Networks, Phillips Curves, and Monetary Policy

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A new framework for monetary policy

- analytical framework with multiple sectors and a general input-output network
- full revisit of traditional results (Phillips curve, welfare function)
- guidelines to design better policies and better empirical analysis
- help explain puzzles in the data (flat/noisy Phillips curve), propose and implement better specification

Textbook New-Keynesian model

- only one sector, no intermediate inputs
- central bank can stabilize employment and prices at the same time ("divine coincidence")
- strong relation between employment and consumer inflation (Phillips curve), consumer prices used as reference indicator and policy target

Open questions

- Relevant inflation index in an economy with many sectors/intermediate inputs (consumer prices, producer prices, core inflation...?)
- With many sectors, can employment and inflation be stabilized at the same time? How should central banks trade off different sectors?
- Does the relation between inflation and employment (Phillips curve) depend on the input-output structure?

Novel results

- consumer price Phillips curve is flat and noisy due to intermediate input linkages
- new "divine coincidence" inflation index restores strong Phillips curve (sufficient statistic for employment gap)
- no first best: tradeoff aggregate vs relative employment
- new inflation target for optimal policy: very different from consumer prices; quantitatively similar to "divine coincidence" index

Model

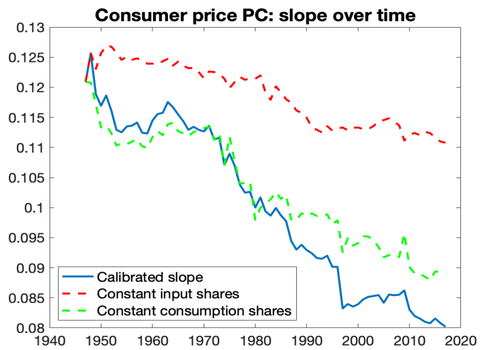
- firms use labor and intermediate inputs: $y_i = A_i F_i(\{x_1,...,x_n\},L_i)$
- unrestricted sector-level input-output + labor + consumption shares, elasticities of substitution, price adjustment probability

Phillips curve(s)

- sector-level and aggregate (same form):

$$\underbrace{\pi}_{\text{inflation}} = \kappa \underbrace{y}_{\text{empl gap}} + \underbrace{u}_{\text{residual}}$$

- intermetiate inputs -> flattening
- productivity shocks -> endogenous residual (cost-push shock)



"Divine coincidence" index

$$DC = \underbrace{\lambda^T}_{\text{sales shares}} \underbrace{(I-\Delta)}_{\text{discount flex sectors}} \Delta^{-1} \pi = (\gamma+\varphi)y$$

(from labor supply curve)

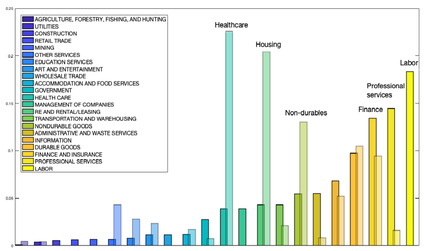
- "divine coincidence" Phillips curve does not flatten with intermediate inputs & has no endogenous cost-push shocks
- sufficient statistic for employment gap

Optimal monetary policy

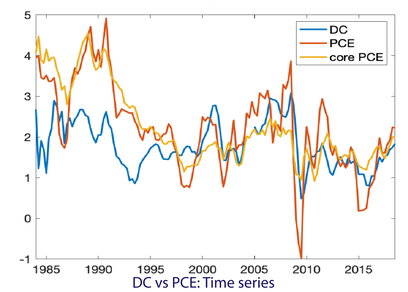
- tradeoff aggregate vs relative employment (across firms/sectors)
- welfare function: $W = \underbrace{y^2}_{\text{aggregate empl}} + \underbrace{\pi^T D \pi}_{\text{relative empl}}$ --> optimal inflation target: $\pi_T = [\underbrace{\lambda^T (I-\Delta)\Delta^{-1}}_{\text{aggregate empl (DC)}} + \underbrace{B^T D}_{\text{relative empl}}]\pi$

Quantitative results

"Divine coincidence" index:



DC vs PCE: Sectoral weights (shaded bars = PCE)



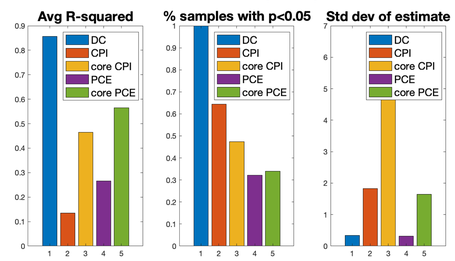
DC vs PCE: Time series

Phillips curve regressions:

	DC	CPI	core CPI	PCE	core PCE
gap	-3.8814**	-0.2832**	-0.1839**	-0.1667**	-0.1007*
	(0.6329)	(0.0729)	(0.0642)	(0.0628)	(0.0565)
intercept	1.9842**	2.9052**	2.9021**	2.3978**	2.372**
	(0.0475)	(0.1196)	(0.1052)	(0.103)	(0.0926)
R-squared	0.2154	0.0991	0.0566	0.0489	0.0227

Regression results for the CBO unemployment gap (1984-2017)

- higher R^2 with DC index, model predicts slope well
- results are robust across sample periods:



Summary statistics for 20y rolling Phillips curve regressions (with proxy for expectations)

Comparing policy rules

- employment gap good target, consumer prices poor target
- input-output structure matters