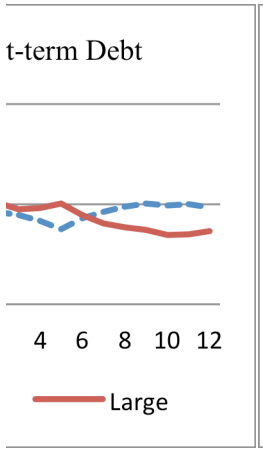
[28] In the earlier periods, on the other hand, either small or large firms are practically unaffected or slightly decline total short-term debt and short-term bank debt after the two kinds of shocks.

More specifically, by comparing the behavior of "the QFR data" to the behavior of the "Flow of Funds data" (the second versus the third column), we can observe that the excess sensitivity of large firms is more pronounced in the QFR data than in the flow of funds data—after either an NBER recession shock or a monetary policy shock. Furthermore, examining only the QFR (the third column) allows us to compare the behavior of "*total* short-term debt" and the behavior of "short-term *bank* debt" after each kind of shock—i.e., the comparison of the first and the second row in the third column. It is interesting to note that such excess sensitivity of large firms is *even*

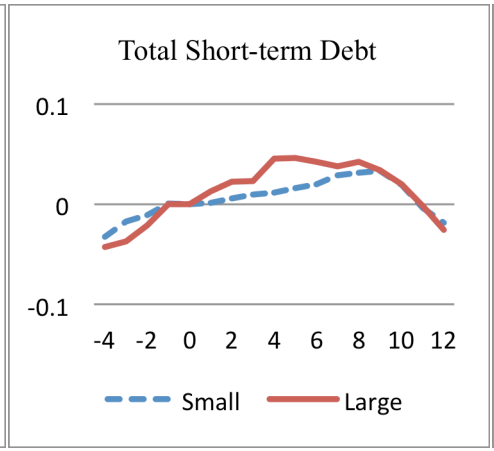


Average Changes in Total Short-term Debt and Short-term Bank Debt Around Beginning Dates of NBER Recessions

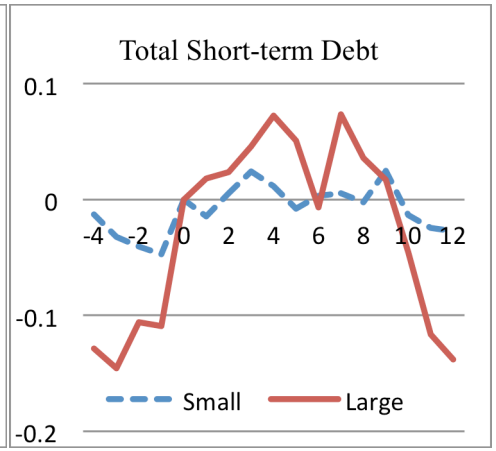
nds Data
60Q1−1989Q4)

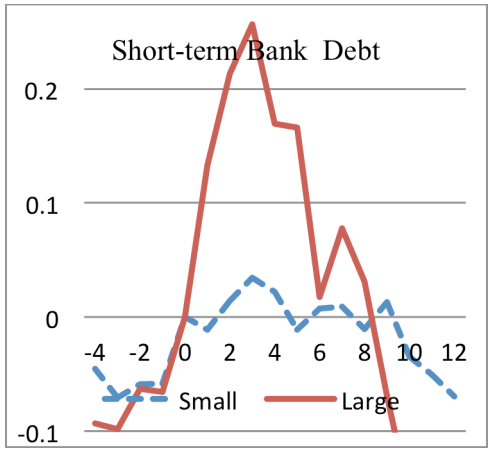


Flow of Funds Data
(Recent Periods: 1990Q1−2011Q3)



QFR Data
(Recent Periods: 1990Q1−2011Q3)





verage Changes in Total Short-term Debt and Short-term Bank Debt Around Monetary Policy Shock
(Adrian Dates)

more pronounced in short-term bank debt than in total short-term debt. That is, after an NBER recession shock, a comparison between the total short-term debt and the short-term bank debt (in the third column of Figure 3.17) shows that, for large firms, the trough of short-term *bank* debt is two times as deep as the trough of total short-term debt: −0.45 in short-term bank debt and −0.27 in total short-term debt. On the other hand, after a monetary policy shock, a comparison between total short-term debt and short-term bank debt (in the third column of Figure 3.18) shows that, for large firms, the peak of short term bank debt is four times as tall as the peak of total short-term debt: 0.27 for short-term bank debt and 0.07 for total short-term debt. From these empirical results, several critical questions arise:

- Why do small and large firms tend to *decrease* total short-term debt and short-term bank debt after an NBER recession shock?
- Why do small and large firms tend to *increase* total short-term debt and short-term bank debt after a monetary policy shock?
- Furthermore, why do large firms show more sensitive responses (than small firms) to either an NBER recession shock or a monetary policy shock in recent periods?

This research paper provides some responses to these three questions. The first and second questions will be answered by examining the *aggregate behavior* of small and large firms.[29] The third question will be answered by accounting for the *disaggregate behavior* of firms. For the first and second questions, a plausible explanation will be illustrated in this section. For the third question, a more detailed explanation will be further illustrated in the subsequent section.

For these first two questions, the use and the availability of "bank lines of credit," which has been more commonly used in recent years, provides one possible explanation for the responses of firms' short-term financing to be different between a monetary policy shock and an NBER recession shock. Because lines of credit can be used as a source of liquidity to some borrowers in times of financial difficulties, a different short-term financing pattern of borrowers may reflect the different ability of borrowers to draw down their credit lines. The borrowers' ability to draw down their lines, in turn, depends on the financial conditions of borrowers *at a time* when either an NBER recession shock or a monetary policy shock arises.

The basic idea suggested in this paper is that, after an NBER recession shock, if borrowers experience a *severe* deterioration of their financial conditions (over a downturn), they may not be able to draw on their credit lines; such limitation of credit lines may generate a *decreasing* pattern of short-term finances. However, after a monetary policy shock, if borrowers undergo a somewhat *weak* exacerbation of their financial conditions (over an upturn) and still maintain strong financial condition,[30] they may be able to draw down their credit lines; such drawdown of credit lines may create an *increasing* pattern of short-term finance. More detailed explanations concerning this basic idea will be demonstrated in the following subsections.

1. Lines of Credit

[29] In this case, the explanation focuses on the aggregate behavior of firms because both kinds of firms respond in the *same* direction to either a monetary policy shock or an NBER recession shock.
[30] Tight monetary policy is likely to arise when the economy is strong over an upturn of the business cycle.

In credit line contracts, lenders promise that they will lend up to a certain amount of money within a certain period of time at a predetermined variable rate, the overall interest rate on credit lines. It is known that the predetermined rate consists mainly of a *borrower-specific risk premium*—usually called a fixed markup—and a floating *market interest rate*, such as a prime rate and LIBOR (Melnik & Plaut, 1986; Shockley & Thakor, 1997). For example, suppose that a lender allows a borrower to take down its balances at a 1% fixed markup (i.e., a risk premium) over a floating prime rate (i.e., a market rate)—i.e., prime plus 1%. In this contract, although the overall interest rate on the credit line is variable over time, it is important to note that a borrower-specific risk premium is fixed during a period of the contract. Such a fixed risk premium shelters borrowers from increases in interest rates, which might be triggered either by the deterioration of a borrower's credit quality or by an increase in spread in market-wide risk. In particular, say a borrower is locked into a fixed borrower-specific risk premium in credit lines (e.g., prime plus 1%), and a lender is obligated to lend someday at that rate. In this situation, let's consider what happens if the borrower's own spot market risk premium increases (e.g., prime plus 2%) due to the financial crisis of 2008, for example. Typical borrowers, in such a situation, would be expected to draw down their credit line if they needed some external finance, because the interest rate on their credit line is lower than what would be available in the spot credit market.

Although lines of credit are the prearranged loans settled between lenders and borrowers, credit-line contracts usually contain "financial covenants" and "contingency clauses" that limit the ability of borrowers to draw down their lines. In financial covenants, borrowing under lines of credit is required to maintain financial ratios, such as cash flow, coverage, liquidity, and other covenants that are all specified in the initial credit contracts (Sufi, 2009). The violations of financial covenants allow lenders to withhold the prearranged credit lines from borrowers or to renegotiate the credit lines on stricter loan terms. In addition to financial covenants, most credit lines usually contain a Material Adverse Change (MAC) clause, even if they are infrequently

invoked. If the credit quality of borrowers deteriorates significantly for some reason, such contingent clause allows lenders to restrict an amount of borrowing under lines of credit (Shockley & Thakor, 1997).

2. A Monetary Shock and the Availability of Credit Lines

As discussed above, the ability of borrowers to draw down their lines is conditional on the obedience of financial covenants and contingency clauses, which in turn are directly linked into the financial conditions of borrowers. As a result, it is reasonable to claim that the use and the availability of credit lines will be determined by the borrowers' financial conditions. Most importantly, the financial conditions of the borrowers may differ (1) *at a time* when an NBER recession shock occurs and (2) *at a time* when a monetary policy shock occurs.

The financial conditions of borrowers are likely to be *somewhat strong* at a time when a monetary policy shock arises. This is because borrowers may be able to create enough cash flow from their operations in order to cover debt services during the late expansion—especially at the *somewhat early stage* of the late expansion, as shown in Figure 3.19.[31, 32] More specifically, in the expansion phase of the business cycle, a positive productivity shock to the economy propagates the business cycle when it has been amplified by the continuous improvement of the borrowers' financial conditions. According to Bernanke and Gertler (1989), an increase in productivity (i.e., a small shock) enhances the cash flow and balance sheet positions of borrowers in current periods. In turn, an improvement of borrowers' financial positions can contribute to a

[31] According to Sinai (1978), the financial cycle can be categorized into phases analogous to the business cycle of Recovery, Peak, Slump or Recession, and Trough. The financial cycle has showed stages termed Accumulation, developing financial instability or the Precrunch period, Crunch, and Reliqefication. The stage of the financial cycle and the business cycle resemble each other as follows: Recovery (Reliqefication and Accumulation), Boom (Accumulation and Precrunch period), Peak (Crunch), and Recession (Reliqefication), trough (Reliqefication).

[32] In Sinai's nomenclature, the "Precrunch period" in the financial cycle—an ongoing tight monetary policy falls into this Precrunch period—occurs between "Recovery" and "Peak" in the real business cycle, more specifically at the "late expansion" and "boom."

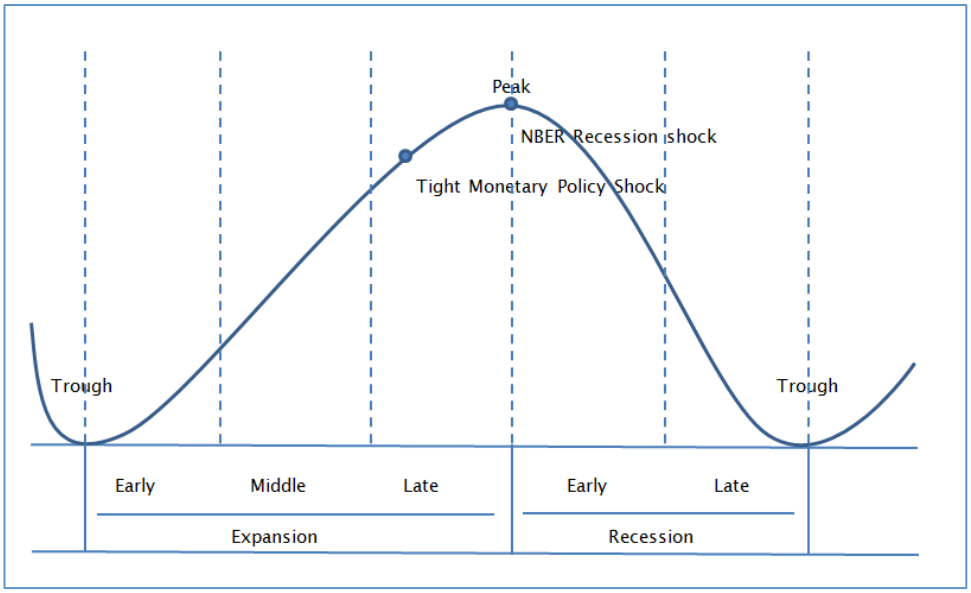


Figure 3.19 Timing of a Monetary Policy Shock and an NBER Recession Shock

lower cost of external finances in subsequent periods. Such lower cost in the following periods extends the expansions, as borrowers are motivated to invest continuously (even after an initial productivity shock has disappeared).[33] The underlying idea that a small shock can be amplified by influencing the credit-market conditions is called the "financial accelerator" theory. This theory can be applied to *any* positive shock that improves borrowers' cash flows or balance sheet conditions. In particular, the financial accelerator theory helps to explain how borrowers' financial conditions (initiated by such a positive shock) become stronger and healthier as the business cycle expands—especially through the feedback effects on financial conditions, the cost of external finance, and investment spending. It is likely that borrowers face a virtuous circle of improving financial conditions, falling costs of external finance, and rising investment spending in the *early and middle* expansion, as shown in Figure 3.19.[34]

[33] An increase in productivity is likely to be accomplished by events "such as new inventions, new industries, development of new sources, and opening of new land or new market" (Fisher, 1933, p. 348). Fisher (1933) suggests that such events may create new investment opportunities for a greater prospective profit (in addition to an increase in productivity), so that they play an important role as *a starter* of the over-indebtedness in his debt-deflation theory.

However, as the economy becomes overheated during the *late* expansion, demand for credits may outstrip the ability of lenders to supply credit at moderate rates; what is more, demand for credit may further increase with accelerating inflation (Eckstein & Sinai, 1986). Accordingly, when the liquidity squeeze takes place, borrowers may find that external finances become less obtainable and available but at higher rates. Although interest rates rise continuously during the late expansion, these rising rates may not fully discourage demand for credit. During the upturn of the business cycle, firms may still expect continuous future profits because of a strong aggregate demand, or they may need more credits because of accelerating inflation. At some point in time, the Fed is likely to adopt a restrictive monetary policy when it has been highly disturbed by noticeable signs of a boom—particularly when the Fed identifies the economy to grow substantially beyond its trend and such economic growth may extraordinarily push up inflation. Because an important objective of monetary policy is to maintain price stability, the Fed may decide to slow down accelerating inflation by raising interest rates. This response is most likely to happen at the *somewhat early stage* of the late expansion, as shown in Figure 3.19, when the financial conditions of borrowers are still *robust* to some extent.

Although a restrictive monetary policy affects borrowers' financial conditions unfavorably to some degree, most borrowers, who may still maintain strong financial conditions, are likely to remain compliant with financial covenants and contingency clauses. Such compliance of financial contracts allows borrowers to draw down their credit lines when loan demands increase. More specifically, suppose that the Fed decides to sharply increase the interest rate. After tightening monetary policy, when the borrowers' financial positions become deteriorated *to some extent*, borrowers may observe that their risk premiums in spot markets increase sharply, but their prearranged risk premiums in credit lines do not change. In other words, they

[34] At the same time, the optimism and overconfidence of borrowers about good business prospects may increase investment spending or production, boosting the aggregate demand.

know that their risk premiums in spot markets would be higher than their prearranged risk premiums in credit lines. In this situation, borrowers are likely to make use of their credit lines after a tight monetary policy because their credit lines are available on more pleasing terms than spot market loans. [35]

3. An NBER Recession Shock and the Availability of Credit Lines

The financial conditions of borrowers are likely to be *vulnerable* at a time when an NBER recession shock arises. This is because borrowers may not be able to create enough cash flow from their operations to cover full-blown debt services in the late expansion—especially at the *very* end of the late expansion, the peak of the business cycle, as shown in Figure 3.19.[36] More specifically, during the early and middle expansion, continuing enhancement in borrowers' financial conditions may allow borrowers to build their indebtedness constantly; during the late expansion, the continually rising demand for credit (as a result of accelerating inflation during a boom) increases the intensity of borrowers' indebtedness more severely.[37] In the situation where debtors become intensely indebted, at some point in time, the Fed (identifying the economy as overheated) may start to raise interest rates. A *continuous and gradually* tighter monetary policy is likely to exacerbate borrowers' financial conditions *more and more* to some extent, reducing borrowers' net cash flow. In particular, as interest rates sharply rise over time, the financial conditions of borrowers—which were somewhat robust at a time when tight monetary policy began—become increasingly weakened. At the same time, the cash flow payments due to swelling debts may catch up with the cash flow receipts from their operations. As borrowers'

[35] Particularly, it is important to note that after tightening monetary policy, although borrowers' net cash flows from their operations become decreased, their cash flow receipts from operations may still exceed their cash flow payments due to debts.

[36] In the nomenclature of Sinai (1978), "Crunch" in the financial cycle corresponds to the "Peak" and "very early stage of downturn" in the real business cycle.

[37] Simultaneously, interest rates may start to rise naturally in the late expansion before the Fed's action of a tight monetary policy, as the liquidity dries up by the overheating of the economy.

net cash flows become reduced, more debtors are continuously forced to issue new debts or to sell their financial assets to raise funds that should be used to pay off their maturing debts—i.e., refinancing their positions. In this situation, it is important to notice that, because some borrowers can still increase their indebtedness by drawing down their credit lines even after an ongoing tight monetary policy, their financial positions become increasingly more strained than others' financial positions. Consequently, as the volume of indebtedness increases and net cash flow decreases rapidly at the very end of the late expansion, the financial conditions of borrowers may become extremely vulnerable to *small* disruptions in the economy.

As suggested by Eckstein and Sinai (1986) and Bernanke et al. (1996), borrowers tend to be financially overreached and hence "vulnerable" at the cyclical peaks. When the business cycle approaches the upper turning point, borrowers are likely to be very susceptible to the disruptions of either financial or real markets—i.e., at the cyclical peaks.[38] Such disruptions to the economy may come from either "external shocks" or "endogenous developments" in the business cycle. For example, external shocks are a variety of events, such as the swing to a federal budget in 1960, the auto strike of 1970, the oil price hike of 1973-74, the collapse of the dot-com bubble in 2001, the collapse of the housing bubble in 2008, etc. Endogenous developments arise when debtors cannot refinance their maturing debts at some point (because of lenders' concerns about borrowers' over-indebtedness) or when an economic expansion naturally ends in the process of a business cycle.

When the financial structure becomes enormously fragile at the very late stage of the expansion, a *small* disruption of the market (i.e., an NBER recession shock) may lead to a severe recession in conjunction with the outbreaks of other ensuing full-grown events—such as collapses of financial institutions or widely increasing defaults and failures of businesses,

[38] When borrowers' over-indebtedness has substantially increased at the very late stage of the expansion (close to a cyclical peak), lenders of credit may have full-blown pessimism and skepticism about borrowers' "solvency" or "creditworthiness," and thereby may stand ready to withdraw their credits supplied in the event of disruptions.

sharply falling asset prices, severe cutbacks in spending (due to increasing pessimism), increasingly prevalent credit rationing, and an inapt continuous monetary tightening.[39, 40] Such multiple and simultaneous, or a series of, bad events are likely to deteriorate borrowers' financial conditions *to a large extent*, reducing borrowers' net cash flow substantially.[41] At this moment, the cash flow outlays from debts may exceed the cash flow receipts from operations by a significant amount. At the onset of a recession, therefore, as many borrowers' net cash flow suddenly changes from a positive to negative number, borrowers may not be able to issue new debt—by using credit lines or other financial methods—at a time when the need for new debt is most acute. At this time, borrowers may not be able to draw down their credit lines because they may violate financial covenants and contingent clauses due to their weaker financial conditions. Likewise, in other financial instruments, borrowers may not be able to renew their existing loans, such as commercial papers or bank loans, with the same reason.

4. Summary

To sum up, a monetary shock may deteriorate borrowers' financial conditions *to a lesser extent*, reducing their cash flow slightly, when an economy experiences the upturn of the business cycle. In this circumstance, because borrowers with somewhat strong financial conditions do not violate financial covenants and contingency clauses, they may be able to draw down their lines. On the other hand, an NBER recession shock may exacerbate a firm's

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[39] Credit crunches or financial crises have been considered and examined by Fisher (1933), Minsky (1975, 1977), Wojnilower (1980), Sinai (1976, 1978) and Eckstein and Sinai (1986). Fisher, Minsky, and Sinai consider such eruptions of events *endogenous* processes normally produced in the economy—a derivative of the real cycle that arises concurrently.

[40] Eckstein and Sinai (1986) introduce the business cycle with five stages that consider the coincident and interdependent behavior of real and financial markets: (1) recovery/expansion; (2) boom; (3) precrunch period/crunch; (4) recession/decline; and (5) reliquefication. They include a "credit crunch"—which is usually triggered by *a tight monetary policy* of a central bank—in the standard stages of the business cycle because every recession since the mid-1950s was preceded and caused by a credit crunch.

[41] Such multiple and simultaneous, or a series of, events may create a massive ripple effect throughout the entire economy, when changes in borrowers' financial conditions amplify and propagate the effects of initial real (or financial) disruptions—the "financial accelerator."

financial condition *to a great extent*, reducing its cash flow substantially, when the financial structure is extremely fragile at the cyclical peak (owing to borrowers' over-indebtedness). In this situation, because borrowers with very weak financial conditions violate financial covenants and contingency clauses, they may not able to draw down their lines. The next section will provide some plausible explanations for the third question described above.

V. Why Do Large Firms Show Much More Sensitive Behavior of Short-Term Debt in Response to an Adverse Shock?

In the previous section, the empirical results of post-1990 periods indicate that, after a monetary policy shock, large firms *increase* short-term debt substantially more than small firms; however, after an NBER recession shock, they *decrease* short-term debt significantly more than small firms. Such excessively sensitive behavior of large firms suggests that firms may have been affected by new or different economic forces during post-1990 periods. If so, what are the explanations for such findings? This section will discuss two possible explanations (of why large firms respond more sensitively to an adverse shock): (1) the financial conditions of borrowers, and (2) the benefits of lending relationships. I suggest that the former mainly justifies the excessively sensitive behavior of large firms in response to a monetary policy shock, whereas the latter mainly rationalizes such behavior of large firms in response to an NBER recession shock. However, the former can be applicable to the sensitive behavior of large firms in response to either a monetary policy shock or an NBER recession shock.

A. Financial Conditions of Borrowers

One possible explanation is related to the financial conditions of borrowers. The financial conditions of large firms may be different from those of small firms over the business cycle—especially at a time when a monetary policy shock or an NBER recession shock arises. In other words, large firms are likely to have *stronger* balance sheet conditions than small firms

at a time when a monetary policy shock occurs; in contrast, they are likely to have *weaker* balance sheet conditions than small firms *at a time* when an NBER recession shock occurs. Such stronger or weaker financial conditions of large firms may play an important role in determining the availability of their short-term debts—either *after* a monetary policy shock or an NBER recession shock.

According to this explanation, the financial conditions of borrowers can be measured in terms of the collateralizable net worth of borrowers. Borrowers' collateralizable net worth includes net financial assets, tangible physical assets, and current and future expected cash flows that may be pledged as collateral (Gertler & Gilchrist, 1993). A number of researchers propose that borrowers' collateralizable net worth plays a critical role in lowering the cost of external finance (Bernanke & Gertler, 1989; Gertler & Gilchrist, 1993; Gertler & Hubbard, 1989). The greater the level of borrowers' collateralizable net worth, the smaller the potential conflict of interest with lenders. This is because borrowers can offer more collateral to lenders, making the expected cost of external finance low. In fact, it should be noted that firms' net worth tends to be procyclical, and the cost of external finance is inversely related to firms' net worth. During an expansion, where firms' net worth tends to rise, their rising net worth decreases the cost of external finance, and it becomes easier to borrow. However, during a contraction, where firms' net worth tends to fall, their falling net worth increases the cost of external finance, and it becomes more difficult to borrow.

Furthermore, a number of empirical findings suggest that the financial conditions of large firms are *more* procyclical than those of small firms over the business cycle. Specifically, the sales and employment of large firms are more sensitive to the business cycle than those of small firms during recent periods of data set (see Chari et al., 2007; Kudlyak et al., 2010, for sales and see Moscarini & Postel-Vinay, 2008, 2009, 2012; Kliesen & Maués, 2011, for employment). These findings suggest that the net worth of large firms may swell during an expansion or

shrink during a contraction at a faster rate than that of small firms.[42] For example, if large firms increase their employment and sales more than small firms over the course of an expansion, they may be able to generate more profits, thereby adding the profits to their net worth in subsequent periods. The opposite is true during a contraction. Therefore, over the course of an expansion, the net worth of large firms may *rise* at a faster rate than the net worth of small firms, making the financial conditions of large firms stronger. By contrast, over the course of a contraction, large firms' net worth may *fall* at a faster rate than small firms' net worth, making the financial conditions of large firms weaker.

Shifting from the financial conditions of firms over the business cycle to a moment of "shock," let's consider the short-term debt of small and large firms after a tight monetary policy shock. At a time when a monetary policy shock arises, we would expect that, to the extent that net worth is more procyclical for large firms, the financial conditions of large firms are substantially stronger than those of small firms. In this situation, a sharp rise in an interest rate (as a result of a tight monetary policy shock) is likely to affect the financial conditions of small firms more adversely than those of large firms. This is so because a financial accelerator, which operates through the fluctuation of borrowers' net worth, is more applicable to *small* firms that have weaker financial conditions.[43] In particular, following a tight monetary policy shock, most small firms, which undergo the *severe* exacerbation of their financial conditions and do not maintain robust financial conditions, may be unable to make use of short-term debt from

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[42] Using the QFR data, I have also examined the net worth and sales of small and large firm. Interestingly, the net worth and sales of large firms are more volatile than those of small firms, as shown the graphs in Appendix D. Unlike other available data sets such as Compustat, the flow of funds data, according to Gertler and Gilchrist (1994), the QFR includes a great deal of nontraded companies. "Nontraded firms dominate the lower tier of the size distribution in our sample. Thus, we believe that the vast majority of companies in our small firm sample would be considered likely to be constrained, using one of the conventional financial indicators" (p. 317).

[43] In a financial accelerator effect, a monetary policy shock may worsen the financial conditions of small firms—those who have weaker financial conditions—*more strongly* than others. Therefore, since small firms (with lower net worth) must face a higher external finance premium, lower credit availability, and lesser investment, they contribute to the macroeconomic downturn *more significantly*.

banks—especially bank lines of credit. In contrast, most large firms, which experience the *moderate* deterioration of their financial conditions and thus maintain still strong financial conditions, may be able to make use of short-term debt from banks and financial markets. More specifically, we should put an emphasis on the availability of credit lines after a monetary policy shock because credit lines are considered a major source of short-term finance.[44] After a monetary policy shock, most small firms may be unable to draw down their credit lines because they have violated cash flow-based financial covenants due to low cash flows.[45] Yet, after a monetary policy shock, most large firms may be able to draw down their credit lines because they have complied with cash flow-based financial covenants due to still sustained cash flows.

As discussed earlier, the Fed is likely to adopt a restrictive monetary policy when an economy grows too rapidly. During such periods, the economy pushes beyond its trend, which causes inflation rates to increase to uncomfortable levels. At a particular point in time, a sustained and increasingly tighter monetary policy may reverse the relative financial conditions between small and large firms. Namely, the financial conditions of large firms—which were previously stronger than those of small firms at the time of a monetary policy shock—are now weaker than those of small firms at the time of an NBER recession shock. Why does this happen? Such a reversal of financial conditions may result from an environment of *continuously* and *gradually* rising interest rates. A sustained and gradually tighter monetary policy may influence a "burden of debt services" between two types of firms to a *different* degree. Because large firms are usually more highly indebted than small firms during an expansion, the burden

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[44] According to Melnik and Plaut (1986), credit lines (or loan commitments) account for 70% of commercial and industrial loans in the United States. The share of credit lines in commercial and industrial loans is likely to rise because credit lines have become more prevalently used in recent years.

[45] Also, many small firms cannot consider credit lines as a source of a short-term finance because they do not own the credit-line contracts with banks. Morgan (1990) finds that the share of loans made under credit lines tends to increase from about 33%, 56%, 70%, and 80%, as the size of loans increases—ranging from under $100,0000; $100,000 to $500,000; $500,000 to $1 million; and $l million to more. If small firms are correlated with the smaller size of loans, this evidence supports that small firms are less likely to own credit-line contracts with banks.

of debt service is likely to be considerably greater for large firms over time.[46] For example, the lower cost of debt (resulting from the procyclicality of borrowers' net worth) may allow borrowers to build up a large amount of debt during an expansion. Such a buildup of debt may not be considered a serious problem to borrowers until a certain point is reached. As the Fed starts to increase interest rates continuously and gradually, such large amounts of debt may serve to increase the burden of debt services, which is particularly a big concern to large firms.[47] Since the burden of debt services grows at a faster pace for large firms, this may make the financial conditions of large firms much more fragile over time—especially when a greater portion of cash flows or profits are used to service their existing debt.

Additionally, let's consider the short-term debt of small and large firms after an NBER recession shock. At a time when an NBER recession shock arises, we would expect that, to the extent that a burden of debt service swells more quickly for large firms after a continuing tighter policy, the financial conditions of large firms are more vulnerable than those of small firms. In this condition, an NBER recession shock is likely to affect the financial conditions of large firms more harmfully than those of small firms. This is so because the financial accelerator effect is more likely to operate through *large* firms that have more fragile financial conditions.[48,49] In particular, following an NEBR recession shock, most large firms, which undergo

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[46] According to the manufacturing firm data in QFR from 1987 Q4 to 2011 Q3, large firms' leverage ratio (2.6)—which is defined as the ratio of debt to equity—is higher than small firms' (2.2) on average.

[47] As has been stated, *even* after a tight monetary policy shock, large firms (with still robust financial conditions) may continue to surge amounts of debts—either by utilizing their credit lines from banks or by issuing commercial papers from the financial markets. This may contribute to increase the burden of debt service more rapidly.

[48] Similarly, in a financial accelerator, an NBER recession shock may exacerbate the financial conditions of large firms that have weaker financial conditions—rather than small firms—more strongly. Here, the logic is the same as a monetary policy shock.

[49] Here, "financial factors" (credit constraint) explain the different behavior of small and large firms. However, "nonfinancial factors" can also explain the different behavior of the two kinds of firms after an NBER recession shock. One possibility is that large firms are concentrated on more greatly in cyclical

substantially severe deterioration of financial conditions and do not have a close relationship with financial intermediaries, may be forced to cut back short-term debt from banks and the financial markets *sharply*.[50] Notably, the sharply declining short-term debt of large firms may be closely associated with the characteristic of large firms that depend greatly on short-term debt (such as commercial papers) in the financial markets. Because borrowers' balance sheet conditions are readily available at any time to the public, lenders in the financial markets may be able to withdraw their short-term loans immediately—after they obtain bad news, for example. In any case, most small firms, which experience less severe exacerbation of financial conditions but do have a close relationship with financial intermediaries, may be compelled to diminish short-term debts from banks *to a lesser extent*. In regard to the availability of credit lines, both small and large firms may be unable to make use of credit lines after an NBER recession shock. This is because continuously and gradually increasing interest rates may change an overall financial structure from robust to fragile borrowing conditions, when it comes to the neighborhood of an upper turning point. Accordingly, both small and large firms that breach a cash flow-based financial covenant may not be able to draw down their lines.

B. Benefits of Lending Relationships

The other possible explanation—of why large firms respond more sensitively to an adverse shock to their short-term debts—is related to the benefits of lending relationships, close ties between firms and financial intermediaries. A number of empirical studies find that small firms with longer banking relationships are likely to have greater availability of credit, and pay a lower cost of credit, and are less likely to pledge collateral (see Petersen & Rajan, 1994, 1995, for the availability of credit and see Berger & Udell, 1995, for the price of credit and collateral requirements). This evidence suggests that, during periods of tight credit, small firms with close

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industries. Another is that large firms may face lower demand for credit than small firms in some way—because large firms are related to more cyclical industries, for example.

[50] In the next section, the benefits of lending relationships will be discussed in more details.

ties to financial intermediaries are much more likely to obtain credit compared to large firms without such ties. During periods of financial difficulty, most small firms, which benefit from close relationships, may experience sluggish debt reduction, whereas most large firms, which do not derive benefit from relationships, may suffer from severe debt reduction.

On one hand, small firms may want to maintain a close relationship with financial intermediaries because maintaining a relationship is beneficial to them—especially in a situation when they cannot directly borrow from financial markets (due to the asymmetric information problems between borrowers and lenders). Lenders in public markets may be unwilling to provide credit to small firms because they have much more information about the prospects of their projects than lenders. Since small firms, in this way, pose severe asymmetric information problems in credit markets, financial intermediaries play an important role in overcoming information problems. In other words, financial intermediaries gather information about borrowers' ability to meet their financial obligations through a continuous interaction—for example, by way of monitoring borrowers and offering financial services to them.

Over the course of lending relationships, financial intermediaries may be able to develop their own expertise in understanding borrowers' financial needs and problems. By maintaining such relationships, as will be explained later, small firms may be able to build up "good reputation." The reputation may be used to help small firms smoothly enter public markets and obtain credits at lower interest rates. Furthermore, encountering financial difficulty during periods of tight credit, small firms may have a greater likelihood that they can obtain new loans or renew their existing loans rather than be cut off from financial intermediaries. Most small firms, which do not have many alternative sources of funds and will hopefully be continuously financed in times of financial difficulty, are more cooperative at building up a relationship with financial intermediaries. For example, they are willing to pay for premiums or service fees of screening, monitoring, and financial services to intermediaries.

On the other hand, financial intermediaries may want to maintain a close relationship with small firms because such a relationship is beneficial to them as well. Financial intermediaries, according to Greenbaum, Kanatas, and Venezia (1989), Petersen and Rajan (1995), Rajan (1992), and Sharpe (1990), can benefit from monopoly power over years of lending because of the *private information*[51] they generate and because of the *search costs* borrowers incur. If the information that is produced by the relationships is durable and is not transferable to other lenders (private information), and if borrowers incur costs while searching for more favorable loan terms (search costs), financial intermediaries can exert monopoly power over the borrowers. According to this view, at an initial stage, monopolistic lenders charge *lower*-than-competitive rates to lure clients and to establish a relationship while only incurring current short-term losses. However, at a later stage, they charge *higher*-than-competitive rates to recover the previous short-term losses and thus reap future monopolistic profits[52]—especially when some mechanism locks clients into the current relationship.[53] The relationship has been

[51] Financial intermediaries may have an incentive to produce private information on small firms, which is called "soft" information. This private information is valuable to financial intermediaries because they can extract profits from such information in future transactions with small firms. In contrast, financial intermediaries may have little incentive to produce private information on large firms because this information is relatively less valuable to financial intermediaries due to the publicly available information about large firms. More specifically, there is very little likelihood that financial intermediaries will be able to extract profits from such private information in their transactions with large firms. Large firms, which generally borrow not only from financial intermediaries but also from the open markets directly, are obligated to disclose information about their management of firms (such as accounting information and credit ratings) to the public. This information is called "hard" information, and it is verifiable or is based on relatively objective criteria such as financial ratios, collateral ratios, and credit scores. Since financial intermediaries know that the "hard" information of large firms is always available at a low cost, they may have little incentive to produce costly private information (see Petersen, 2004; Berger & Udell, 2002, for soft information and hard information).

[52] It is important to note that, although monopolistic lenders charge *higher*-than competitive rates, they may *reduce* interest rates over time. Monopolistic lenders reduce interest rates more *slowly* than lenders in competitive markets. Therefore, we would expect interest rates of monopolistic markets to fall more *slowly* than those of competitive markets.

[53] Such a "holdup" problem of a relationship occurs because the borrowers' search costs for finding other lenders, who have ability to handle their needs, are likely to be high—especially when the market has few lenders. This holdup problem does not last forever. In Greenbaum, Kanatas, and Venezia's (1989) model, the longevity of the relationship increases the likelihood that the borrower will switch to other lenders and consequently reduces the remaining expected length of the relationship. That is, they show

built on the belief that the short-term losses generated initially (by lenders) are offset by the expected profits extracted later over the life of lending.

This type of relationship is beneficial to monopolistic lenders for the following reasons. First, at the initial stage, monopolistic lenders have the chance to open up new relationships with small firms, while they are offering lower interest rates than competitive lenders would offer. These *lower* interest rates also may mitigate the adverse selection and the moral hazard problem of firms because *higher* interest rates are likely to drive away safer firms (the adverse selection problem) or persuade them to choose risky projects (the moral hazard problem). Second, at the later stage, monopolistic lenders can produce much higher profits when they charge higher-than-competitive rates. This is so because monopolistic lenders, who have accumulated private information through the relationships with borrowers, can reduce loan rates *by less* than the true decline in loan rates that competitive lenders would charge at the later stage.

Since maintaining a close relationship is beneficial to both small firms and financial intermediaries, as described in the previous two paragraphs, financial intermediaries are more willing to help small firms than large firms during recessions. For this reason, small firms may experience a more sluggish decrease of loans than large firms when the economy goes into recessions. In particular, financial intermediaries may want to lend a hand to small firms during recessions because of the *sunk costs* they have previously incurred and because of the *monopolistic profits* they will enjoy in the future.

First, financial intermediaries may have already incurred *sunk costs* to overcome asymmetric information problems, while committing a great deal of resources to understand the small firms' businesses. At the outset of the relationship, intermediaries have previously made payments for the high costs of screening and monitoring small firms. Over the long-term

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that "the expected remaining duration of a lender-client relationship is decreasing in the existing length of the relationship. Thus, clients that have been with a particular lender longer will be more likely to leave and establish a relationship with another lender" (Greenbaum et al., 1989, p. 221).

relationship, they develop the best knowledge of the ins and outs of firms' financial conditions through good and bad times. If they reject small firms during a recession, they know that they will lose the customers they have invested in up front. Second, as discussed earlier, since financial intermediaries have *monopoly power* over small firms (owing to their private information and the firms' search costs), they may think that, if they help small firms in times of financial difficulty today, they can extract monopoly profits tomorrow from the investment (Greenbaum et al., 1989; Petersen & Rajan, 1995; Rajan, 1992; Sharpe, 1990). For this reason, during periods of recessions, financial intermediaries are more willing to extend loans to small firms, allowing small firms to weather recessions with minimum losses. In contrast to what happens to small firms, large firms may experience a more rapid decline of loans than small firms during recessions because of a *loose* relationship with financial intermediaries. If financial intermediaries overcome information problems and ease credit constraint during firms' financial difficulty, why do large firms choose to weaken a relationship with financial intermediaries? The answer should be that there are compensating benefits when large firms borrow directly from public markets or there are costs when they maintain the relationship with financial intermediaries. Switching from financial intermediaries to public markets, large firms may be able to sidestep two problems associated with financial intermediaries: the intermediaries' *monitoring costs* and their *monopoly power*.

First, large firms may want to avoid the monitoring costs of financial intermediaries. Small firms, which pose severe moral hazard problems, may be willing to pay the monitoring costs of financial intermediaries because intermediated loans are the only source of credit they can rely on in that financial intermediaries alone are well suited to deal with their moral hazard problems. However, large firms, which pose mild moral hazard problems, may feel the monitoring costs of financial intermediaries unnecessary— particularly when they can resort to an alternative source of credits in public markets.

Diamond (1991) suggests a "life cycle" of a firm's borrowing in the following way. A new firm that poses severe moral hazard problems may *initially* borrow from financial intermediaries because its moral hazard problem can be mitigated by the monitoring of financial intermediaries. Yet, the same firm that has obtained good reputation (i.e., reputation capital) through the monitoring of financial intermediaries over time may *later* borrow directly from public markets because reputation alone can take care of moral hazard problems and consequently eliminate the need for monitoring.[54] According to Diamond (1991), during the life cycle of a firm' borrowing, large firms are likely to be the firms that may have accumulated "reputation capital" through a long-term relationship with financial intermediaries. Since such large firms have more reputation capital to lose when they take a risky action (i.e., less moral hazard problems), they may not need to incur the costs of monitoring associated with intermediated loans.[55]

Second, in addition to elusion from monitoring costs, large firms may also want to avoid the monopoly power of financial intermediaries. As discussed earlier, in a situation where financial intermediaries have the monopoly power, they may be able to extract big monopoly profits later by demanding higher interest rates than the competitive rates. To reduce such monopoly power, large firms may want to diversify their sources of funds. One way is that large firms borrow directly from public markets when they are large enough to bear the costs of issuing the public debt. By using public markets, they would acquire not only more discretion over investment decisions and production but also more bargaining power in negotiation with financial intermediaries. In any case, since maintaining a relationship with financial intermediaries would

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[54] That is, a firm's reputation capital obtained through intermediaries' monitoring will serve to predict the behavior of the firm in public markets in the absence of monitoring.

[55] By contrast, since small firms have not yet established enough reputation through intermediaries' monitoring, they have less "reputation capital" to lose when they take a risk action (i.e., severe moral hazard problem). Accordingly, small firms, who have a lack of access to public markets due to moral hazard problems, may need to incur the costs of monitoring to obtain loans from financial intermediaries.

be costly for large firms owing to the intermediaries' monitoring costs and monopoly power, large firms may choose to weaken their relationship with financial intermediaries by borrowing directly from financial markets. When this relationship is loose, they may have more difficulty acquiring credits during periods of recessions and they experience more rapid reduction of loans than small firms.

C. Summary

This section provides why large firms show more sensitive behavior of short-term debt either after a monetary policy shock or after an NBER recession shock. The main theme is as follows. After a monetary policy shock, small firms may be more credit constrained than large firms because small firms undergo more severe exacerbation of *their balance sheet conditions* than large firms.[56] Small firms, who experience more *serious* deterioration of financial conditions, may be prohibited from drawing down banks' lines of credit—which become increasingly important as a source of liquidity. In contrast, large firms, who experience the *weak* exacerbation of financial conditions, may still be allowed to use their credit lines, expanding more short-term debt—at the time demand for loans increases. Therefore, the availability of credit lines explains why large firms increase short-term debt more than small firms following a monetary tightening.

On the other hand, after an NBER recession shock, large firms may be more credit constrained than small firms because they have more vulnerable financial conditions than small firms—*at a time* when NBER recession shock arises. Although large firms had stronger financial conditions than small firms at the time of a monetary shock, large firms may have *weaker* financial conditions at the time of an NBER recession shock. Because large firms tend

[56] Some evidence suggests that the financial conditions of large firms are more procyclical than that of small firms (see Chari et al., 2007, for sales and see Moscarini & Postel-Vinay, 2008, 2009, 2012, for employment). If so, the financial conditions of large firms are stronger than those of small firms when tight monetary policy arises. Because a monetary tightening is likely to occur when the economy is strong, the loan demand for small and large firms may still increase when interest rates are rising.

to be more highly leveraged than small firms during an expansion, a sustained and increasingly tighter monetary policy may deteriorate the financial conditions of large firms more rapidly than that of small firms. For this reason, after an NBER recession shock, most large firms, who undergo more severe deterioration of financial conditions, find it hard to obtain credit more than small firms. In addition to their weaker financial conditions, large firms may face more difficulty in obtaining credit because they have looser relationships with intermediaries than small firms. After an NBER recession shock, small firms with a close tie with financial intermediaries may benefit from the relationship lending at the time of financial difficulty, whereas large firms without such close ties may suffer from the decline of loans more harshly. Therefore, the borrowers' financial conditions and lending relationship with lenders help us understand why large firms decrease short-term debt more than small firms.

VI. Conclusion

Previous research, particularly the credit channel of monetary policy, finds that small firms are more credit-constrained than large firms after a *tight monetary shock*. Small firms, according to this channel, play a special role in the monetary transmission mechanism. Recently, however, a large number of researchers find that large firms are more sensitive to a *business cycle shock* than small firms in terms of sales, inventories, short-term debt, and employment. Why does the recent research find somewhat different results from the previous ones? Do large firms, rather than small firms, play a unique role after business cycle shock—particularly in recent periods? To address these issues, I examine the behavior of small and large firms in two ways: (1) by different episodes, a monetary policy shock and an NBER recession shock and (2) by different periods, earlier periods and recent periods.

First, by examining the behavior of small and larger firms by different episodes, I find that a monetary policy and an NBER recession shock *differently* affect firms' short-term financing behavior. During recent periods, while firms *increase* their short-term debt after a tight

monetary policy shock, they *decrease* after an NBER recession shock. What is more, large firms exhibit much more sensitive behavior in their short-term debt than small firms to the two kinds of shocks. That is, after a contractionary monetary policy shock, large firms increase their short-term debt more than small firms; however, after an NBER recession shock, large firms decrease more than small firms.

These findings suggest that small firms are likely to be more credit-constrained after a monetary policy shock, whereas large firms are likely to be more credit-constrained after an NBER recession shock. If so, as in the balance sheet channel theme, a financial accelerator mechanism may operate through small firms that are financially more constrained after a contractionary monetary shock. On the other hand, the financial accelerator mechanism may operate through large firms that are financially more credit-constrained after an NBER recession shock. In both ways, a small adverse shock may be amplified through each credit-constrained firms, ultimately diminishing output in the economy.

Second, by examining the behavior of small and large firms by different periods, I find some empirical results that are consistent with previous research (earlier periods) and recent research (recent periods). During earlier periods, I find that small firms are more sensitive in some of balance sheet variables to either a monetary policy shock or an NBER recession shock, which is in line with previous studies. In particular, small firms diminish their inventories, total short-term debt, and bank debt more than large firms to these two kinds of shocks. This finding suggests that small firms are more credit-constrained than large firms.[57] During recent periods, however, large firms are more sensitive in most balance sheet variables to either a monetary policy shock or an NBER recession shock, which support recent research. In particular, large firms are more responsive than small firms to both kinds of shocks in their sales, total short-

[57] However, for other variables such as mortgages, other debt, and trade debt, large firms decline more than small firms after either a monetary shock or an NBER recession shock.

term debt, short-term bank debt, mortgages, other debt, and trade debt.[58] After an NBER recession shock, large firms substantially decrease more than small firms in all of those variables. Yet, after a monetary policy shock, large firms show somewhat similar behavior with small firms in some variables such as bank debt and mortgages even if they are generally more sensitive than small firms.

One interesting result is that, after a monetary policy shock, *all* firms decrease their short-term debt during earlier periods, but they increase during recent periods. The evidence suggests that, after a monetary policy shock, firms' ability to raise short-term debt appears to have increased in recent periods. Furthermore, following a contractionary monetary policy shock, small firms *decrease* their short-term debt more than large firms during earlier periods; in contrast, large firms *increase* more than small firms during recent periods. Although those results seem to be contradictory, they are consistent in that small firms continue to be more credit-constrained than large firms—at the time when demand for loans increases. For example, during earlier periods, small firms, which are credit-constrained more than large firm, experience more severe decline of short-term debt. Similarly, during recent periods, small firms financially constrained more may be able to obtain less short-term debt.

For the evidence described above, I propose some explanation of why large firms are more sensitive in their short-term borrowing either to monetary policy or an NBER recession shock. A monetary shock differently affects firms' short-term debt than an NBER recession shock does, depending on the *firms' financial conditions* which change over the business cycle. First, firms' financial conditions may be somewhat strong at a time when a tight monetary shock arises. This is because a monetary tightening usually occurs when the economy is strong. Thus, firms' demand for loans still increases when interest rates rise. During an expansion, if large firms

[58] For bank loans, large firms are more sensitive to an NBER recession shock, whereas they exhibit very similar behavior with small firms to a monetary shock. For inventories, larger firms show very similar response with small firms to an NBER recession shock, but the sensitivity of firms is indistinguishable to a monetary shock.

have a stronger financial condition than small firms, large firms may be able to easily finance short-term debt more than small firms. Second, firms' financial conditions may be very weak at a time when an NBER recession shock arises. This is because, to the extent that firms tend to increase their leverage during an expansion, a gradually and increasingly tighter monetary policy adversely affects firms' financial conditions. If large firms are more leveraged than small firms—in fact, they are according to the QFR data—their financial condition might be more fragile than those of small firms to an adverse shock in the economy. After an NBER recession shock, large firms may experience more severe reduction of loans than small firms do due to their weaker financial conditions.

3.7 Appendices

3.7.1 Appendix A: Creating Time Series for the Small Firm Group[59]

The QFR provides the financial data on eight asset sizes, grouped by assets sizes: the asset of 1) less than $5 million, 2) $5 to $10 million, 3) $10 to $25 million, 4) $25 to 50 million, 5) $50 to $100 million, 6) $100 to $250 million, 7) $250 million to $1 billion, and 8) more than $1 billion. One difficulty in using the QFR data is that the size categories are constructed in nominal terms. Therefore, inflation causes firms to drift between categories. To control for the inflation drift, following Gertler and Gilchrist (1994), I define small firms as those at or below the 30th percentile in sale distribution and large firms as above the 30th percentile. The specific procedure I used is as follows.

[59] In this Appendix A, I only explain the procedures to create time series for small firms. To create time series for the large firms, a parallel approach is used to large firms.

1. Identify the "marginal size class" with respect to sales. When we are adding up the class sizes by starting with the smallest firm class, marginal size class is the final one that contains the 30th percentile of nominal sales for that period. I cumulate each increasingly larger firm class until I reach 30% of total sales. After that, I define the *upper bound* of small firms as the cumulated aggregation that includes the marginal size class, which is denoted by CU(γ)—i.e., γ = 30%. CU(γ) includes $\gamma+\omega^U$ percent of total sales—i.e., γ (30%) plus ω^U (the amount exceeding upper 30%) where $\omega^U > 0$.

2. At the same time, I define the *lower bound* of small firms as the cumulated aggregation that excludes the marginal size class, which is denoted by CL(γ). CL(γ) includes $\gamma-\omega^L$ percent of total sales—i.e., γ (30%) minus ω^L (the amount that falls short of 30%) where $\omega^L > 0$.

3. Now, I identify the sale-based weight to separate small firms from the dataset. The weight in *upper bound*, CU(γ), is $\omega^L/ (\omega^U +\omega^L)$ and the weight in *lower bound*, CL(γ), is $\omega^U/(\omega^U +\omega^L)$. For example, let γ =30, and assume that CU(γ) includes 31% of total sales and CL(γ) includes 27% of total sales; in this illustration, ω^U =1 and ω^L =3 [60] so that a weight of CU(γ) is 3/4 and a weight of CL(γ) is 1/4. By using this weighted average, we can assign the bigger weight to CU(γ) because it approaches to the 30% of total sales more closely than CL(γ) does.

4. Such sale-based weight can be applied to the growth rate of other series we examine—for example, inventories and short-term debts. In other words, we compute the growth rates of other series (i.e., inventories and short-term debts) in small firms as a weighted average of other series growth in CU(γ) and CL(γ). For instance, in the previous example, the growth rate of inventories for small firms is 3/4 * g + 1/4 * s, where g is the growth rate associated with CU(γ) of inventories and s is the growth rate associated with CL(γ) of inventories. Here, the basic idea

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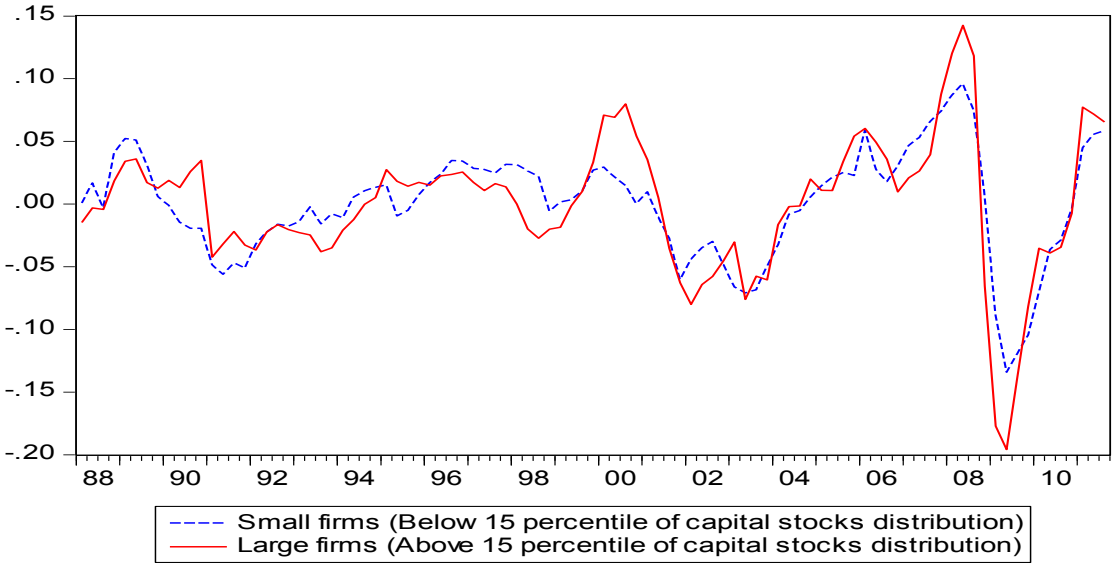
[60] The amount exceeding 30% in the upper bound is equal to 1, ω^U =1 because $CU(\gamma) = \gamma+\omega^U$ (i.e., $31=30+\omega^U$); similarly, the amount falling short of 30% in the lower bound is equal to 3, ω^L =3, because $CL(\gamma) = \gamma-\omega^L$ (i.e., $27=30-\omega^L$).

is that we apply the sale-based weight to the other series in order to find the growth of other series in small firms.

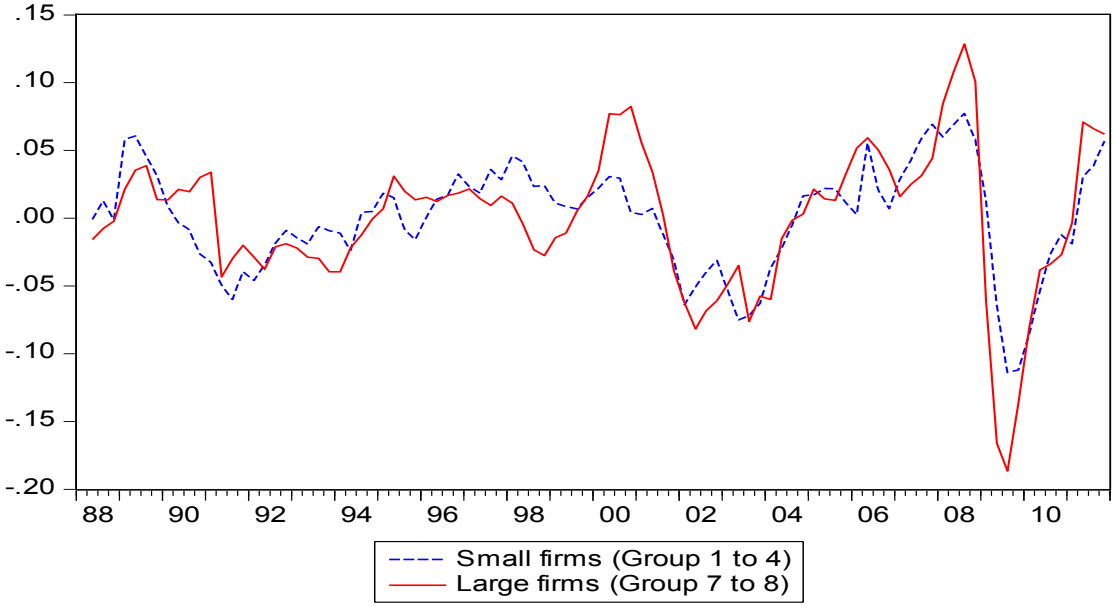
5. We can get the initial value for small firms. The initial level for other series was taken to be a weighted average of their value in CU(γ) and CL(γ), where the weights are the same as those defined above.

6. Cumulate up to achieve the level series.

3.7.2 Appendix B: Cumulative Growth Rates of Sales after HP Filtering (15th Percentile Capital-based Division and Nominal Cut-off Division)



Cumulative Growth Rates of Sales After HP Filtering
(15th Percentile Capital-based Division)

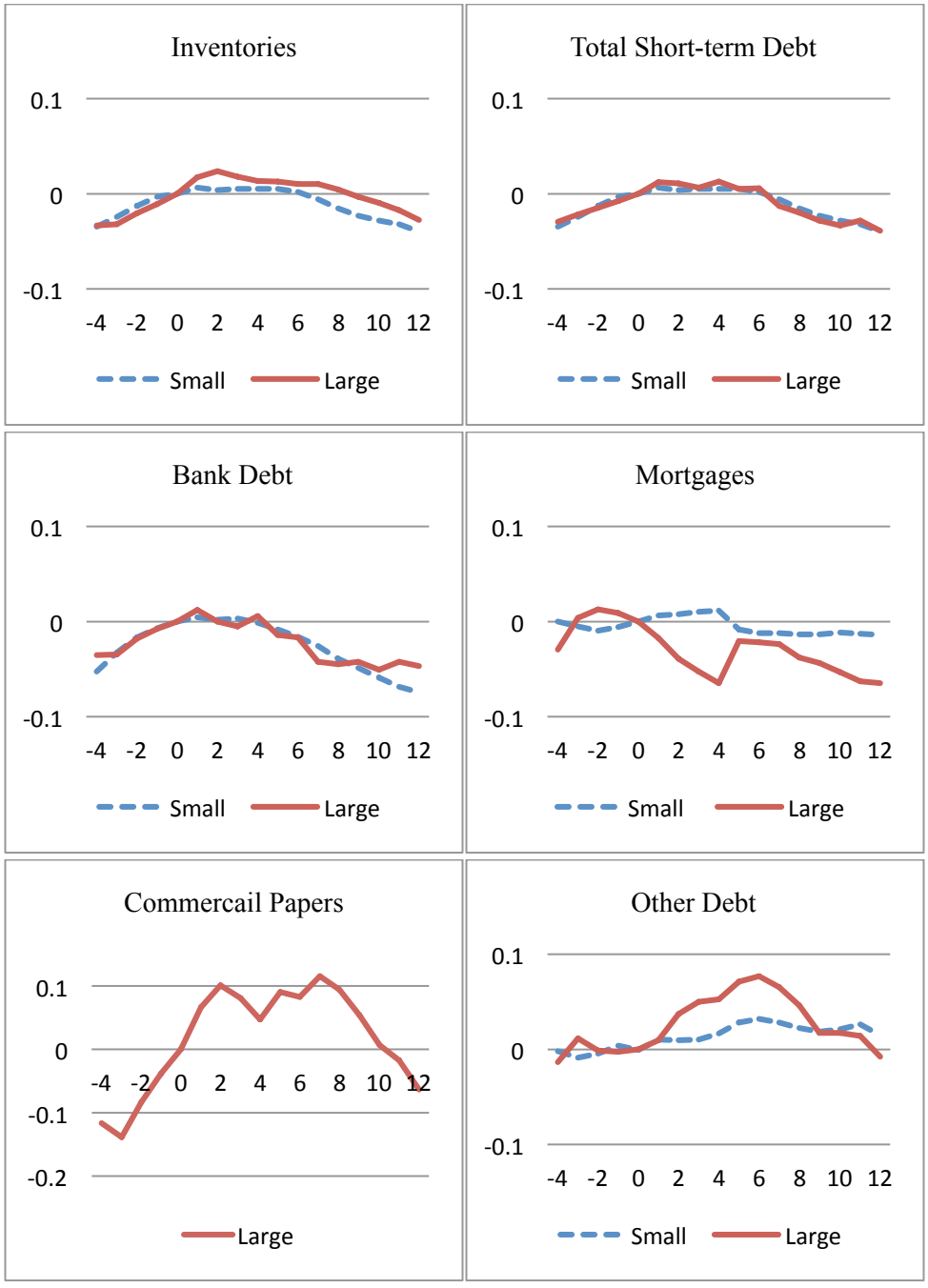


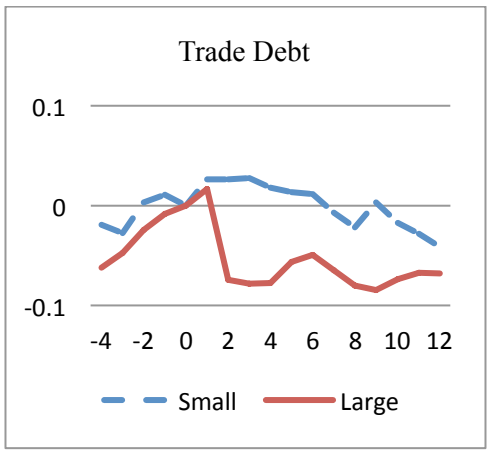
Cumulative Growth Rates of Sales After HP Filtering
(Nominal-cutoff Division)

Data Source: The Quarterly Finance Report

3.7.3 Appendix C: Average Changes in Inventories, Total Short-term Debt, Components of Aggregate Debt and Trade Debt Around Romer Dates

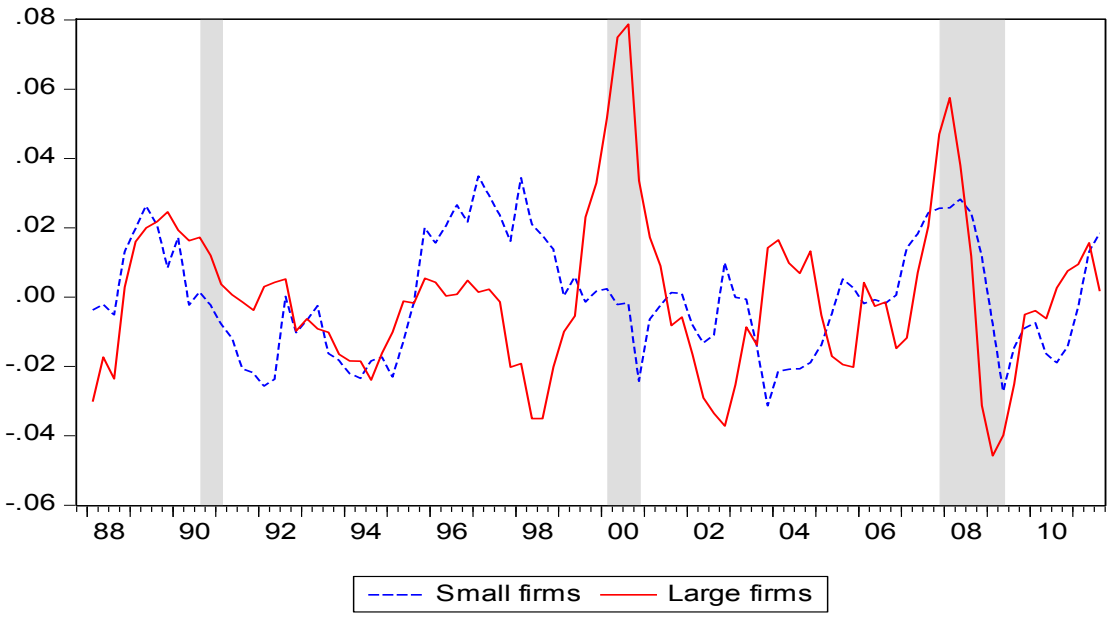
Flow of Fund Data (Earlier periods: 1960Q1−1989Q4)





Data Source: The Flow of Funds data

3.7.5 Appendix D: The Behavior of Net Worth Between Small and Large Firms Measured by Using the QFR Data



Cumulative Growth Rates of Net Worth after HP Filtering

Data Source: The Quarterly Finance Report

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