

Endogenous Technology, Scarring and Fiscal Policy

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**Measuring economic slack or shortages:
new methods and ways forward**

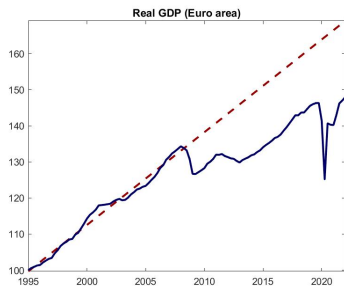
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OUTLINE

1. **Hysteresis in TFP and long-run trend effects**
 - Implications for the measurement of potential output
 - Modeling approach
 - Scarring mechanisms
2. **Long-run effects of fiscal policy in this environment**

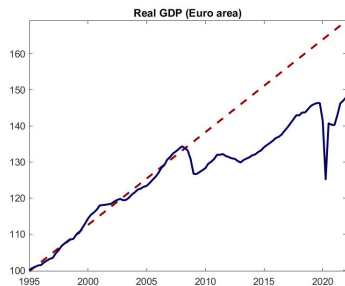
HYSTERESIS AND LONG-RUN TREND SHIFT



- Trend-shift post-recession in advanced economies

Real GDP and post-2008 trend level shifts in the euro area

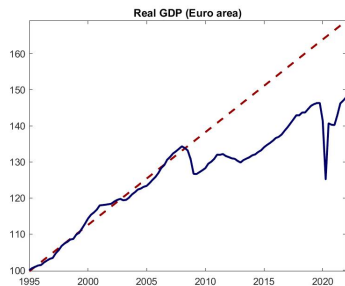
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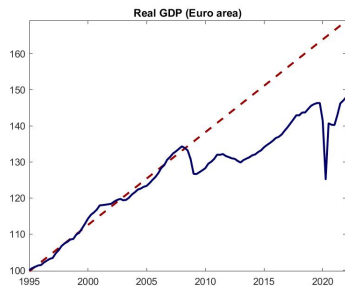
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 - Standard models cannot rationalize these dynamics
 - Ignoring hysteresis: biased potential output + output gap

HYSTERESIS AND PROCYCLICALITY OF TFP ACROSS COUNTRIES

	1995-2007	2008-2013	2014-2018
US	1,32	0,53	0,47
UK	1,53	-0,49	0,58
Germany	0,88	0,14	0,75
France	0,81	-0,22	0,44
Italy	-0,12	-0,65	0,29
Spain	-0,24	-0,07	0,73
Finland	2,21	-0,90	1,05

*TFP in advanced economies over time (multifactor productivity;
source: OECD)*

PREVIOUS LITERATURE

New Keynesian models with endogenous technology growth: Anzoategui et al. (2019, AEJ: Macro), Bianchi et al. (2019, JME), Moran and Queralto (2018, JME), Elfsbacka Schmöller and Spitzer (2021, EER; 2022); Garga and Singh (2020, JME)

Empirical evidence on long-run effects in TFP: Moran and Queralto (2018), Jordt al. (2022), Furlanetto et al. (2022), Aikman et al. (2022), Elfsbacka Schmöller, Goldfayn-Frank and Schmidt (2023)

Long-run effects of fiscal policy:

Permanent R&D subsidies and stagnation traps: Benigno and Fornaro (2018, RES), Fornaro and Wolf (2020)

Empirical evidence: Ilzetzki (2022), Antolin-Diaz and Surico (2022), Cloyne et al. (2022)

MODEL SUMMARY

- Medium-scale DSGE model setup (Christiano et al. (2005); Smets and Wouters (2007))
 - Calvo price and wage rigidities
 - Policy rate set via interest rate rule
 - ZLB constraint
- Endogenous technology growth mechanism (Comin and Gertler (2006, AER)):
 - Innovation through R&D
 - Technology adoption
- Fiscal policy:
 1. Government spending
 2. Novel fiscal policy tools in DSGE setup: growth-enhancing fiscal support to R&D and technology adoption
 3. Monetary-fiscal interaction

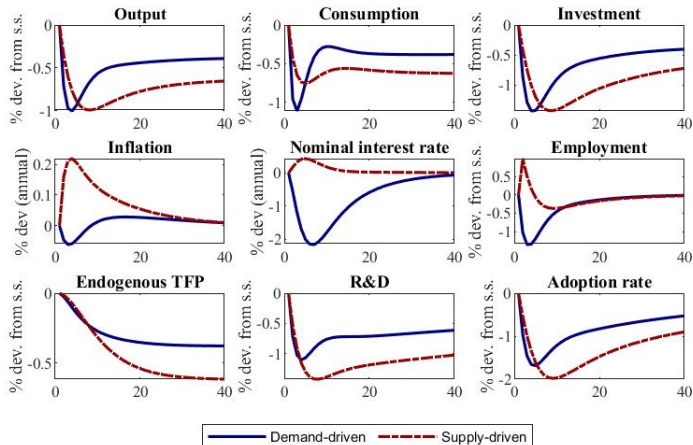
ENDOGENOUS TECHNOLOGY MECHANISM

- Departure from the standard exogenous TFP assumption
- Two-stage technology growth process (Comin and Gertler (2006, AER)):
 1. Horizontal innovation through expanding varieties in intermediate goods (Romer (1990))
 2. Endogenous diffusion: costly technology adoption
- TFP decomposition:

$$TFP_t = \theta_t A_t^{\frac{1}{\vartheta-1}}$$

- θ_t : standard technology shock
- A_t : endogenous component of TFP

BOTH DEMAND AND SUPPLY SHOCKS CAN RESULT IN SCARRING IN THE LONG-RUN TREND



Output hysteresis dynamics in demand- and supply-driven recessions

IMPLICATIONS FOR MEASUREMENT OF POTENTIAL OUTPUT AND OUTPUT GAP

- **Interaction between cycle and trend:**

- Recessions \rightarrow procyclical slowdown in TFP \rightarrow long-run trend
- Slack on the TFP margin (ruled out in standard models)
- Biased conventional potential output and output gap measures

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- **Demand-supply spillovers:** short-run aggregate demand influences long-run aggregate supply
- **Supply shocks can have long-run effects:** inflationary pressures can co-exist with scars to aggregate supply
→ Trade-off between inflation and output stabilization (over short and long run)

FISCAL POLICY AND OUTPUT HYSTERESIS

Insights on fiscal policy based on models with exogenous technology:

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- Departure from strictly exogenous technology: insights from endogenous growth theory
- Cycle-trend interaction: aggregate demand affects the long-run output path

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→ **Mechanisms and scope of fiscal policy**

→ **Novel, alternative fiscal tools**

MAIN RESULTS: FISCAL POLICY AND THE LONG RUN

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1. Generally reduced government spending multiplier (\rightarrow *long-run crowding out*)
2. Growth policies as novel fiscal tools in the New Keynesian world:
 - Mechanism: support to aggregate demand and simultaneous expansion of long-run trend
 - Multipliers > 1 , trend multiplier > 0
 - Disinflationary

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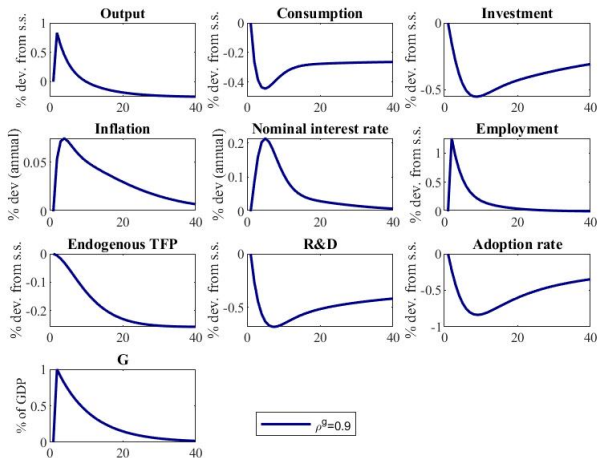
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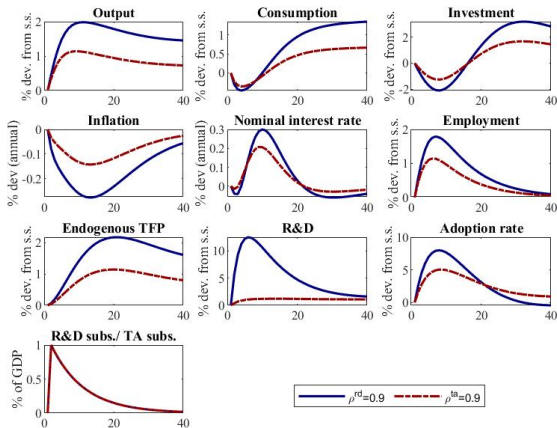
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2. Growth policies as novel fiscal tools in the New Keynesian world:
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3. Increased importance of monetary-fiscal interaction

GOVERNMENT SPENDING



Macroeconomic dynamics: gov. spending shock (1% of GDP)

GROWTH-PROMOTING FISCAL POLICIES



Macroeconomic dynamics: growth-enhancing fiscal policy (1% of GDP)

FISCAL MULTIPLIERS OVER THE SHORT TO LONG RUN

	Impact multiplier	1 year	2 years	4 years	Peak	Permanent multiplier
G	0.83	0.67	0.54	0.46	0.83 (1q.)	-0.26%
R&D	0.46	0.99	1.32	1.15	1.35(10q.)	+1.42%
Techn. adopt.	0.35	0.69	0.87	0.75	0.88(9q.)	+0.69%

Fiscal multipliers under endogenous growth

CONCLUSION

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- Models with endogenous trend growth: possibility and mechanisms of hysteresis
- Ignoring hysteresis induces biased estimates of potential output and the output gap
- Hysteresis and supply shocks: trade-off between inflation and output stabilization (short and long run)
- Fiscal growth policies as novel and powerful tools in the DSGE context:
 - Short-run demand stabilization - long-run trend expansion
 - Apt in counteracting hysteresis also in supply-driven recessions
 - Government spending: inflationary, long-run crowding out