Customer Markets and Financial Frictions: Implications for Inflation Dynamics

Simon Gilchrist
Boston University and NBER

Egon Zakrajšek
Federal Reserve Board

FRB Kansas City - Economic Policy Symposium
Jackson Hole, WY
August 27 - 29, 2015

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Exhibit 1: Introduction

The question

- What accounts for the resilience of inflation in the face of significant and long-lasting economic slack?
- In particular, the absence of more substantial deflationary pressures during the “Great Recession” is difficult to square with the Phillips curve common to most macroeconomic models.

Cyclical Dynamics of Producer Prices and Industrial Production

Core producer prices*  
Percentage points

Industrial production*  
Percentage points

-24 -16  -8   0   8  16  24
-30
-25
-20
-15
-10
-5
0
5

Months to and from business cycle peaks

* Deviations from a linear trend estimated over the 24 months preceding the specified recession.

Our answer

- Economic forces that dampen the response of inflation to adverse demand or financial shocks reflect the interaction between customer markets and financial frictions:
  - **Customer markets:** markets in which customer base is "sticky" and an important determinant of firm’s assets and firm’s ability to generate profits
  - **Financial frictions:** systematic countercyclical wedge between the cost of external and internal finance due to asymmetric information or moral hazard problems in financial markets
Exhibit 2: Customer Markets and Financial Frictions

The mechanism

- Customer markets imply that firms invest in their customer base by lowering prices.

- Financial frictions imply that firms discount the future more heavily and therefore are less willing to invest in their customer base.

- When financial conditions tighten during a downturn:
  - Financially constrained firms raise prices and preserve current cash flows to fund operations and meet debt obligations.
  - Financially unconstrained firms lower prices and gain market share at the expense of their constrained competitors.
  - This leads to significant upward pressure on inflation despite a contraction in output.

Industry-adjusted PPI inflation by firms’ internal liquidity position

3-month moving average

Note: Weighted-average inflation relative to industry (2-digit NAICS) inflation (seasonally adjusted monthly rate).
Source: Gilchrist, Schoenle, Sim, and Zakrajšek (2015)
Exhibit 3: New Evidence From the 2008 Crisis

Empirical approach

- Examine how firms' pre-crisis internal liquidity positions affected their price-setting behavior during the crisis:
  - Construct firm-level industry-adjusted 12-month price changes from December 2007 to December 2008
  - Use quantile regressions to estimate the effect of firms' 2006 liquidity position (i.e., liquid asset ratio) on the entire distribution of industry-adjusted price changes in 2008

Liquidity and firms' pricing behavior in 2008

Empirical findings

- Differences in firms' 2006 liquidity positions primarily affected firms that raised prices relative to their industry in 2008.
- Consider two firms:
  - "Low" liquidity firm: 2006 liquid asset ratio at the 25th percentile (4%)
  - "High" liquidity firm: 2006 liquid asset ratio at the 75th percentile (23%)
  - At the median of the price-change distribution, a low liquidity firm increased prices 4 percentage points more in 2008 in comparison with its high liquidity counterpart
  - At the 90th percentile of the price-change distribution, this difference is 10 percentage points
Exhibit 4: Is This a One-Off Event?

Empirical approach

- Use detailed industry-level PPIs to examine the sensitivity of inflation to changes in aggregate financial conditions during the 1973 - 2013 period.
- Regress industry-specific year-ahead inflation on
  - Current and lagged inflation
  - Current and lagged growth in industry-level industrial production
  - Current commodity price inflation measured by GSCI
  - Indicator of current financial conditions - excess bond premium (EBP)
- Coefficients on EBP and commodity price inflation vary across 4-digit industry groups.
  - Is variation in industry-specific EBP coefficients related to the likelihood of financial constraints across industries?
  - Use industry-specific size-age index to identify the likelihood of financial constraints

12-month PPI inflation and financial conditions
By industry-specific indicator of financial constraints

Note: Smaller values of the size-age index indicate a smaller likelihood of financial constraints.

12-month PPI inflation and commodity prices
By industry-specific indicator of financial constraints

Note: Smaller values of the size-age index indicate a smaller likelihood of financial constraints.
Exhibit 5: DSGE Model of Customer Markets and Financial Frictions

An overview of GSSZ model
Gilchrist, Schoenle, Sim, and Zakrajšek (2015)

- Intuition:
  - Customer markets imply that firms trade off current profits for future market share
  - Financial frictions induce firms to discount future more heavily when demand is low and, therefore, to maintain high markups

- Embed this mechanism into a DSGE model with nominal rigidities:
  - Basic structure: Phillips curve, IS equation, and interest-rate rule
  - Customer markets introduced via "deep" habits
  - Financial frictions introduced via costly external equity finance
  - Two sectors: financially constrained vs. financially unconstrained

- Analyze the behavior of output and inflation when the economy is hit by demand and financial shocks:
  - Demand shock causes a direct shift in the marginal utility of consumption
  - Financial shock induces a direct increase in the cost of external finance
  - Highlight monetary policy implications due to the lack of "divine coincidence"
Demand shocks lead to usual dynamics implied by nominal rigidities: output rises, markups fall, and inflation increases.

As output increases, financial conditions improve and financially constrained firms lower prices.

This causes a modest increase in output and a significant reduction in inflation relative to the model without financial frictions.
In response to the tightening of financial conditions:
- Financially constrained firms raise prices to avoid increased cost of external finance
- Financially unconstrained firms cut prices and gain market share
- As markups rise, aggregate output falls, which causes a further reduction in the profitability of financially constrained firms
- This adverse feedback loop generates substantial amplification effects and causes aggregate inflation and output to move in opposite directions

Financial shocks resemble "cost-push" shocks: aggregate output falls, average markup increases, and inflation rises sharply.
Exhibit 8: Monetary Policy Implications

Interest-rate policy rules

<table>
<thead>
<tr>
<th></th>
<th>Inflation Weight</th>
<th>Output Weight</th>
<th>Interest-Rate Smoothing Coefficient</th>
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</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>1.5</td>
<td>0</td>
<td>0.75</td>
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<tr>
<td>Hawkish</td>
<td>3</td>
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<tr>
<td>Dovish</td>
<td>1.1</td>
<td>0.5</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Macroeconomic Effects of a Demand Shock

Baseline vs. hawkish rule

Baseline vs. dovish rule

Macroeconomic Effects of a Financial Shock

Baseline vs. hawkish rule

Baseline vs. dovish rule
Changes in financial conditions significantly influence cyclical dynamics of producer prices:

- During the 2008 crisis, financially constrained firms raised prices relative to their unconstrained counterparts
- This finding is a robust feature of business cycles:
  - Industry-level evidence indicates that a tightening of financial conditions leads to a significant decline in prices for financially unconstrained firms but elicits no price response for financially constrained firms

Interaction of customer markets and financial frictions rationalizes these empirical findings:

- Significant attenuation of the response of inflation to demand shocks
- Negative comovement between inflation and output in response to financial shocks

These results highlight the challenge of using a specific interest-rate rule in an environment where changes in financial conditions affect firms’ pricing behavior:

- An aggressive response to inflation is potentially beneficial when responding to demand shocks
- Putting greater weight on output stabilization provides significant economic benefits in periods of financial turmoil