Aggregate Demand, Idle Time, and Unemployment

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The available models

- 1. matching model of the labor market
 - ► realistic mechanism + tractable
 - but no aggregate demand
- 2. ?
- 3. New Keynesian DSGE model
 - many shocks + quantitatively realistic
 - but greater complexity

The general disequilibrium model?

vast literature after Barro & Grossman [1971]
recent revival after Great Recession

- ► Mankiw & Weinzierl [2011]
- ► Caballero & Farhi [2014]
- captures important intuitions
- but difficult to analyze

This model

equilibrium version of the Barro-Grossman model, with **matching frictions** on product + labor markets:

- graphical representation of GE and welfare
- frictional + classical + Keynesian unemployment
- broad range of comparative statics
- empirical measures of slack

Basic model (no labor market)



- static model
- measure 1 of identical households
- production takes place within households
- households cannot consume own production
- households trade production on frictional market

Matching function and tightness



Matching function and tightness capacity k sales CRS matching function h(k,v)purchases visits v

Matching function and tightness



Low product market tightness



High product market tightness



Matching cost: ρ goods per visit • output = $\left| 1 + \tau(x) \right| \cdot \text{consumption}$ ■ proof: $\underbrace{y}_{\text{output}} = \underbrace{c}_{\text{consumption}} + \underbrace{\rho \cdot v}_{\text{trading}} = c + \rho \cdot \frac{y}{q(x)}$ $\Rightarrow y \cdot \left| 1 - \frac{\rho}{q(x)} \right| = c$ $\Rightarrow y = \left| 1 + \frac{\rho}{q(\underline{x}) - \rho} \right| \cdot c \equiv \left[1 + \tau(\underline{x}) \right] \cdot c$



quantity of produced good



quantity of produced good





quantity of produced good



quantity of produced good

Nonproduced good

- valued by consumers
- in fixed supply
- traded on a perfectly competitive market
- examples: real money, land, gold, fixed capital
- as in Barro & Grossman [1971], Hart [1982], and Blanchard & Kiyotaki [1987]

Households

- take price p and tightness x as given
- choose c, m to maximize utility



subject to budget constraint



Optimal consumption decision

■ first-order condition



a aggregate demand (as $m = \mu$):

$$c^{d}(x,p) = rac{\chi^{arepsilon} \cdot \mu}{(1+ au(x))^{arepsilon} \cdot p^{arepsilon}}$$

Tightness and aggregate demand





Definition of equilibrium

• equilibrium is (x,p) such that supply = demand:

$$c^s(x) = c^d(x, p)$$

- 1 equation, 2 variables: indeterminacy
- need a price mechanism to select equilibrium
 - fixed price
 - efficient price

Comparative statics with fixed price and efficient price

Increase in AD with fixed price



Increase in AD with fixed price



Increase in AS with fixed price



Comparative statics with fixed price

	effect on:			
	output	tightness	idle time	
increase in:	У	x	1-f(x)	
aggregate demand	+	+	_	
aggregate supply	+	—	+	

Definition of efficient price



Definition of efficient price



Definition of efficient price



Comparative statics with efficient price

	effect on:			
	output	tightness	idle time	
increase in:	У	X	1-f(x)	
aggregate demand	0	0	0	
aggregate supply	+	0	0	

Complete model

Labor market and unemployment



- employ producers and recruiters and sell production
- **\blacksquare** take real wage w and tightnesses x and θ as given
- choose number of producers n to maximize profits

$$\underbrace{f(x)}_{\text{selling probability}} \cdot \underbrace{a \cdot n^{\alpha}}_{\text{production}} - \underbrace{[1 + \hat{\tau}(\theta)] \cdot w \cdot n}_{\text{wage of producers + recruiters}}$$

Optimal employment decision

■ first-order condition:



■ labor demand: demand for producers

$$n^{d}(\boldsymbol{\theta}, \boldsymbol{x}, \boldsymbol{w}) = \left[\frac{f(\boldsymbol{x}) \cdot \boldsymbol{a} \cdot \boldsymbol{\alpha}}{(1 + \hat{\boldsymbol{\tau}}(\boldsymbol{\theta})) \cdot \boldsymbol{w}}\right]^{\frac{1}{1 - \alpha}}$$

Partial equilibrium on labor market



General equilibrium (x, θ, p, w)

■ supply = demand on product and labor markets

$$\begin{cases} c^{s}(x,\theta) = c^{d}(x,p) \\ n^{s}(\theta) = n^{d}(\theta,x,w) \end{cases}$$

- 2 equations, 4 variables: indeterminacy
- need price and wage mechanisms

Keynesian, classical, and frictional unemployment

• equilibrium employment:

$$l = \left(\frac{f(x) \cdot a \cdot \alpha}{w}\right)^{\frac{1}{1-\alpha}} \cdot \left(\frac{1}{1+\hat{\tau}(\theta)}\right)^{\frac{\alpha}{1-\alpha}}$$

- \blacksquare frictional unemployment from $\hat{\tau}(\theta)>0$
- classical unemployment from $w > a \cdot \alpha$
- **•** Keynesian unemployment from f(x) < 1

Comparative statics with fixed prices

			effect on:	
		product	labor	
	output	tightness	tightness	employment
increase in:	У	X	θ	l
aggregate demand	+	+	+	+
technology	+	_	+	+
labor supply	+	—	_	+
mismatch	—	+	+	_

Comparative statics with efficient prices

	effect on:			
		product	labor	
	output	tightness	tightness	employment
increase in:	У	x	θ	l
aggregate demand	0	0	0	0
technology	+	0	0	0
labor supply	+	0	0	+
mismatch	—	0	0	_

Rigid or flexible prices?

Construct proxy for product market tightness from

capacity utilization measure in Survey of Plant Capacity:



Fluctuations in product market tightness: rigid price



Fluctuations in labor market tightness: rigid real wage



Labor demand or labor supply shocks?

Source of labor supply and demand shocks

- labor demand: AD, technology
- labor supply: mismatch, job search, participation

Effect of labor supply and demand shocks

- Iabor supply shocks: negative correlation between employment and labor market tightness
- Iabor demand shocks: positive correlation between employment and labor market tightness

Evidence of labor demand shocks



Cross-correlogram: labor market tightness and employment



Labor demand shocks: AD or technology shocks?

Effect of AD and technology shocks

- AD shocks: positive correlation between output and product market tightness
- technology shocks: negative correlation between output and product market tightness

Evidence of AD shocks



Cross-correlogram: product market tightness and output



Conclusion

- \blacksquare tractable model of unemployment fluctuations
- empirical series to measure tightness
 - product market tightness
 - labor market tightness
- origins of unemployment fluctuations
 - 1. importance of price and wage rigidity (not flexibility)
 - 2. importance of labor demand shocks (not labor supply)
 - 3. importance of AD shocks (not technology)