

Inflation Dynamics during the Financial Crisis

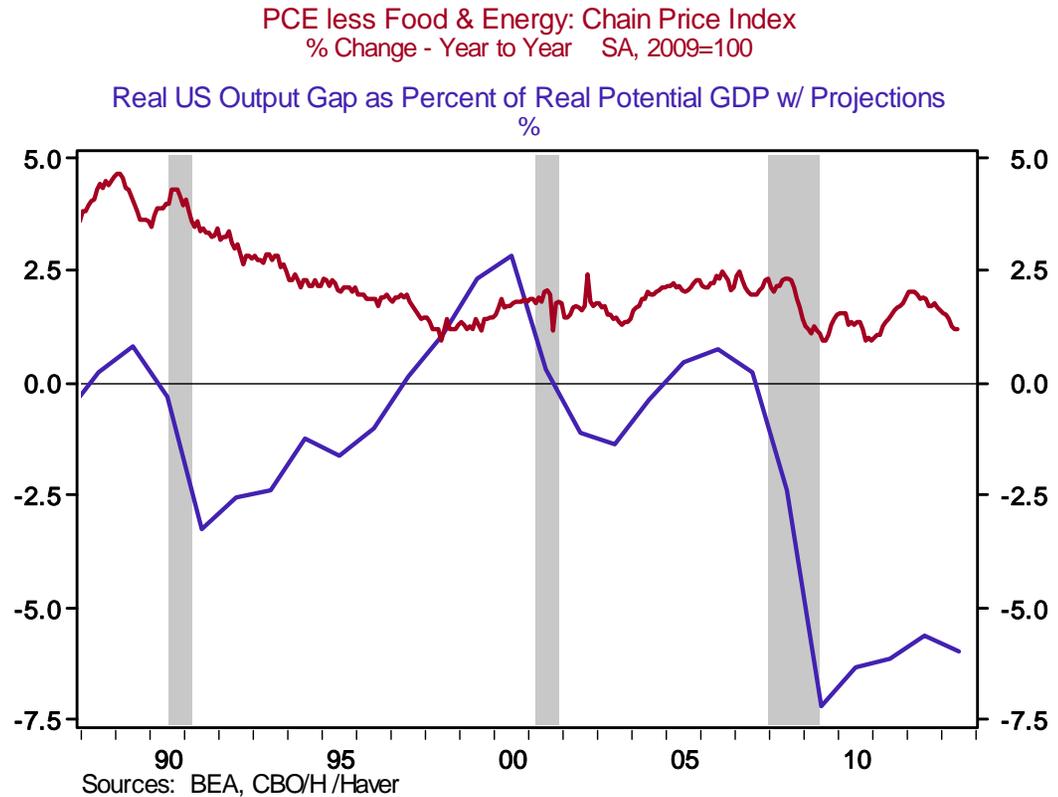
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A discussion by Etienne Gagnon
Federal Reserve Board
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The big question (1/2)

Why has U.S. inflation been so steady despite ample resource slack in the wake of the Great Recession?



The big question (2/2)

- ▶ Traditional Phillips curves counterfactually predict a large deceleration in consumer prices.
 - ▶ Notably, previously popular “accelerationist” models, which impose a unit root in inflation, have been entirely dismissed because they predict an ever falling rate of inflation.
- ▶ Central bankers tend to emphasize the anchoring of inflation expectations around a credible target as a key source of inflation stability during and after the financial crisis.
- ▶ GSSZ’s alternative/complementary explanation: Firms facing costly external finance chose to conserve cash by boosting markups, thus limiting the fall in inflation.

Plan of discussion

- ▶ Micro facts and the financial crisis: U.S. producer prices versus U.S. consumer prices.
- ▶ Some thoughts on GSSZ's empirical facts and modeling choices.

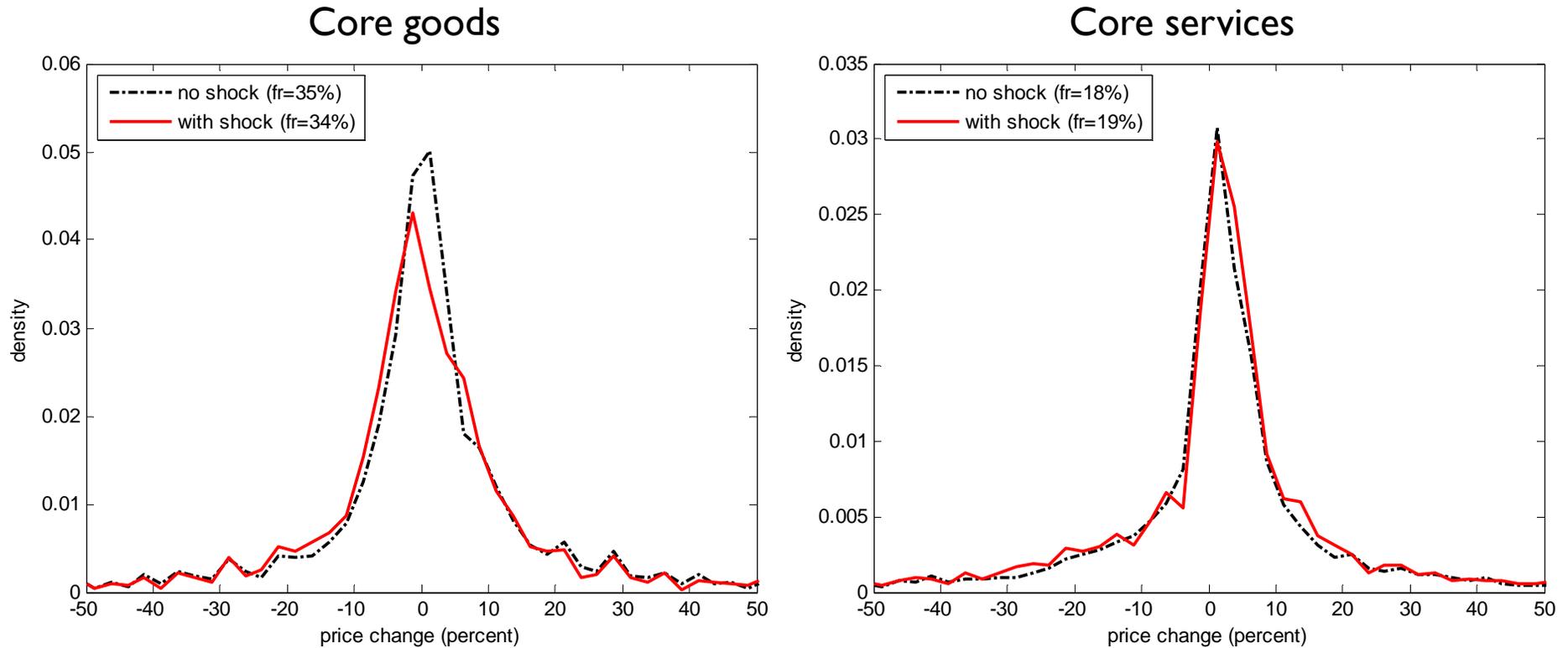
Producer versus consumer prices

- ▶ GSSZ uncover some very large relative price movements in the U.S. PPI in 2008:Q4:
 - ▶ Firms with liquidity ratios above their sector's median saw their prices **jump 15-20 percent** relative to prices of firms with liquidity ratios below their sector's median!
- ▶ By contrast, commentary on U.S. consumer prices has emphasized the absence of large price movements during the Great Recession (energy and housing sectors aside). Have we overlooked the elephant in the room?

Price dispersion implications

- ▶ I did not have GSSZ's extraordinary patience and minutia to replicate their empirical findings using CPI data. I instead looked for *circumstantial* evidence that a shock similar to that of GSSZ hit CPI prices.
- ▶ GSSZ's findings are consistent with a marked increase in the dispersion of individual price adjustments in 2008:Q4.
- ▶ I do not find such evidence in micro CPI data from BLS.

Distribution of individual CPI price changes around Lehman Brothers' collapse



With shock: September/October, 2008

No shock: September/October, 2003-2006

Source: author's calculations using BLS micro CPI data.

Price re-optimization implications

- ▶ Similarly, I found limited evidence of greater re-optimizing of consumer prices in 2008:H2 when I looked at time series of
 - ▶ sales and promotions;
 - ▶ clearance sales;
 - ▶ unplanned item substitutions;
 - ▶ price novelty.

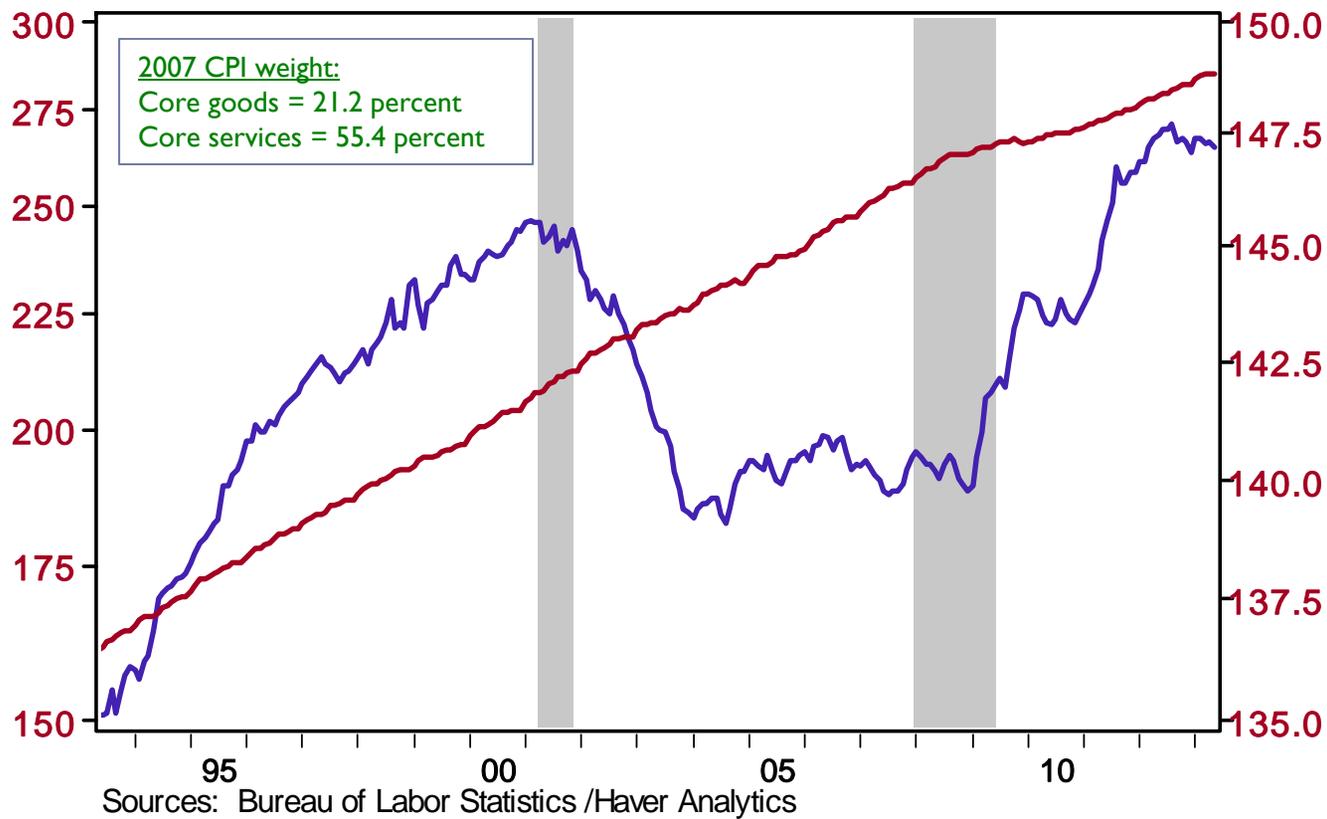
Pass-through implications

- ▶ GSSV's financial shock was transmitted very rapidly (a single quarter) and its impact was highly persistent (not sure much of it has gone away).
- ▶ U.S. CPI movements do not display as clear a timing:
 - ▶ Core services inflation *slowed* in first half of 2008 amid falling housing prices and transportation costs.
 - ▶ Core good inflation *picked up* in late 2008.
 - ▶ In either case, dynamics extended over several years.

Core prices over the past quarter century

CPI-U: Services Less Energy Services
NSA, 1982-84=100

CPI-U: Commodities Less Food & Energy Commodities
SA NSA, 1982-84=100



What pricing models do GSSZ's findings suggest?

- ▶ The one-time jump in the relative price of firms with low versus high liquidity ratios is more reminiscent of state-dependent pricing than time-dependent pricing.
- ▶ Even if authors had imposed their matched sample's high re-pricing rate, one would still expect any shock to relative prices to be transmitted over several quarters in a time-dependent model.
- ▶ GSSV opt for Calvo-like dynamics in their model section, and further boost the intrinsic persistence of the model through deep habits.

A confession

- ▶ I was quite surprised (in a good way) by GSSZ's modeling section. I was expecting them to match the rich micro facts presented in their empirical section, such as the frequency and size of price adjustments, the swing in relative price, the behavior of liquidity ratios, etc.
- ▶ Instead, GSSV provide a thorough examination of aggregate dynamics under external finance and consumer base concerns.

Some thoughts on consumer base concerns

- ▶ A key insight of GSSZ is that shocks to the cost of external finance impact the effective discount rate, and thus interact with other intertemporal frictions such as price stickiness and consumer base concerns.
- ▶ Their focus on consumer base concerns is more than just about matching the fact that firms spending more on generating sales increased their relative price. The sizeable swing in relative prices during the crisis calls for large swings in quantities, unless (short-term) price elasticities are low.
- ▶ As far as I know, nobody has explored firms' ability to smooth idiosyncratic shocks when consumer base is sticky. Can it induce implausibly large individual price volatility? If so, what does it tell us about plausibility of deep habits?

Summing up

- ▶ The apparent discrepancy between CPI and PPI behavior is an invitation to investigate further the nature of GSSV's shock and the channels of transmission from the PPI to the CPI.
- ▶ GSSV's modeling section raises a plethora of additional questions worth investigating.

Additional slides

Liquidity ratios of large U.S. corporations

| ▶ year | cash_ratio_w | sic2 | conn |
|--------|--------------|------|-----------------------------|
| ▶ 2012 | 79.37643 | 73 | PRICELINE.COM INC |
| ▶ 2012 | 75.73591 | 73 | VERISIGN INC |
| ▶ 2012 | 75.14644 | 73 | AUTOMATIC DATA PROCESSING |
| ▶ 2012 | 69.95998 | 36 | ANALOG DEVICES |
| ▶ 2012 | 65.0237 | 36 | ALTERA CORP |
| ▶ 2012 | 64.9927 | 36 | LINEAR TECHNOLOGY CORP |
| ▶ 2012 | 57.96323 | 35 | NETAPP INC |
| ▶ 2012 | 57.14381 | 82 | APOLLO GROUP INC -CL A |
| ▶ 2012 | 54.48267 | 35 | CISCO SYSTEMS INC |
| ▶ 2012 | 52.74956 | 60 | MASTERCARD INC |
| ▶ 2012 | 52.1988 | 73 | MICROSOFT CORP |
| ▶ 2012 | 51.90729 | 73 | GOOGLE INC |
| ▶ 2012 | 51.58303 | 21 | LORILLARD INC |
| ▶ 2012 | 51.00705 | 38 | KLA-TENCOR CORP |
| ▶ 2012 | 47.31242 | 36 | MICROCHIP TECHNOLOGY INC |
| ▶ 2012 | 46.85111 | 73 | AUTODESK INC |
| ▶ 2012 | 45.17131 | 73 | COGNIZANT TECH SOLUTIONS |
| ▶ 2012 | 44.31287 | 28 | AMGEN INC |
| ▶ 2012 | 44.21313 | 62 | FRANKLIN RESOURCES INC |
| ▶ 2012 | 42.96097 | 36 | XILINX INC |
| ▶ 2012 | 42.85203 | 72 | BLOCK H & R INC |
| ▶ 2012 | 42.05268 | 87 | ACCENTURE PLC |
| ▶ 2012 | 40.84009 | 60 | WESTERN UNION CO |
| ▶ 2012 | 40.2621 | 36 | JDS UNIPHASE CORP |
| ▶ 2012 | 39.4638 | 73 | ORACLE CORP |
| ▶ 2012 | 38.0635 | 28 | ALEXION PHARMACEUTICALS INC |
| ▶ 2012 | 37.45961 | 73 | TRIPADVISOR INC |
| ▶ 2012 | 35.60938 | 73 | ADOBE SYSTEMS INC |
| ▶ 2012 | 35.29847 | 59 | AMAZON.COM INC |
| ▶ 2012 | 35.10669 | 36 | MOTOROLA SOLUTIONS INC |

Our approach

- ▶ The Great Recession was a large observable shocks that may have acted as a signal that firms needed to pay attention to the economic situation. Thus, one might expect more price optimization during the Great Recession, especially around the dramatic collapse of Lehman Brothers.
- ▶ To see if that is the case, we look at the incidence of :
 - ▶ Regular price changes;
 - ▶ Item substitutions;
 - ▶ Sales and promotions;
 - ▶ Novelty and comeback prices;
 - ▶ Reference and nonreference prices;
 - ▶ Clearance sales;
- ▶ Statistics are weighted by expenditure shares.

Frequency of regular price changes (processed items)

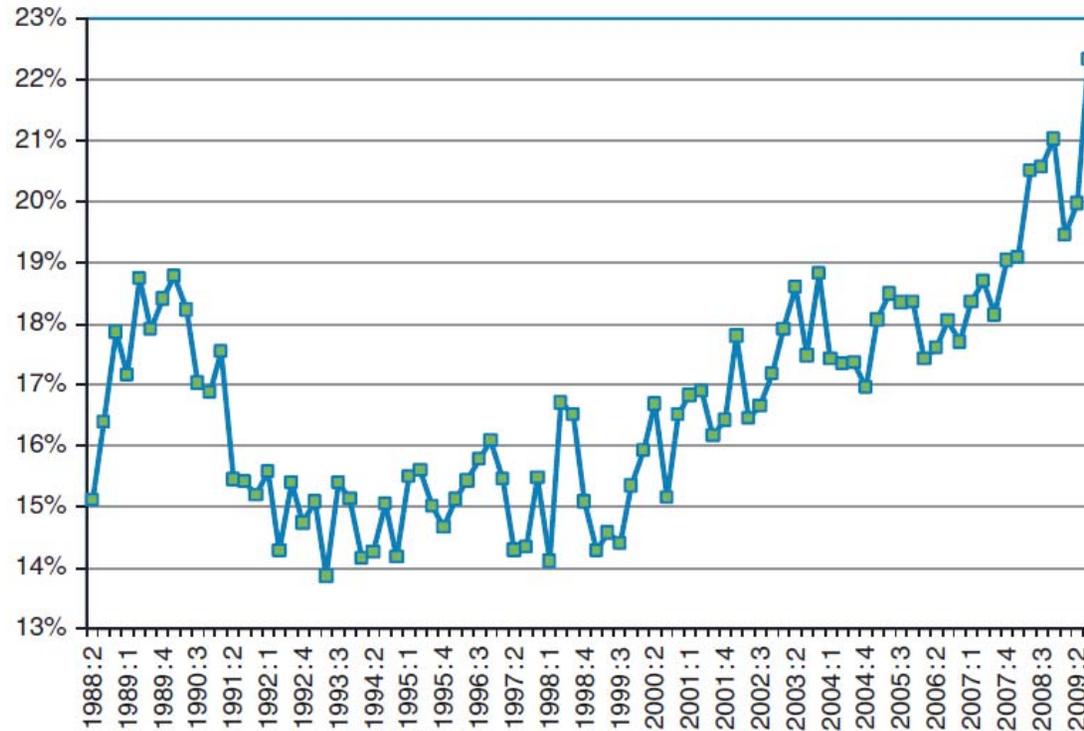
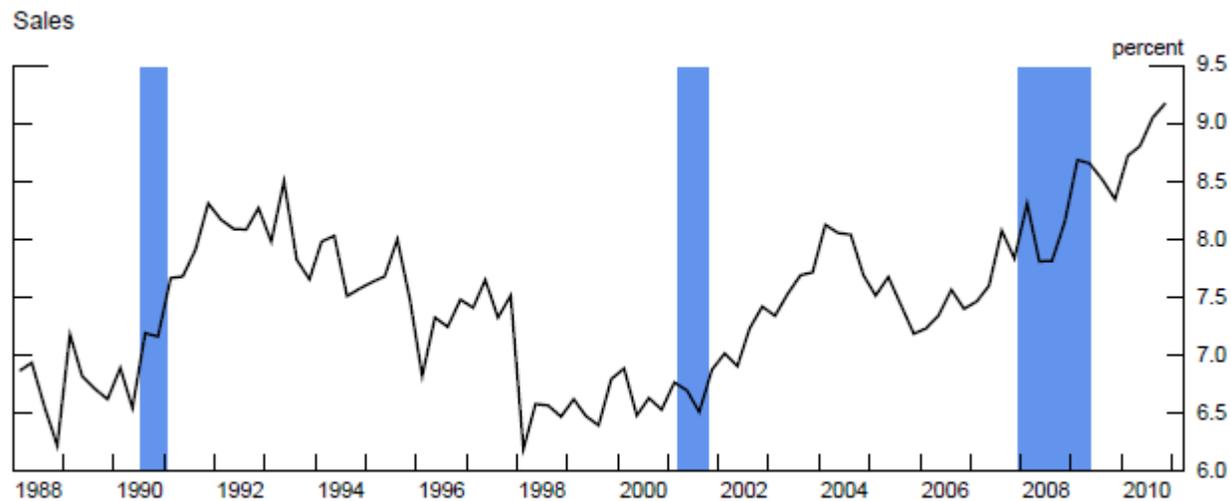


Figure 5 U. S. Monthly CPI frequency over time. *Source:* CPI-RDB. Data are for the top three cities (New York, Los Angeles, and Chicago), based on regular prices for processed items. We first calculated the monthly frequency of price changes (weighted mean across ELIs) from April 1988 through September 2009. We then took out seasonal (monthly) dummies, and calculated deviations from them. Finally, we averaged the monthly deviations in each quarter, and added back the mean across all quarters, to produce quarterly data from 1988:2 through 2009:3.

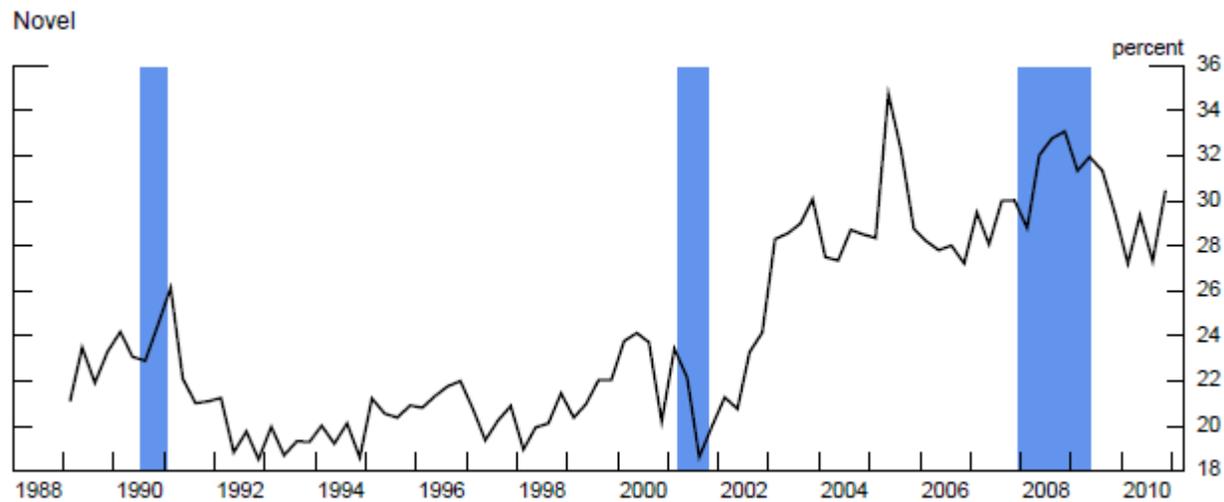
Source: Klenow and Malin (2010)

Fraction of prices on sales or promotion



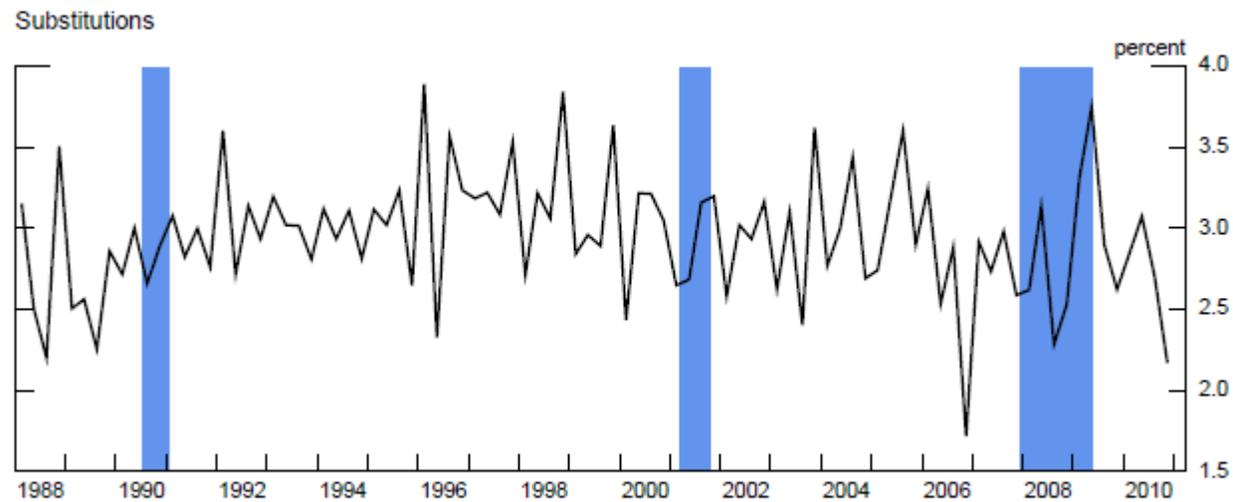
Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Fraction of novel prices



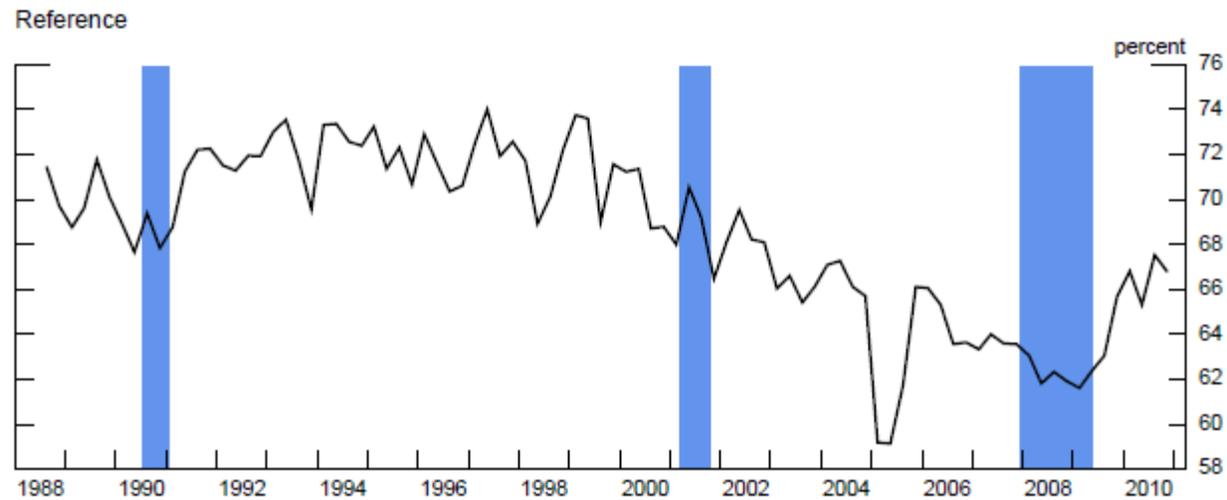
Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Fraction of item substitutions



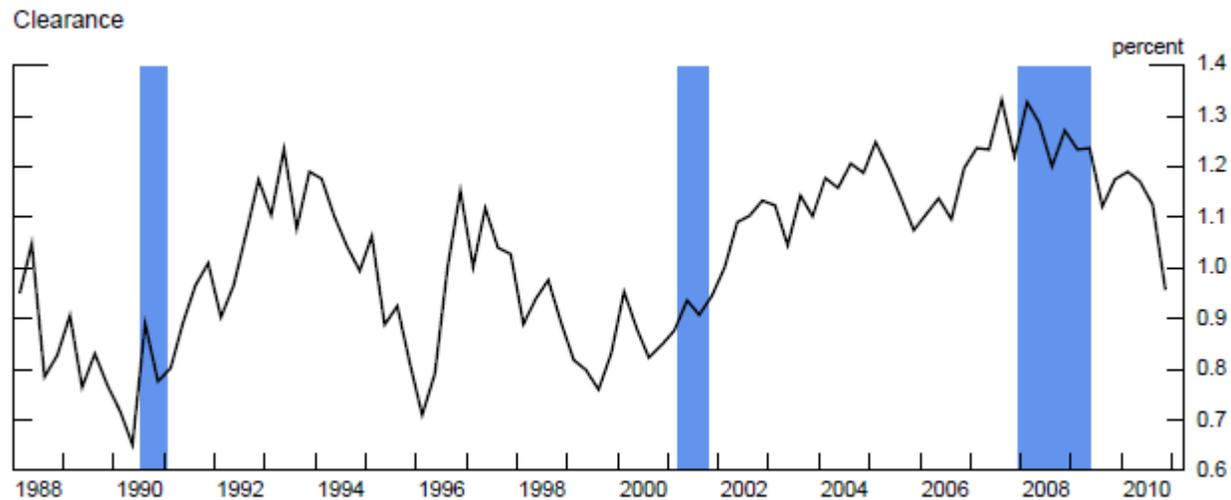
Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Fraction of reference prices



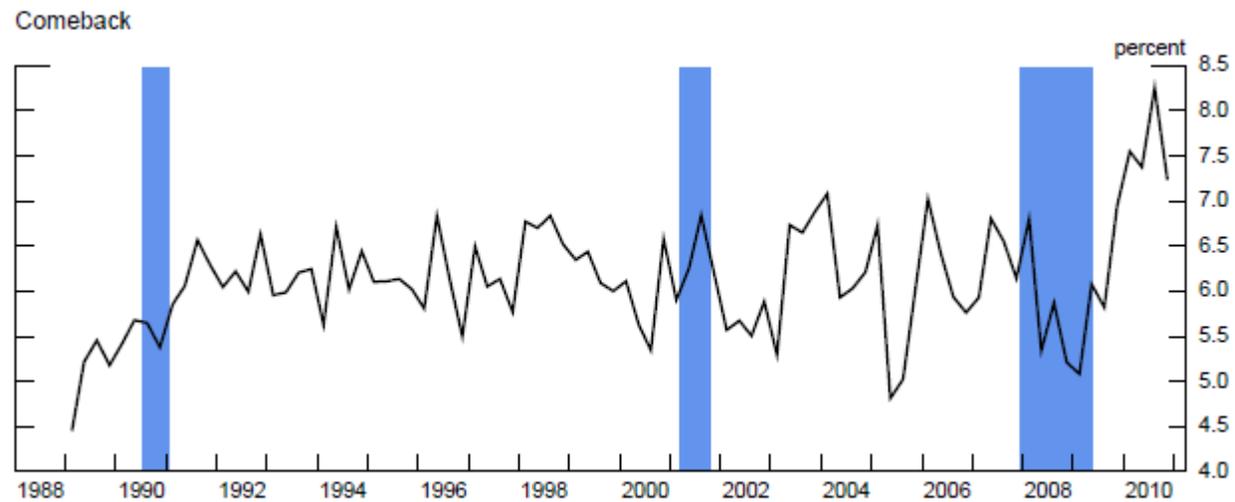
Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Fraction of clearance sales



Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Fraction of comeback prices



Source: Gagnon and Lopez-Salido using U.S. CPI microdata.

Bottom line on reoptimization

- ▶ The evidence on price reoptimization is mixed.
- ▶ On the one end, the frequency of price changes has drifted upward from late 2007 onward. This finding is true whether we consider regular prices or sales prices.
- ▶ On the other hand, there is hardly any evidence that firms exhibited greater novelty in prices, used clearance sales more extensively, or were more likely to alter an item's availability or characteristics in a way that would have triggered a substitutions.
- ▶ As we next show, firms may not have felt much of a need for repricing because the shock to reset prices was typically small.