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Clement Bohr

Northwestern University

CCAPACITY BUFFERS: EXPLAINING THE RETREAT AND RETURN OF THE PHILLIPS CURVE

EUROPEAN CENTRAL BANK

EUROSYSTEM

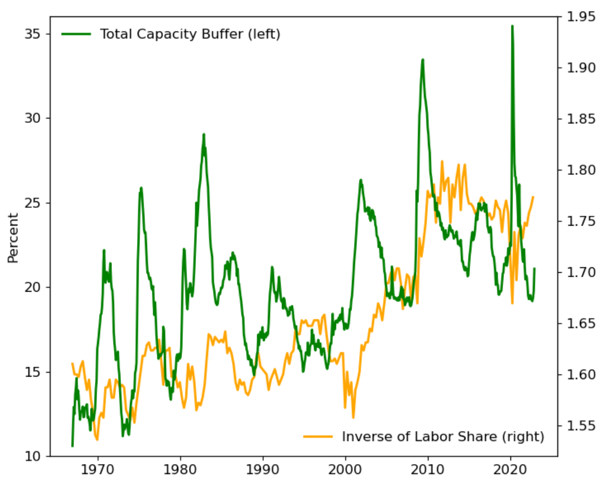
Capacity Buffers:
Explaining the Retreat and Return of the Phillips Curve

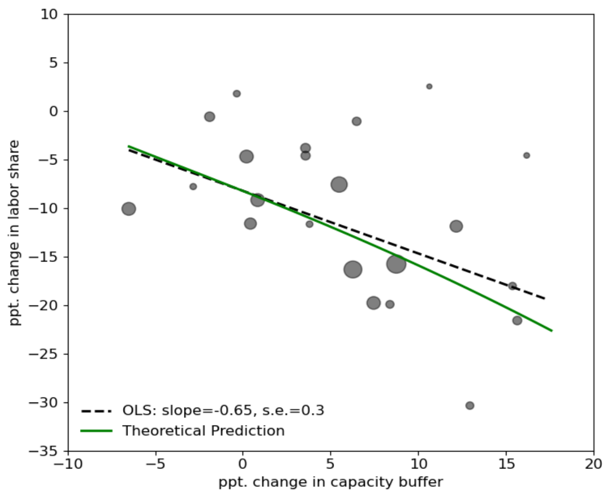
Clement E. Bohr

Northwestern

Since the 1960s,
1. Variable and labor costs shares declined
2. Capacity utilization rates declined
3. **Phillips curve flattened**
4. Idiosyncratic volatility of sales increased

During COVID-19,
1. Large increase demand for goods
   + restriction on production capacity
2. Firms became capacity constrained
3. **Phillips curve steepened**





This Paper

*Can the size of firms' **capacity buffers** explain the changing slope of the Phillips curve?*

The Capacity Buffer = 1 − Capacity Utilization Rate ***= measure of distance to capacity constraint***

Excess production capacity of capital stock to buffer against demand fluctuations

Buffer size affects slope of supply curve Fagnart, Licandro, and Sneessens (1997); Boehm and Pandalai-Nayar, (2022)

Larger Buffer → Smaller probability of becoming capacity constrained → flatter supply curve

Theory

Precautionary capacity buffer due to:
- Putty-clay technology → SR capacity constraints
- Idiosyncratic demand shocks

Capacity Buffer Size, B, determines:
- Probability of becoming capacity constrained
  → **Optimal price** via sales-weighted price elasticity

$$p(B) = \mu(B) W / a_l \quad \text{with markup} \quad \mu(B) = \frac{\varepsilon(B)}{\varepsilon(B) - 1}$$

$$\underbrace{\varepsilon(B)}_{\substack{\text{price elasticity} \\ \text{of sales}}} = \eta(B) \underbrace{\varepsilon_p}_{\substack{\text{price elasticity} \\ \text{of demand}}} + \underbrace{(1 - \eta(B))}_{\substack{\text{sales weighted prob. of} \\ \text{becoming capacity constrained}}} \; 0$$

- Volatility in the probability of hitting capacity
  → **Sensitivity of prices to demand shocks**

Evidence

Prices more sensitivity to **monetary policy shocks** under smaller capacity buffers

Logit Smooth Transition Local Projection Model

$$\underbrace{y_{t+h}}_{\text{outcome}} = \underbrace{\tau t}_{\text{trend}} + F(B_t)\Big(\overbrace{\underbrace{\alpha_1^h}_{\text{intercept}} + \underbrace{\beta_1^h m_t}_{\text{shocks}} + \underbrace{\gamma_1' x_t}_{\text{controls}}}^{\text{small capacity buffers}}\Big) + (1 - F(B_t))\Big(\overbrace{\alpha_0^h + \beta_0^h m_t + \gamma_0' x_t}^{\text{large capacity buffers}}\Big) + \underbrace{u_t}_{\text{residuals}}$$

- Convex state *F(B)* depends on capacity buffer size
- RR shocks on monthly aggregate data 1969-2008

Results: When capacity buffers, B <15%,
price responsiveness increases by twice that of output

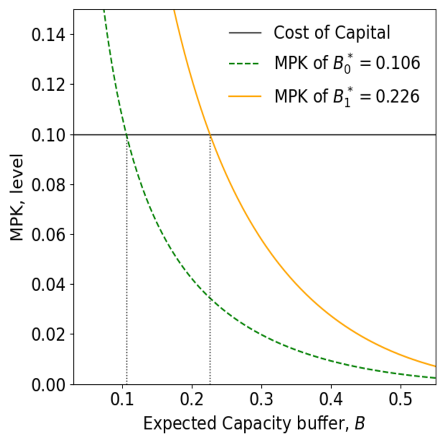
Table 1: Relative response of consumption prices to quantities across horizons

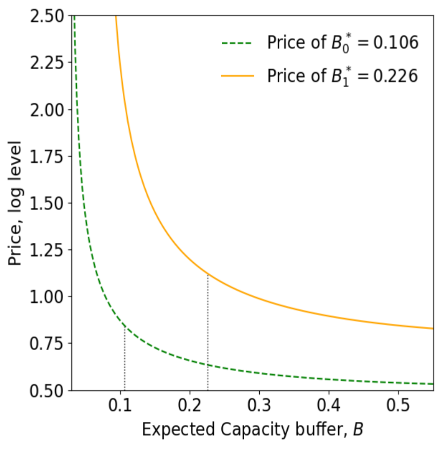
	Horizon (months)	12	18	26	30	36
Any B	P/C	-0.04	-0.13	0.02	0.50	1.21
$B < 15\%$	P/C	0.69	1.34	1.19	1.35	2.64

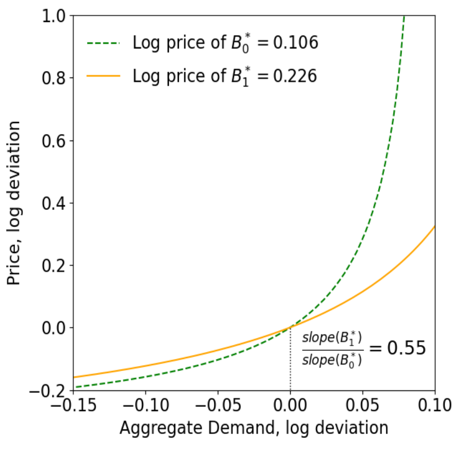
1. Larger markups → 2. larger capacity buffers → 3. flatter Phillips curve

$$mpk(B) = \underbrace{\mathbb{P}(b = 0 | B)}_{\substack{\text{Probability of becoming} \\ \text{capacity constrained}}} \; \underbrace{a_k(\mu(B) - 1) W / a_l}_{\substack{\text{Profits from additional} \\ \text{unit of capital}}}$$

Exogenous Rise in Markups: μ
- → Marginal product of capital rises
- → Capacity buffer expands
- → Probability of hitting capacity falls
- → Volatility in probability of hitting capacity falls
- → Supply curve flattens

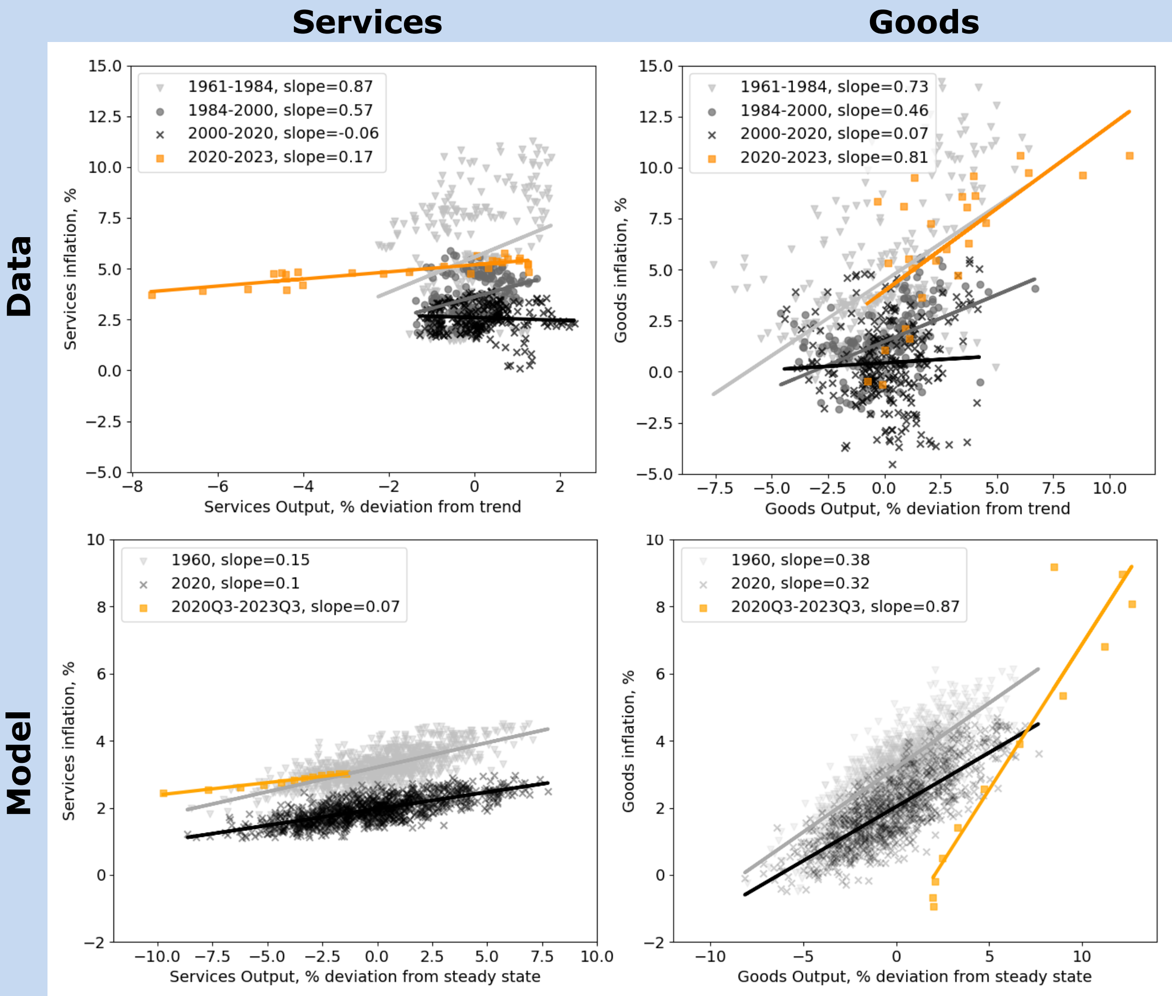






2. Larger capacity buffers → higher demand pass-through into sales → 4. higher idiosyncratic volatility of sales

Sectoral Phillips Correlations



COVID-19 Sectoral Inflation

Explained by combo of two shocks:
1. Shift in demand from services to goods
   → Persistent sectoral taste shock
2. Restricted capacity from health restrictions
   → Temporary capital productivity shock

Goods Sector:
Increase in demand + decrease in capacity
→ buffers collapsed → **steep Phillips Correlation**

Services Sector:
Decrease in demand + decrease in capacity
→ buffers remained → **flat Phillips Correlation**

Aggregate Inflation Decomposition:
- **59% Demand Shift**
- 31% capacity restrictions
- 10% interaction

Total Nonlinear Contribution: 21%