Output Gap, Monetary Policy Trade-Offs and Financial Frictions

Francesco Furlanetto
Norges Bank

Paolo Gelain
Norges Bank

Marzie Taheri Sanjani
International Monetary Fund

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Usual disclaimer applies

Motivation

- Large interest in macroeconomic models with financial frictions
  - Propagation of standard disturbances (Bernanke and Gertler, 1989, Bernanke, Gertler and Gilchrist, 1999)
  - Financial shocks (Christiano, Motto and Rostagno, 2014, Jermann and Quadrini, 2012)
  - Banking in macroeconomic models (Gerali et al., 2010, Gertler and Karadi, 2011, Gertler and Kiyotaki, 2011)
  - Unconventional monetary policies (Gertler and Karadi, 2011)
  - Macroprudential policies (Angelini et al., 2011, Quint and Rabanal, 2013, Gelain and Ilbas, 2014)
- Much less attention on the **policy implications** for standard monetary policy objectives
  - Output gap
  - Optimal monetary policy (trade-offs between different policy objectives)

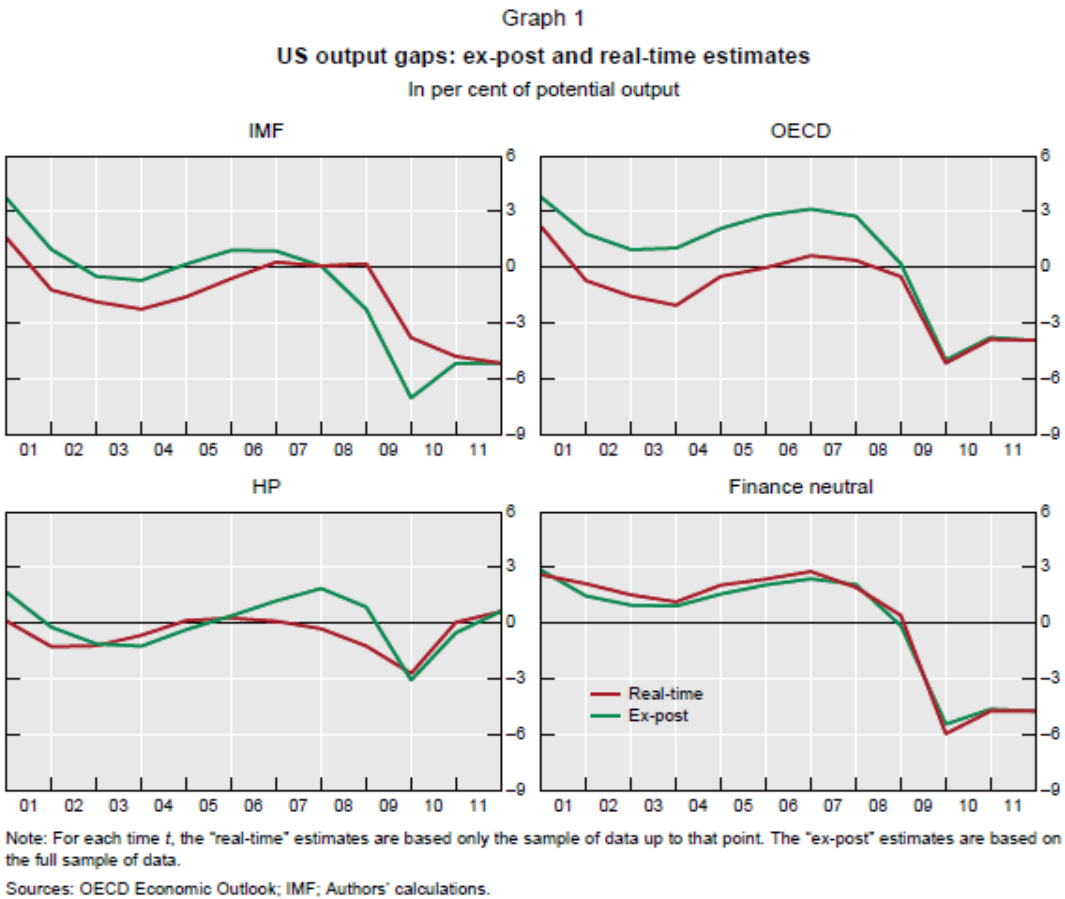
What do we do?

- We estimate a standard DSGE model with financial frictions (BGG, 1999, CMR, 2014) over the period 1964-2009 using U.S. data

- **Our contribution**: we analyze the implications of financial frictions (financial accelerator) and financial shocks (stock market shocks and spread shocks) for
  - **Output gap**
    - **No papers in the DSGE literature.**
  - **Optimal monetary policy and trade-offs**
    - Other papers use **calibrated** models driven by **few** shocks
    - We use an **estimated** model driven by **several** shocks

Why is this interesting I?

- Output gap. Borio, Disyatat and Juselius (2013): financial factors are important for the output gap
  - "Finance neutral" vs. "inflation neutral" output gap
  - Claim: large and positive output gap in the pre-Great Recession period



Why is this interesting II?

- Trade-offs for monetary policy
  - Central Banks have dual mandate: real economy and inflation stabilization
  - Underlying assumption: trade-off between the two objectives (loss function approach)
  - With financial frictions: more intermediate targets to trade-off
    - price inflation
    - wage inflation
    - output gap
    - spread (external finance premium)

What do we find?

- Output gap
  - The presence of financial frictions and financial shocks change output gap dynamics
  - Positive output gap in the pre-crisis period
- Monetary policy trade-offs
  - Estimated model with a Taylor rule: large trade-offs between different objectives
  - Counterfactual with optimal Ramsey monetary policy
    - It is optimal to stabilize price and wage inflation
    - at the cost of some fluctuations in the output gap
    - ...and somewhat large fluctuations in the premium

Plan of the rest of the talk

- Overview of the model
- Results: output gap
- Results: monetary policy trade-offs
- Conclusions

The model: structure

1. Standard New Keynesian DSGE model with nominal and real rigidities (Christiano, Eichenbaum and Evans, 2005, and Smets and Wouters, 2007)

2. Financial accelerator mechanism (Bernanke, Gertler and Gilchrist, 1999, Del Negro and Schorfheide, 2013, CMR, 2014)

3. Financial shocks: stock market (net worth) shocks and spread (risk) shocks

4. Our model *perfectly* "nests" the model by Justiniano, Primiceri and Tambalotti, 2013.

The model: entrepreneurs

- Entrepreneurs balance sheet

$$B_t = Q_t K_t - N_t$$

- They have some internal funds N_t to buy capital $Q_t K_t$ but need to borrow the rest B_t
- Borrowing subject to frictions (imperfect information and monitoring costs): External finance is costly

$$S_t = \frac{E_t R^k_{t+1}}{R_t} = f\left(\frac{N_t}{Q_t K_t}, \sigma_t\right)$$

- Spread shocks σ_t as in Christiano, Motto, and Rostagno (2014)
- Stock market shocks ϑ_t as in Gilchrist and Leahy (2002)

$$N_t = \vartheta_t \left\{ R^k_t Q_{t-1} K_{t-1} - \left[R_{t-1} + \frac{\mathcal{M}_t}{Q_{t-1} K_{t-1} - N_{t-1}} \right] (Q_{t-1} K_{t-1} - N_{t-1}) \right\}$$

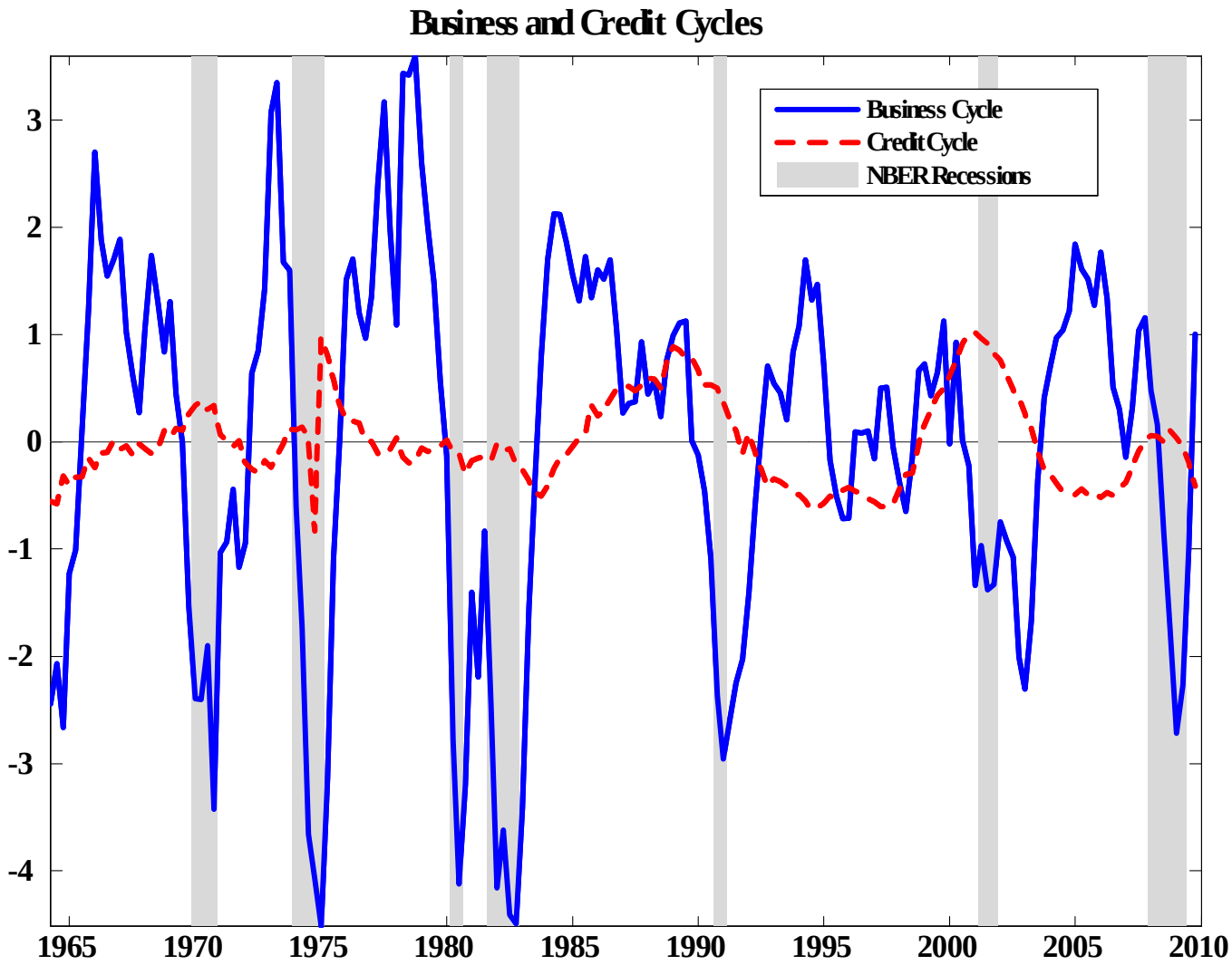
Estimation results in a nutshell

- Data: quarterly US data from 1964 QII to 2009 QIV in log differences
  - **Stock market index (in growth rate)**
  - **External finance premium** (baa - 10y yield on government bonds)
  - **Credit-to-GDP gap**

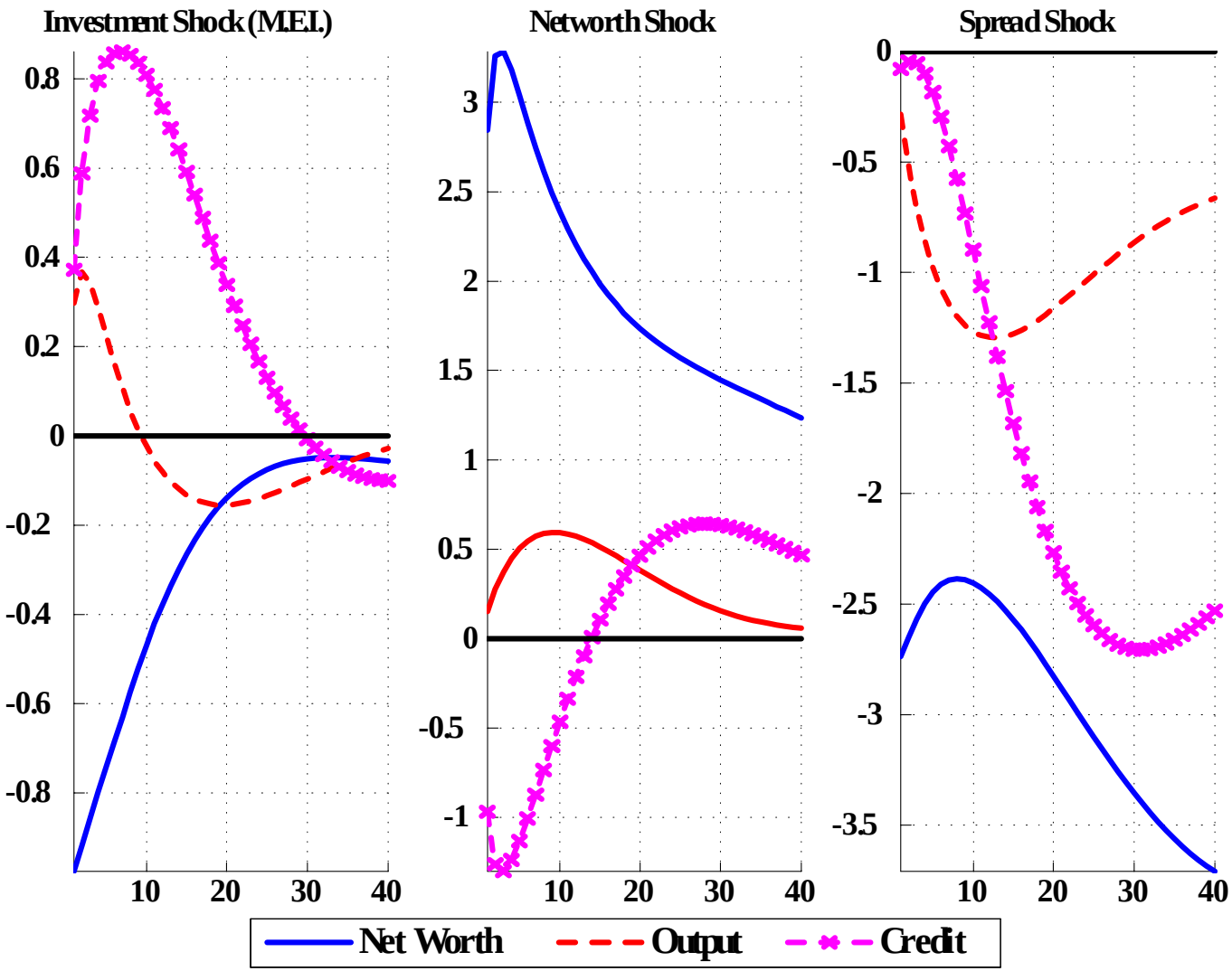
- Financial accelerator estimated parameters
  - similar to the values estimated by Del Negro and Schorfheide (2013) and CMR (2014)

- Financial shocks and macroeconomic fluctuations
  - Relatively important at **business cycle frequency** (absorb some explanatory power from investment shocks)
  - Very important to explain **low-frequency** dynamics (absorb some explanatory power from labour supply shocks)

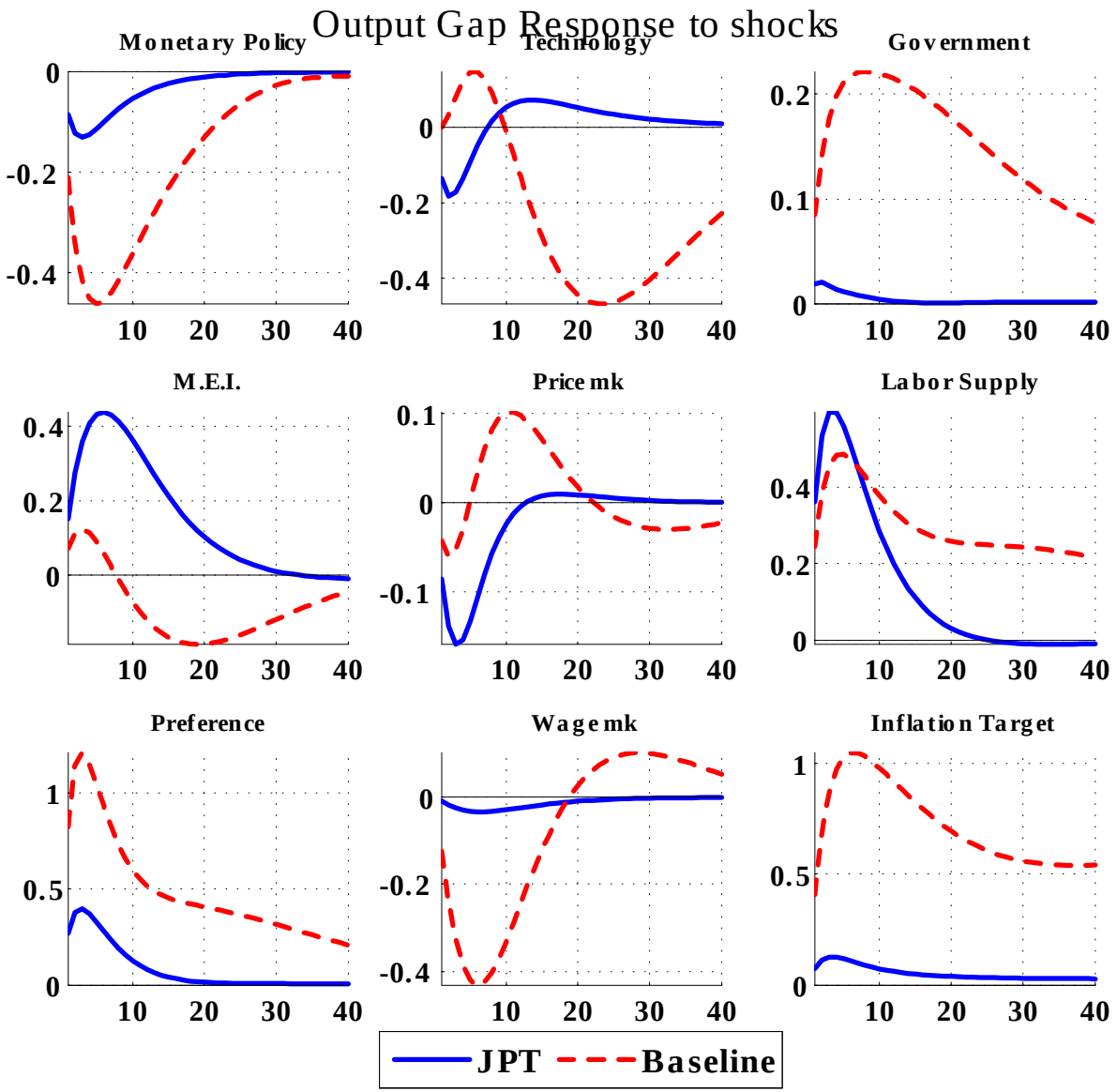
Business Cycle vs. Credit Cycle



Selected IRFs



Acceleration or deceleration



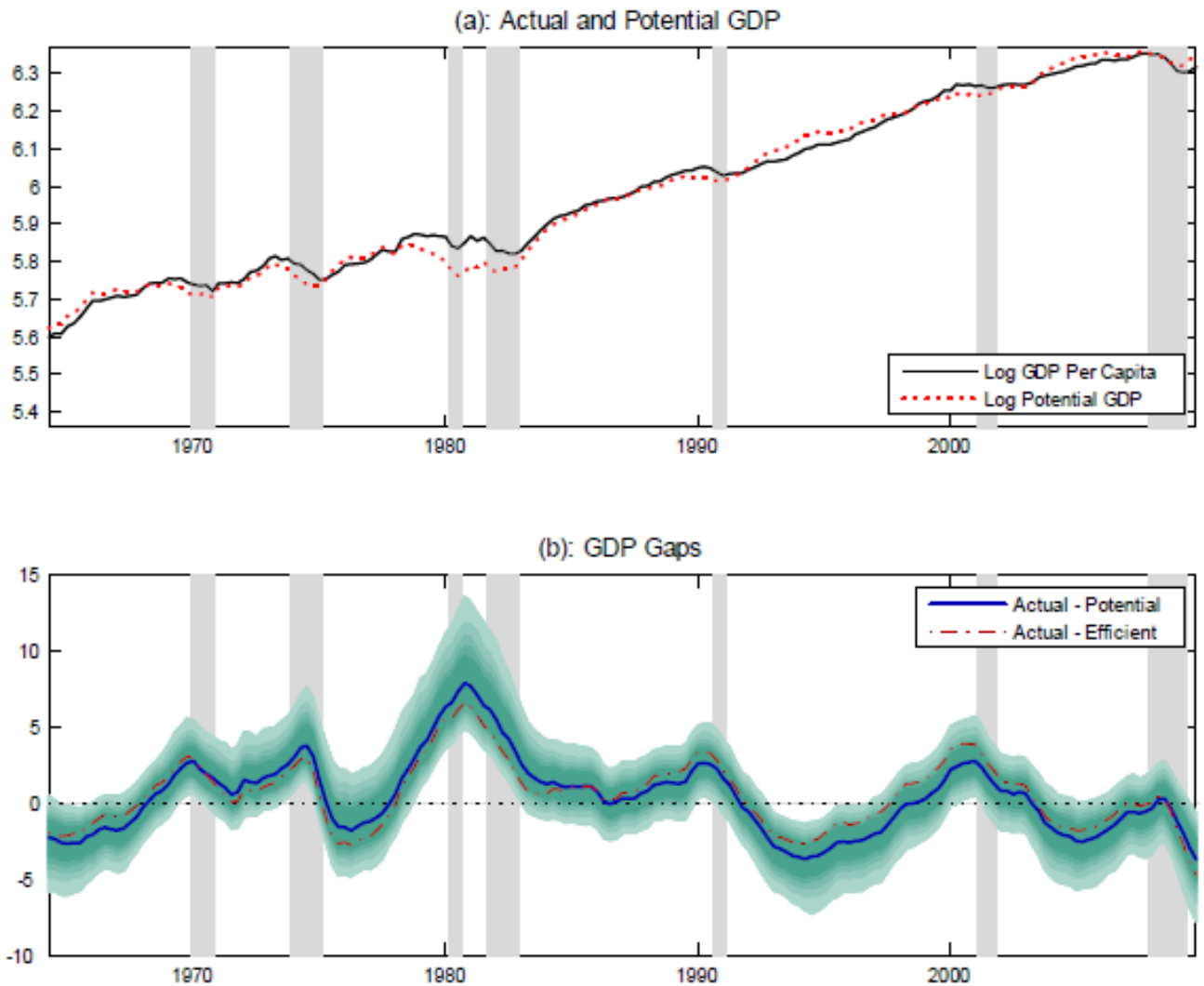
Sources of inefficiencies in a model

- Output is inefficiently low in this economy
- Static Distortions
  - Monopolistic competition in goods and labor market
  - Spread in steady state
- Dynamic distortions
  - Price and wage stickiness
  - Financial frictions: wedge between expected return to capital and the risk-free rate

Output gap...gap from what?

- In standard NK models common to use actual output in deviation from potential output (second best)
- Potential output in standard NK models: counterfactual level of output when
  - prices and wages are flexible
  - inefficient shocks are turned off (price and wage mark up shocks)
- Why not efficient output (first best)?
  - Monetary policy is neutral in the long-run and cannot reduce the static distortion
  - Dynamics: potential output follows efficient output up to a level difference

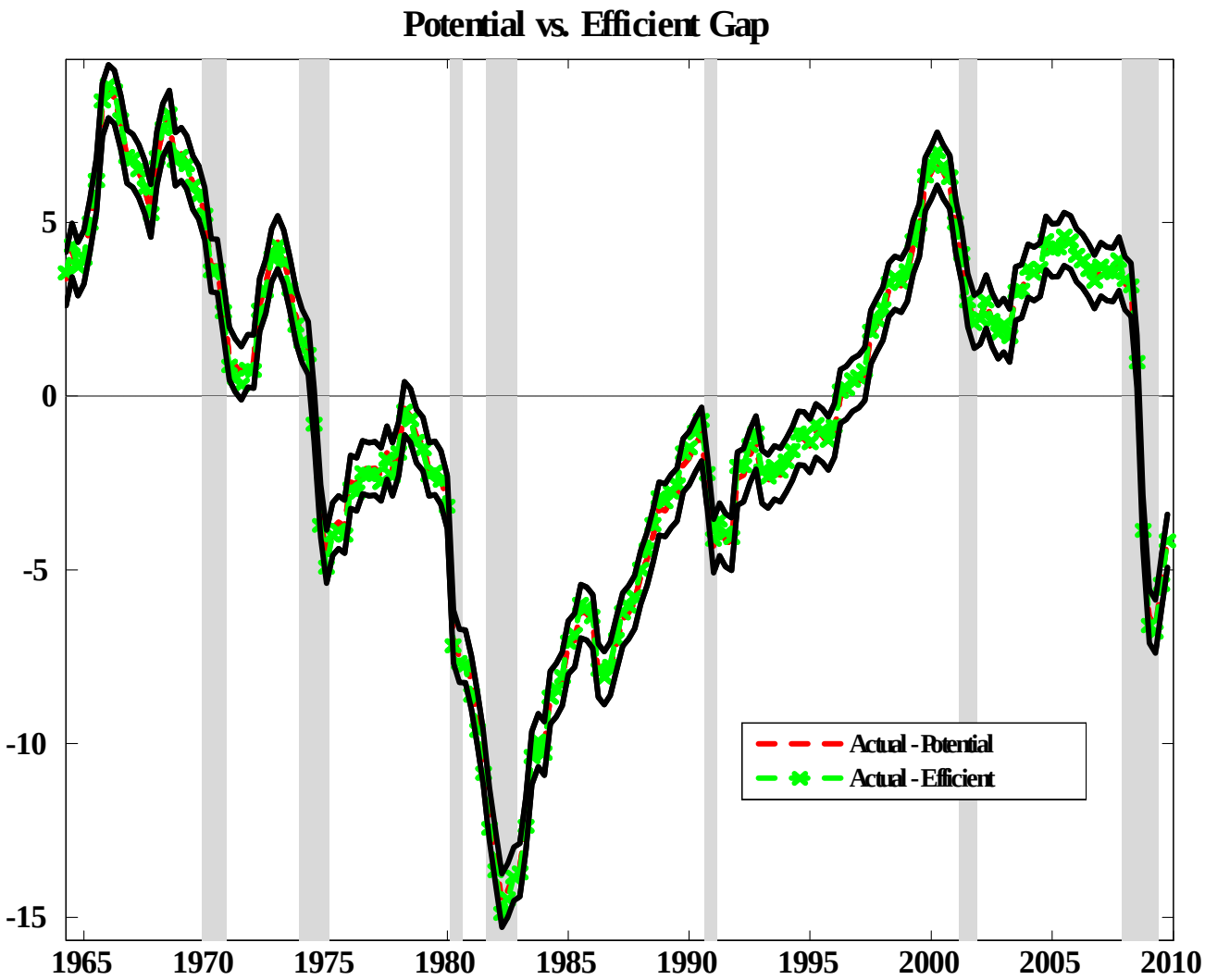
Output gap: Efficient vs potential in JPT (2013)



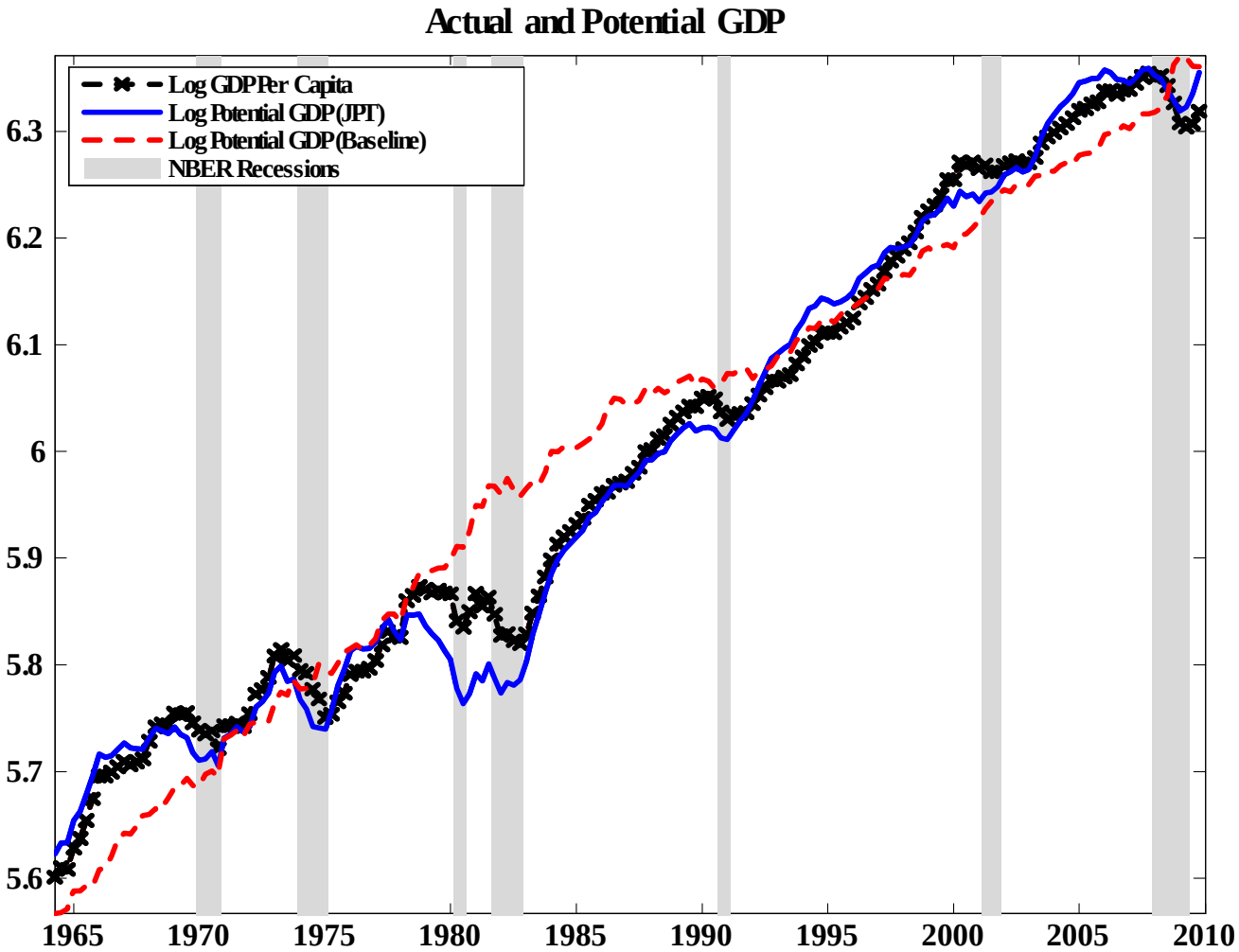
Potential output with financial frictions

- Counterfactual level of output that emerges when
  - flexible prices and wages
  - no inefficient shocks
    - price mark-up, wage-mark-up, **stock market and spread shocks**
  - **no dynamic distortion due to financial frictions**
- New in this paper: **we turn off the financial accelerator and the financial shocks**
- Following JPT (2013) the gap is in deviation from potential

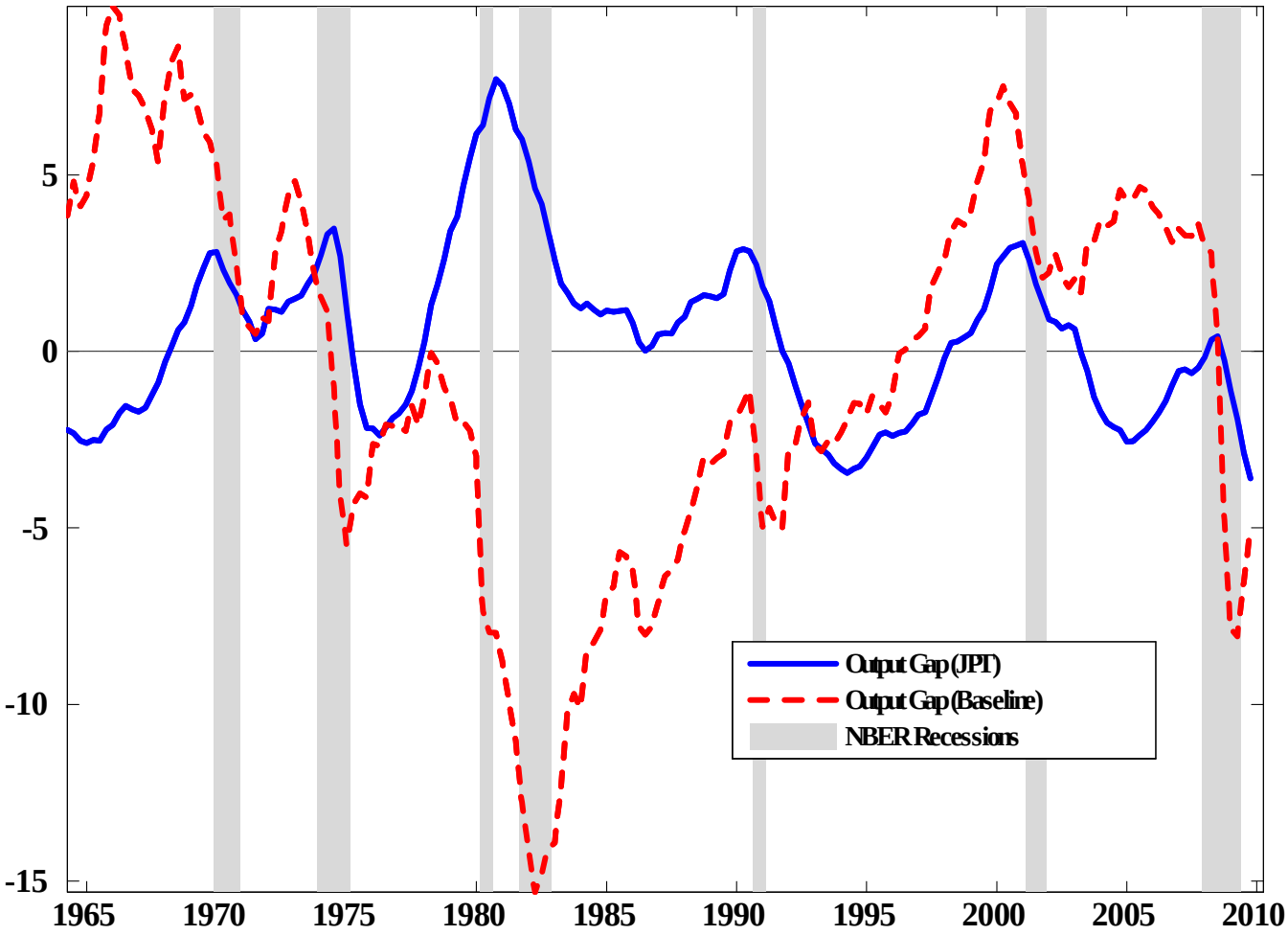
Output gap in deviation from efficient and potential



Actual and potential GDP



Comparison with JPT (2013)

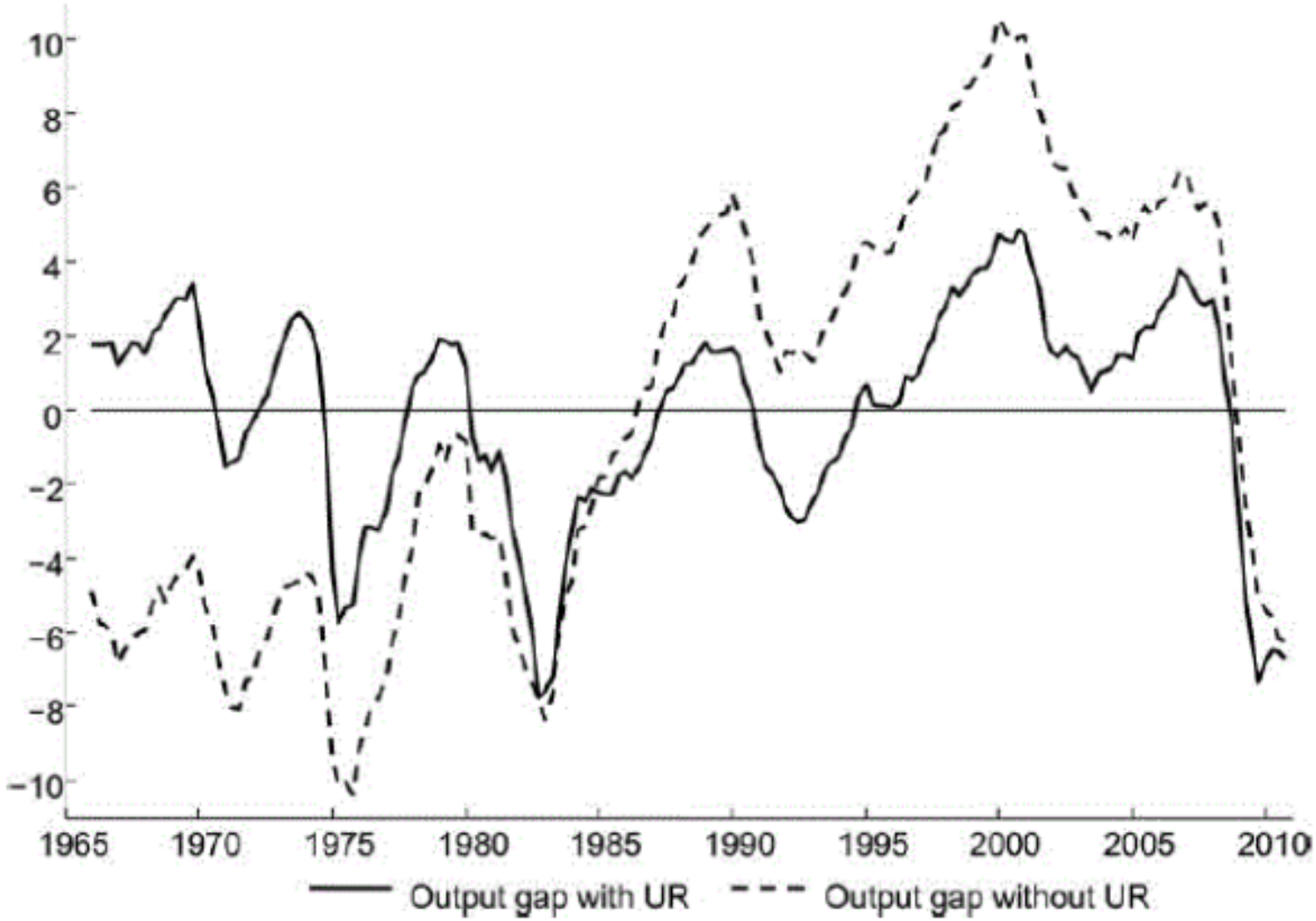


What explains the difference?

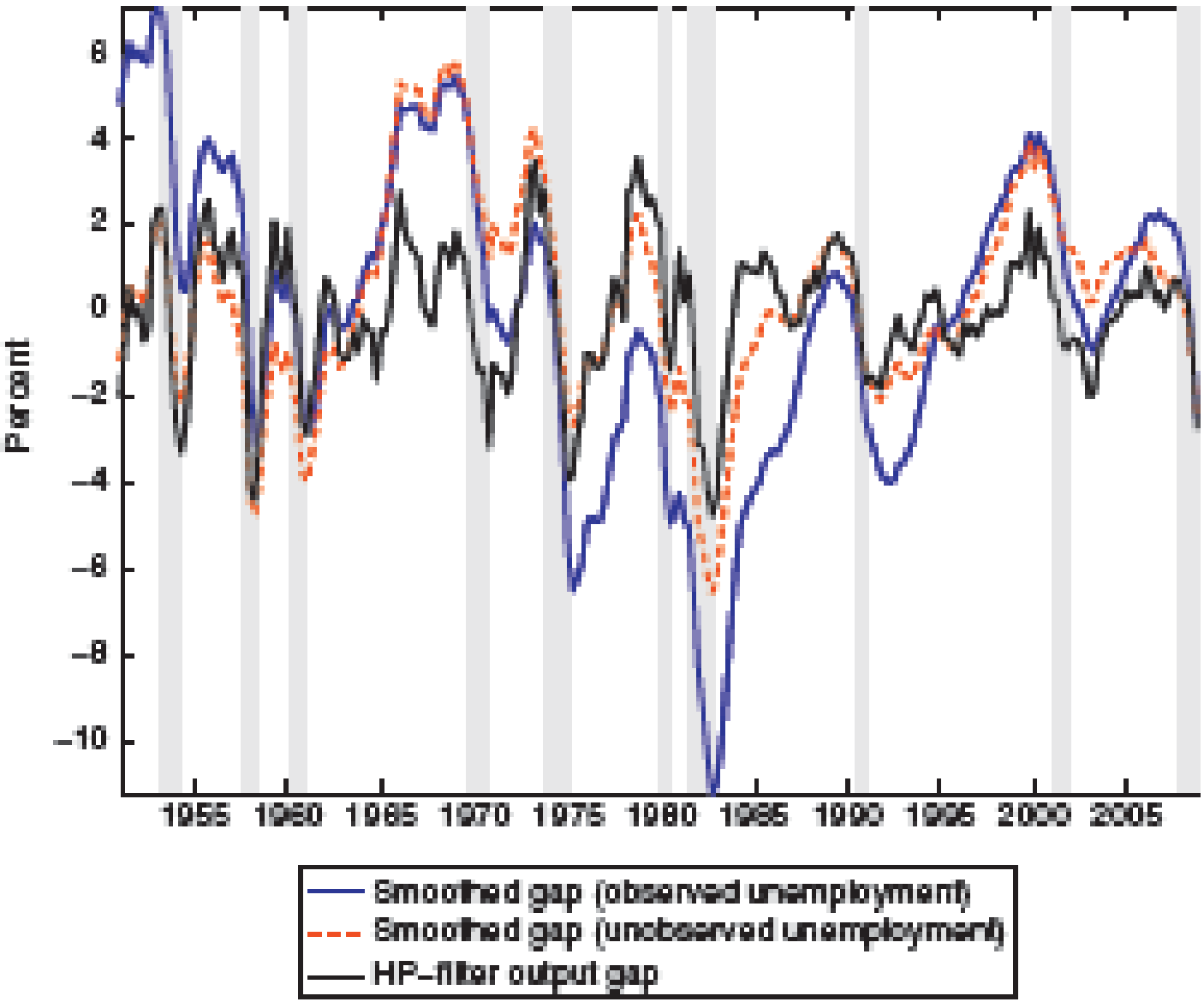
- In JPT hours worked unique source of low-frequency movements
- In JPT labour supply shocks explain 70% out low-frequency output fluctuations

- In our case extra source of low-frequency movements (i.e. credit-to-GDP gap)
- Labour supply shocks become irrelevant in favour of financial shocks (risk 54%, net worth 5%)

Comparison: Gali', Smets and Wouters (2011)



Comparison: Christiano, Trabandt and Walentin (2011)



Financial factors and output gap

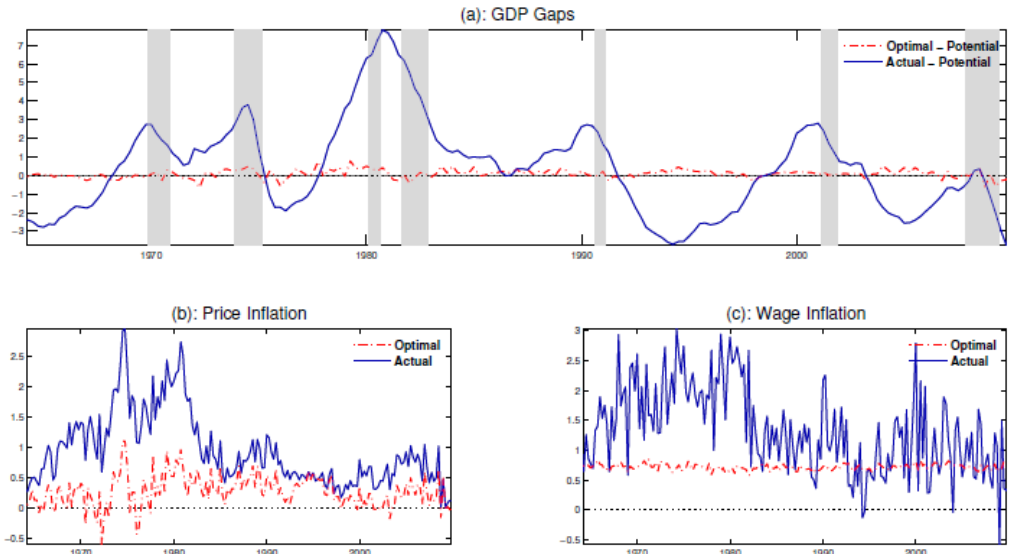
- Borio, Disyatat and Juselius (2013): the financial cycle affects the output gap
- We confirm their intuition in a DSGE set-up
- Financial shocks and financial frictions imply a lower potential output in the pre-crisis period
- Important differences due to dominance of financial shocks in explaining low-frequency movements of output

Trade-offs in NK models

- Small scale NK models: Divine Coincidence (Blanchard and Galí, 2007)
  - There is no trade-off between output gap stabilization and inflation stabilization
  - Exception 1: Cost push shocks
  - Exception 2: Real wage rigidities
- Medium-scale NK model (Smets and Wouters, 2007)
  - Capital accumulation and habit persistence⇒ all shocks generate trade-offs

Trade-offs in NK models

- Justiniano, Primiceri and Tambalotti (2013):



- Trade-offs are present
- Optimal monetary policy: trade-offs are small⇒price inflation, wage inflation and the output gap can be roughly stabilized at the same time
- Contribution: **does "trinity" hold also in a New Keynesian model with financial frictions** where trade-offs are more complicated?

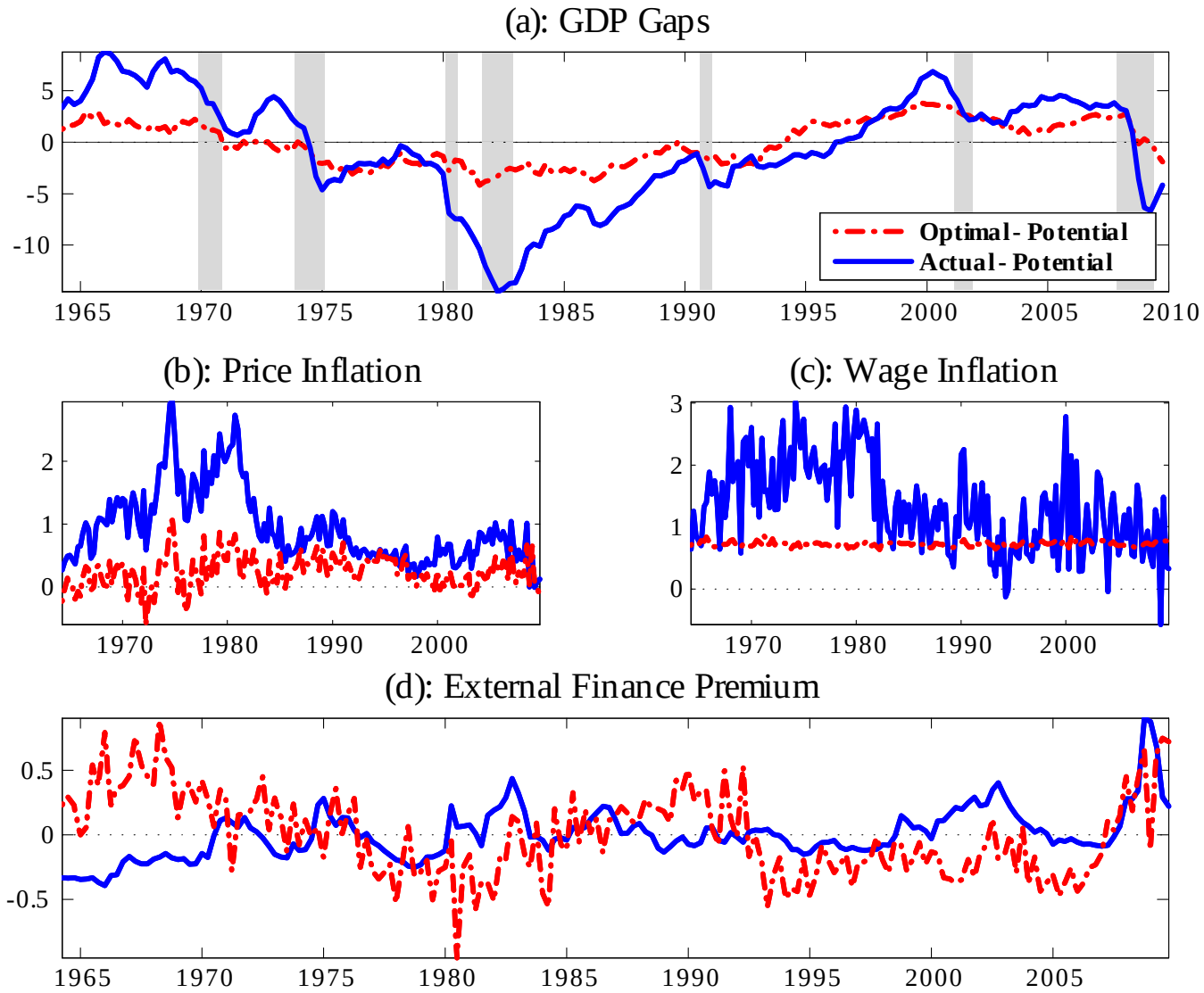
Why trinity in JPT (2013)?

- **Main reason**: wage mark-up shocks are not a fundamental driver in macroeconomic fluctuations
  - at high frequency: measurement error
  - at low frequency: labor supply shocks
- Additional reason: Price inflation is largely explained by inflation targeting shocks (absent under optimal policy)

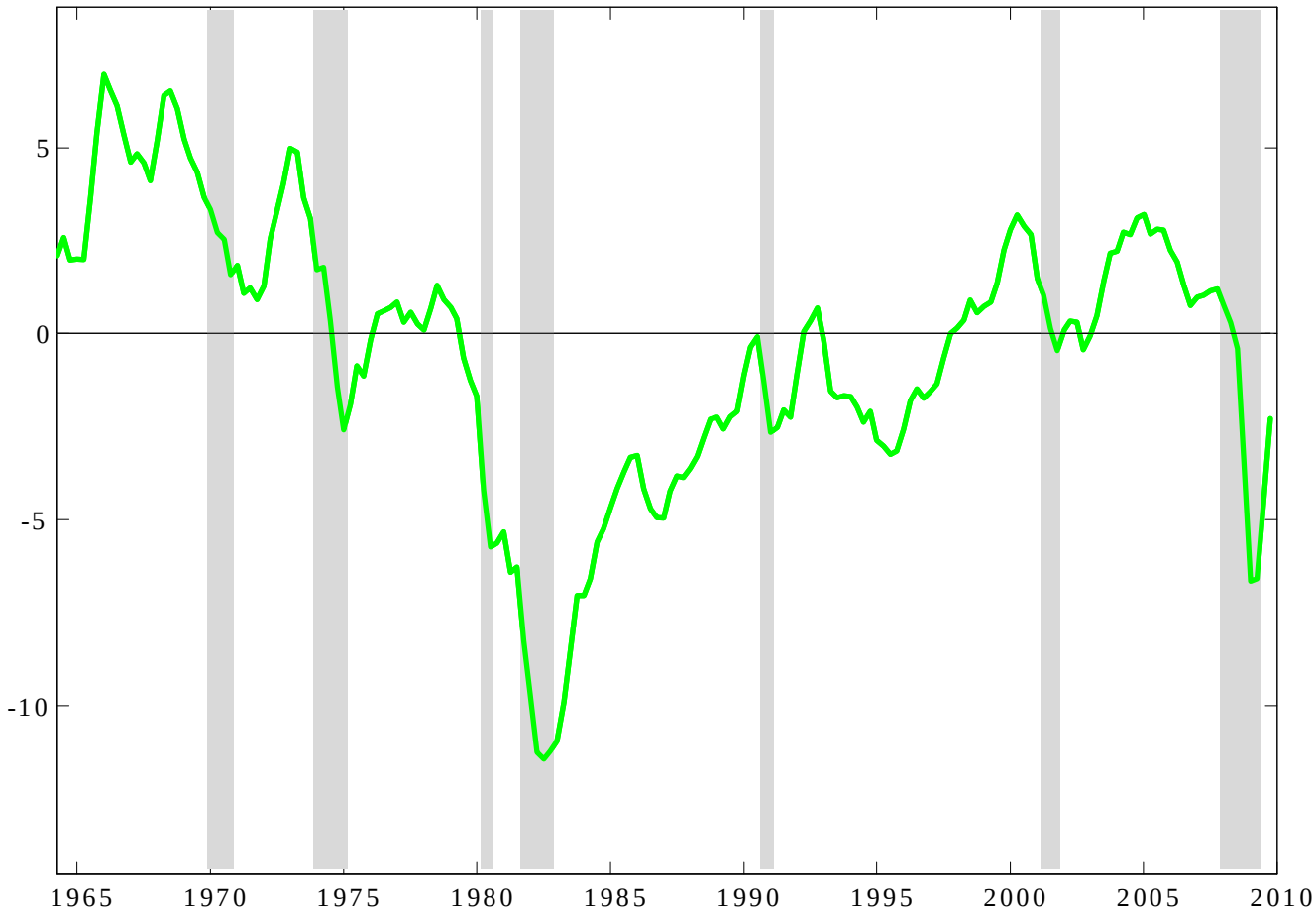
Optimal monetary policy with financial frictions

- Several previous contributions: Faia and Monacelli (2007), Curdia and Woodford (2009), De Fiore and Tristani (2009), ,Carlstrom, Fuerst, and Paustian (2009), Fendoglu (2013), Huang and Davis (2013), Kolasa and Lombardo (2014)
  - calibrated models driven by few shocks
- Contribution: **use an estimated model driven by several shocks**

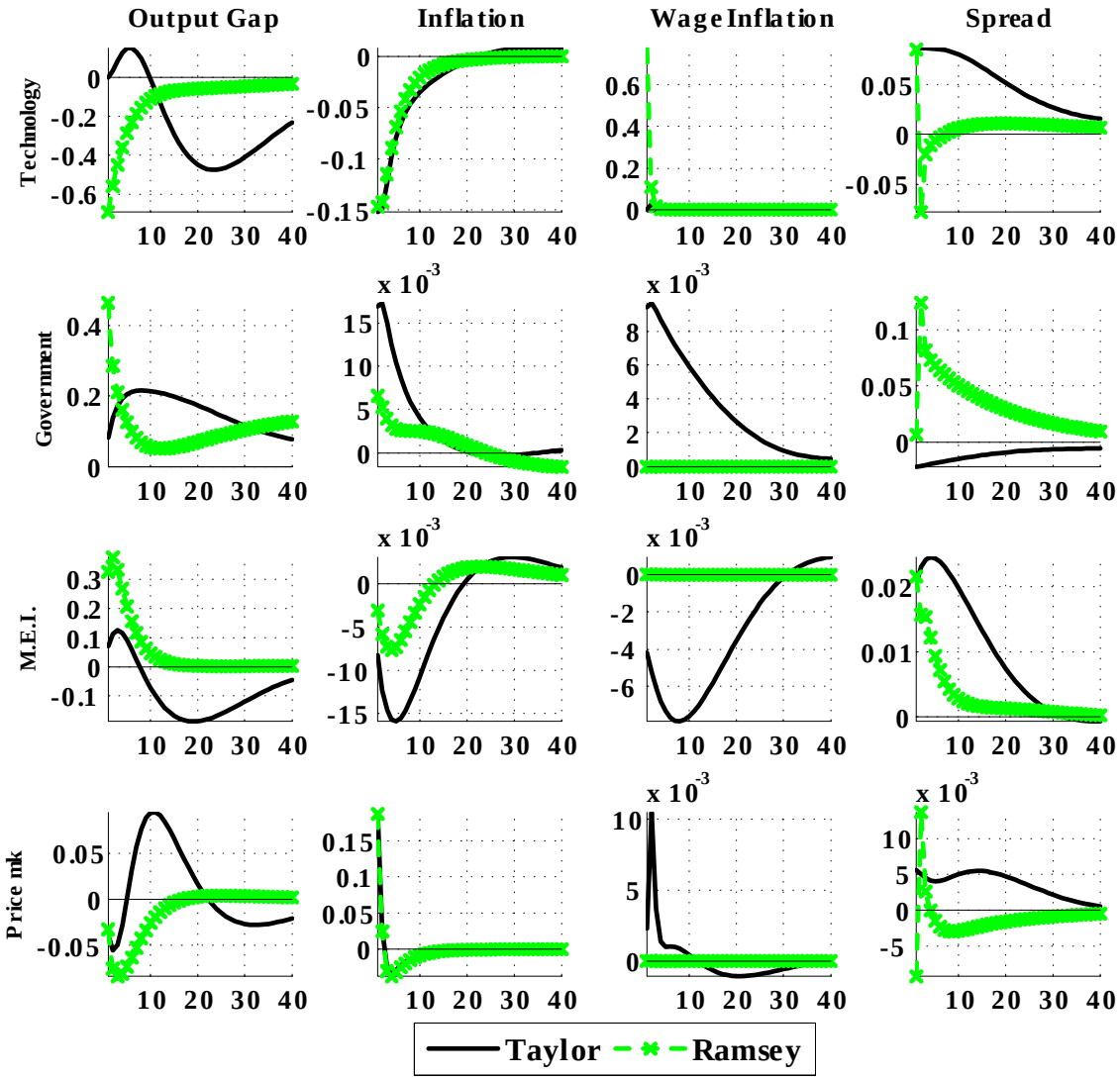
Monetary policy trade-offs and financial frictions



Fluctuations that could have been avoided



Optimal monetary policy and financial frictions



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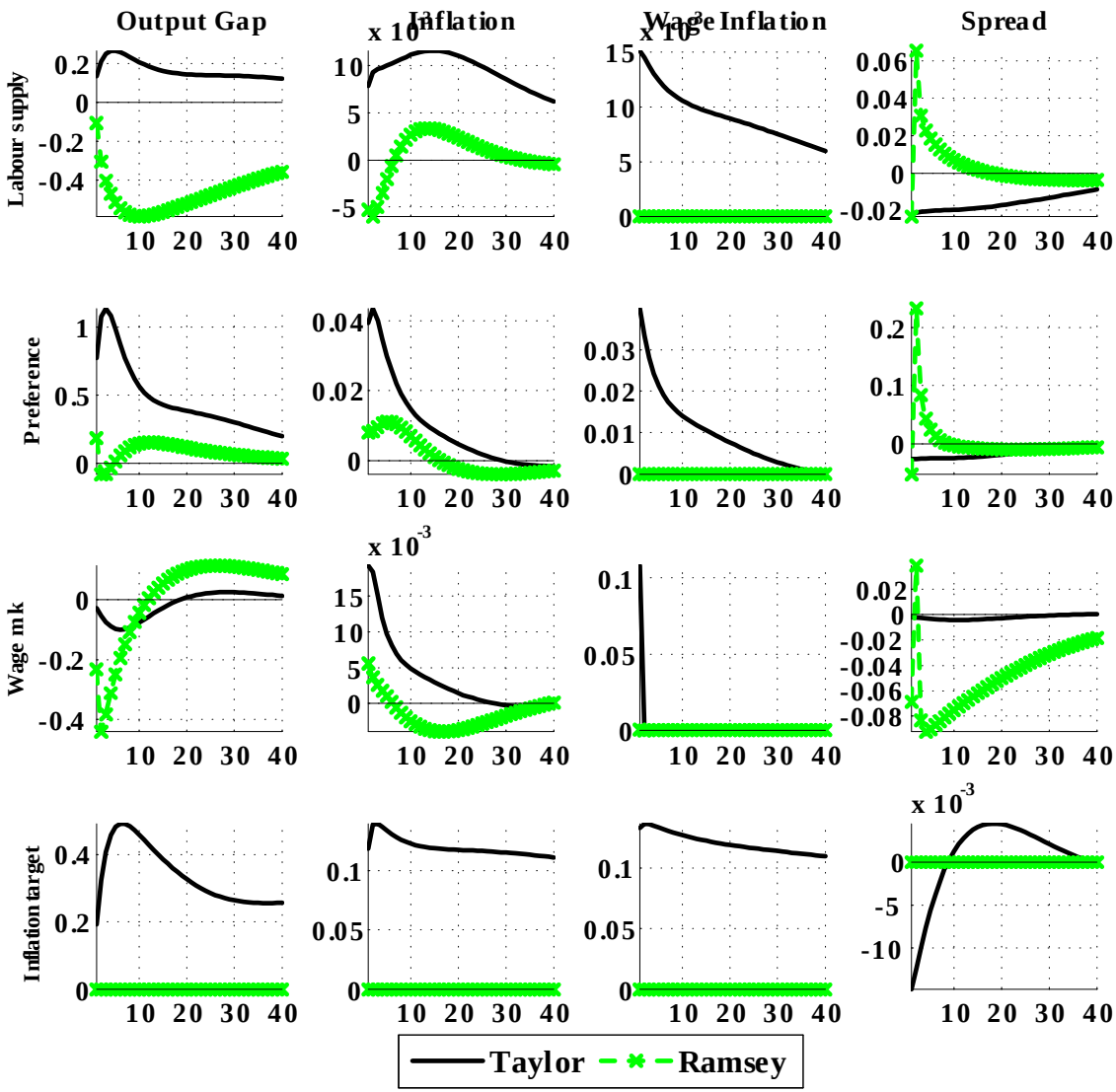
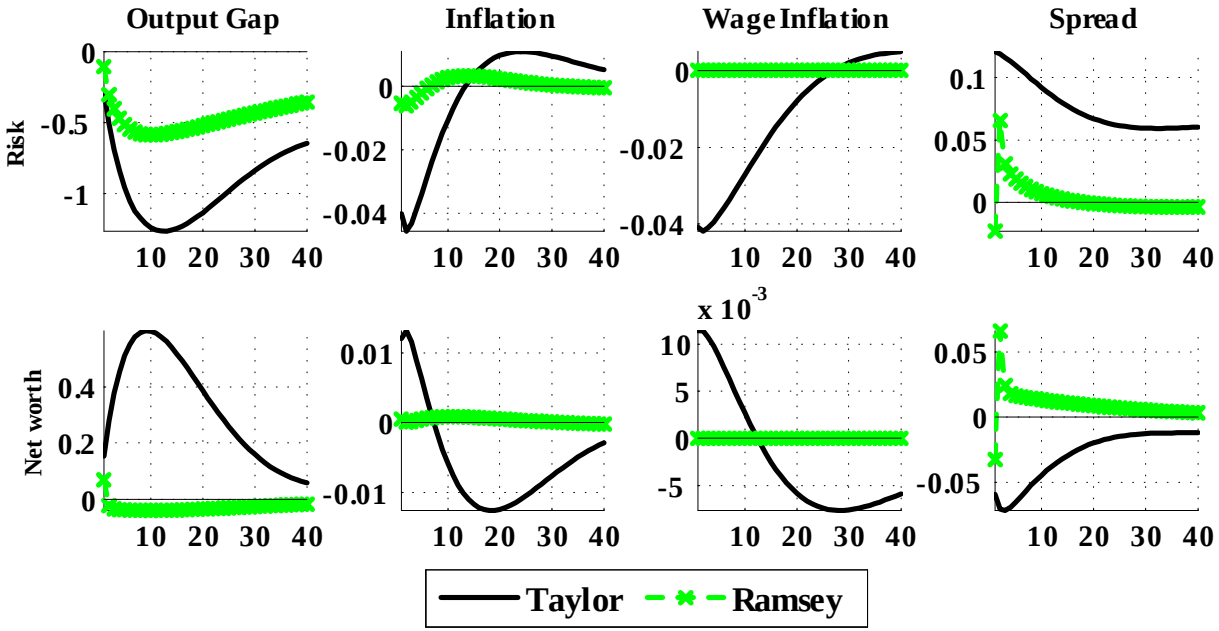


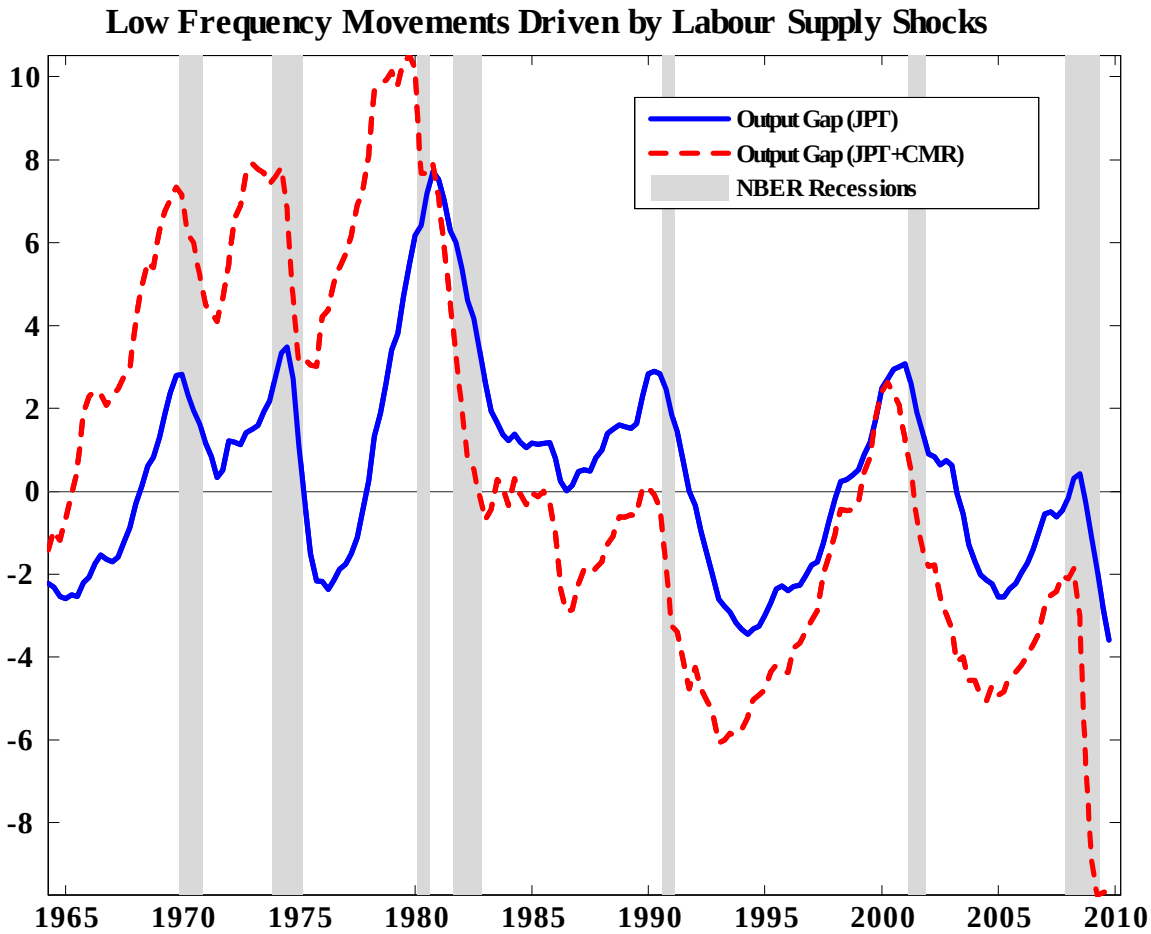
Optimal monetary policy and financial frictions



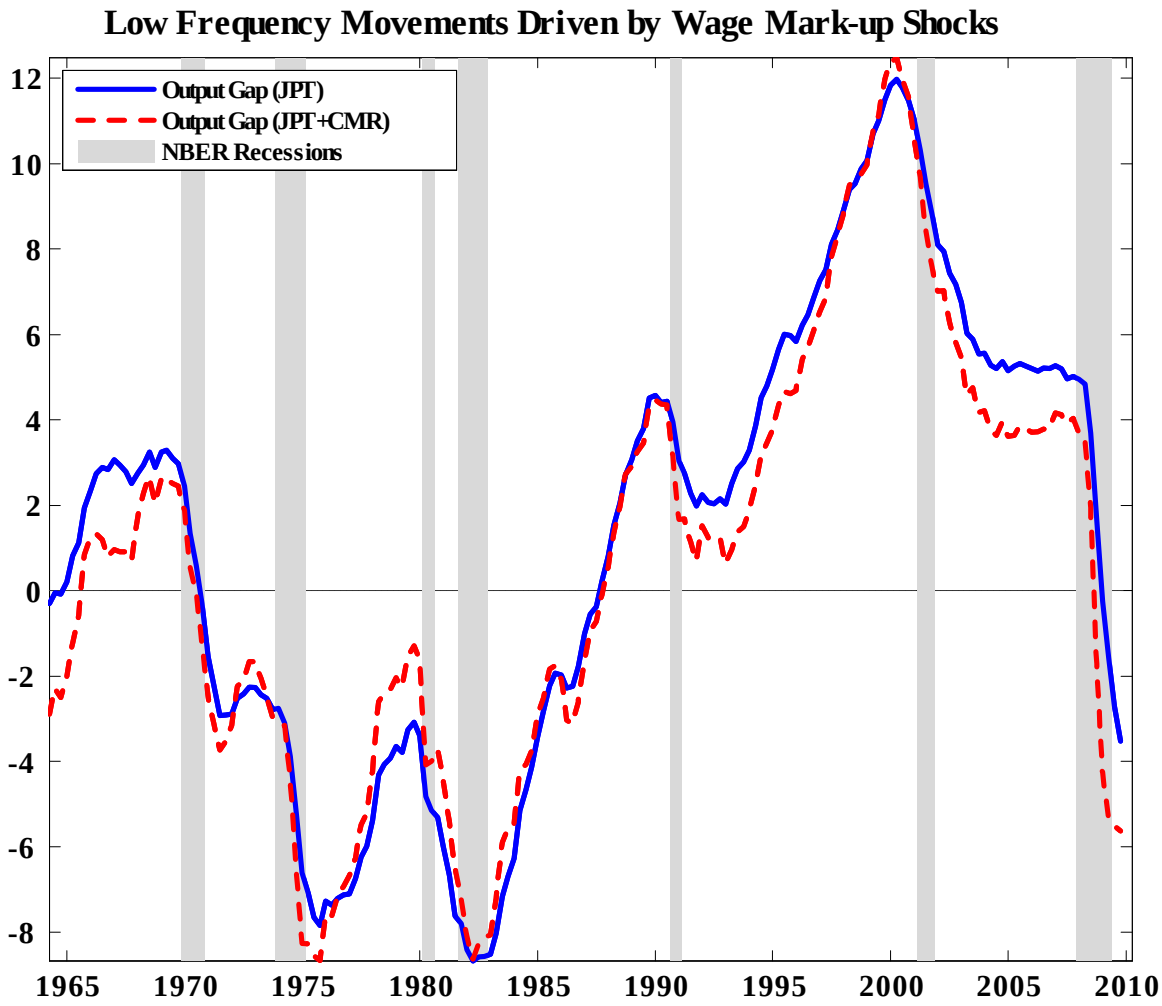
Conclusion

- We have looked at the **policy implications** of an estimated DSGE model with financial frictions
- Financial frictions and financial shocks matter for the output gap
  - Positive output gap in the pre-Great Recession period
- Trade-offs between different monetary policy objectives are substantial...
  - ...but optimal monetary policy is very effective in stabilizing nominal variables
  - at the cost of some fluctuations in the output gap
  - and somewhat large fluctuations in the premium

Robustness - Standard financial observables and labour supply shocks on



Robustness - Standard financial observables and labour supply shocks off



Robustness - Alternative series of net worth in level