The Cost Channel of Monetary Transmission

by

Marvin Barth and Valerie Ramey
The conventional monetary transmission mechanism operates through the demand side of the economy.

The credit channel investigates credit rationing mechanisms that affect the supply of credit.

Barth and Ramey (2001) investigate monetary effects on the supply side of the economy.
Three empirical puzzles:

1. **Amplification:** money shocks induce small and transitory effects on interest rates but have large and persistent effects on output (see credit channel literature).

2. **Price Puzzle**

3. **RBC Evidence:** money shocks produce responses in the economy that are more similar to a technology shock rather than the responses to an aggregate demand shock.
Monetary Policy as a supply shock:

- **Credit Channel Effects**: the inability to obtain credit reduces output, see Kashyap, Stein and Wilcox (1993) and Gertler and Gilchrist (1994).

- **Limited Participation Effects**: Christiano, Eichenbaum and Evans (1997), Farmer (1984, 1988a, b) – factors of production have to be paid in advance of production, hence firms need to borrow.
The RBC Evidence – Identifying Supply vs. Demand Shocks with long-run restrictions

Assumption: technology shocks are the only shocks that have permanent effects on productivity (see Galí, 1999, AER). In Galí (1999), shocks to labor (labeled as demand shocks) appear to drive business cycle movements.
Set-up

\[ \Delta y_t = \Delta \log(\text{productivity}) = x_t \]
\[ = \Delta \log(\text{hours}) = n_t \]
\[ = \Delta \log(\text{wages}) = w_t \]
\[ = \Delta \log(\text{prices}) = p_t \]
\[ = \Delta \log(\text{M2}) = m_t \]

Fed funds rate = \( ff_t \)

Assume that \( \Delta y_t \) has a Wold decomposition, such that:

\[ \Delta y_t = C(L)u_t \]
Imposing identification restrictions – Blanchard-Quah:

First, a simple example:

Suppose $y_t$ is a two dimensional vector, with reduced form:

$$y_t = u_t + B_1 u_{t-1} + B_2 u_{t-2} + \ldots \text{ with } \sum B_j = B$$

The structural version is:

$$y_t = C_0 \varepsilon_t + C_1 \varepsilon_{t-1} + \ldots \text{ with } \sum C_j = C, \text{ s.t. } C = B C_0$$

Further assume that:

$$C_0' C_0 = \Omega = E(u'u)$$

Finally, assume the long-run restriction:

$$\sum C_j (1,2) = 0$$
Then from (1) and (3) \( B_{11} C_0 (1,2) + B_{12} C_0 (2,2) = 0 \)

and from (2)

\[
\begin{align*}
C_0 (1,1)^2 + C_0 (1,2)^2 &= \sigma_{11}^2 \\
C_0 (1,1) C_0 (2,1) + C_0 (1,2) C_0 (2,2) &= \sigma_{12} \\
C_0 (2,1)^2 + C_0 (2,2)^2 &= \sigma_2^2
\end{align*}
\]

which gives enough conditions to identify the matrix \( C_0 \).
Going back to the paper,

\[ y_t = \begin{bmatrix} C_{11}(L) & C_{12}(L) & \ldots & C_{16}(L) \\ C_{21}(L) \\ \vdots \\ C_{61}(L) & C_{66}(L) \end{bmatrix} \begin{bmatrix} \varepsilon^x \\ \varepsilon^n \\ \vdots \\ \varepsilon^{ff} \end{bmatrix} \]

Assume:

- \( C_{1j}(1) = 0 \) for \( j = 2,3,\ldots,6 \) (long-run restrictions: only shocks to \( \varepsilon^x \) have permanent effects – supply shock)
- \( C_{2j}(0) = 0 \) for \( j = 3,4,5,6 \) (short-run restrictions based on Galí to identify demand shocks)
The shock $\varepsilon^f$ is uncorrelated contemporaneously with any of the other variables.

Hence:

- The supply shock is given by the shock to technology $\varepsilon^x$
- The non-monetary demand shock is the shock to hours, $\varepsilon^n$
- The monetary shock is the shock to the fed funds equation $\varepsilon^f$
Figure 1  MONETARY, TECHNOLOGY, AND DEMAND SHOCKS

Private Output

- Demand shock
- Monetary shock
- Technology shock

Quarter

Private Hours

- Technology shock
- Monetary shock
- Demand shock

Quarter
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**Productivity**
- Demand shock
- Monetary shock
- Technology shock

**Quarter**:
0 4 8 12 16

**Real Wages**
- Demand shock
- Monetary shock
- Technology shock

**Quarter**:
0 4 8 12 16

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U.C. Davis
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Price Level

- Technology shock
- Demand shock
- Monetary shock

Quarter

Funds Rate

- Monetary shock
- Technology shock
- Demand shock

Quarter
How good is the identification of shocks?

- MP shocks differ significantly from demand shocks identified from defense build-ups in their effect on output and wages (Fig. 2)
- Wages respond countercyclically to exogenous fluctuations in demand and are consistent with the effects of a demand shock in a standard neoclassical model with flexible prices, but are not consistent with a theory of countercyclical mark-ups. (Fig. 3)
- Comparing the response of the Romer dates to Ramey-Shapiro dates, both shocks lead to a decline in output but have opposite effects of wages.
Figure 2(a) THE EFFECT OF DEFENSE SPENDING ON AIRCRAFT INDUSTRY OUTPUT AND WAGES (QUARTERLY DATA); (b) THE EFFECT OF ROMER DATES AND RAMEY–SHAPIRO MILITARY DATES
Figure 3 RESPONSE OF MANUFACTURING INVENTORIES BY STAGE OF PROCESS TO A FEDERAL FUNDS RATE SHOCK: (a) EARLY SAMPLE PERIOD—JANUARY 1959 TO SEPTEMBER 1979; (b) LATE SAMPLE PERIOD—JANUARY 1983 TO MARCH 2000.
Mechanics of the Cost Channel

Assumption: Firms must pay workers before selling goods. Hence firms borrow cash in order to produce. This is an additional cost of labor (similar to limited participation models):

Labor demand: \[ \ln N_t = \frac{1}{\alpha} \left[ \ln(1 - \alpha) + \ln \mu - \ln R_t - \ln \frac{w_t}{p_t} \right] \]

\( \alpha \) is the capital coefficient in the Cobb-Douglas prod. fn.
\( \mu \) is a constant mark-up
\( R \) is a gross nominal interest rate
Assume there is a one year delay between payments and selling output.

If $\alpha = 0.3$ then an increase in $R$ of 1% reduces labor demand by 3%, holding wages constant.

Credit Channel Effects: a monetary policy shock reduces demand, hence firms accumulate inventory and have lower cash-flow. This reduces their net worth.

The cost channel is a short-run phenomenon.
Industry Level Evidence of M.P. as a Supply Shock

With industry level data on industrial production (IP) and the inverse of the industry real wage (w/p) construct a VAR:

- **Macro block**: IP, P, PCOM, M2, FF
- **Industry Level Variables**: IP(industry); p/w (industry)
- **Seasonal Dummies**
- **Hoover-Perez Dummies**: oil shocks

A demand shock should cause IP and p/w to drop

A supply shock should cause IP to drop but p/w to increase
Industry Results

In 10 of 21 industries a positive shock to FF causes IP to drop and p/w to increase – this is consistent with a cost channel story.

8 of 21 industries respond to the FF shock as if it were a demand shock.
Figure 5 INDUSTRY OUTPUT & RELATIVE PRICE RESPONSES TO A FEDERAL FUNDS RATE SHOCK: EARLY SAMPLE PERIOD: JANUARY 1959 TO SEPTEMBER 1979
Thin line with circles, output: filled, significant at 10%; open, significant at 25%. Thick line with boxes, price/wage: filled, significant at 10%; open, significant at 25%.
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**Petroleum & Coal Products**

![Graph showing the percent change in prices over months following a shock.]

**Rubber & Plastic Products**

![Graph showing the percent change in prices over months following a shock.]

**Hides, Skins, Leather & Related Products**

![Graph showing the percent change in prices over months following a shock.]

**Stone, Clay & Glass Products**

![Graph showing the percent change in prices over months following a shock.]

Óscar Jordà
U.C. Davis
Robustness – other explanations for the empirical results

1. Wages are more variable than prices
2. Inadequate modeling of the Fed’s inflation forecasts
3. Countercyclical mark-ups

1. **Sticky Prices and Flexible Wages**

With sticky prices, a monetary contraction causes profits to rise since prices are fixed and wages are falling. However, this is at odds with the data.
2. Forecasts of Inflation

Use *greenbook* forecasts on inflation and output as exogenous variables in the FF equation do not make a big difference in the results.

3. Countercyclical Mark-ups

- **Countercyclical markup:** liquidity constraints lead to higher prices because they raise the optimal mark-up.
- **Cost Channel:** liquidity constraints raise prices because they raise marginal costs.

Empirically, it is difficult to distinguish between the two.