

# Macro II

Professor Griffy

UAlbany

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# Announcements

- ▶ Briefly review Mortensen and Pissarides.
- ▶ Show extension incorporating endogenous separations.
- ▶ Reminder:
  - ▶ HW6 due 5/8. ONLY Q1, not Q2!

# Part-Time Employment and Labor Market Volatility

Pedro Gomis-Porqueras <sup>1</sup>   Ben Griffy <sup>2</sup>   Stan Rabinovich <sup>3</sup>

<sup>1</sup>Deakin University

<sup>2</sup>University at Albany, SUNY

<sup>3</sup>University of North Carolina - Chapel Hill

A long time ago

# Overview

- ▶ Here, we extend the Mortensen-Pissarides model to include heterogeneous match productivity.
- ▶ There will be an “endogenous separation” threshold and an “endogenous promotion” threshold.
- ▶ We generate the separate threshold through different costs.
- ▶ Ultimate goal of project is to show that acyclical cost generates more procyclical employment and countercyclical unemployment.
- ▶ But here focus is on showing use of surplus and ex-post match heterogeneity to generate cool model features.

# Paper Outline

- ▶ Start with “empirical regularities”
  - ▶ What we will explore;
  - ▶ Motivate our model construction.
- ▶ Show existence of part-time jobs in steady-state model.
- ▶ Characterize productivity thresholds.
- ▶ Use discrete time version to simulate out of steady-state.
- ▶ (I will present this like a seminar to show a template for talk.)
- ▶ Bullet points vs. sentences:
  - ▶ Sentence: contains a subject, verb, and a complete idea.
  - ▶ Bullet point in talk: fits on one line.
- ▶ The current version of the paper is much less theory, much more quantitative. This is more elegant.

## Part and Full-Time Employment

- ▶ Part-time employment large component of labor market:
  - ▶ Part-time employment rate: 22% (Prime age, 17%)
  - ▶ Ages 18-24: 35%, up from 25% a decade ago.
  - ▶ Ages 55-64: 47%
  - ▶ Production: 40 hours/week for full-time, 28 hours/week for part-time
- ▶ Search models rarely feature part-time employment.

# Cyclicity

- ▶ Different cyclicity of part and full-time jobs.

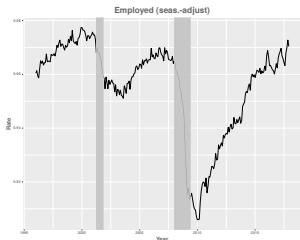


Figure: Employment

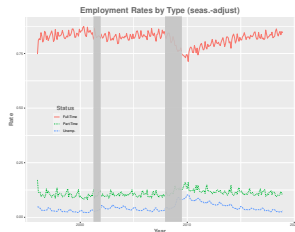


Figure: Unemployment

- ▶ Would PT improve fit?

# Cyclicalty of Flows

- ▶ Different cyclicalty of part and full-time jobs.

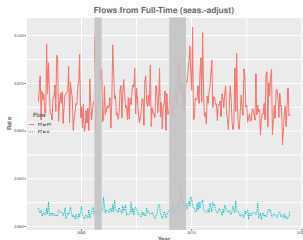


Figure: Employment

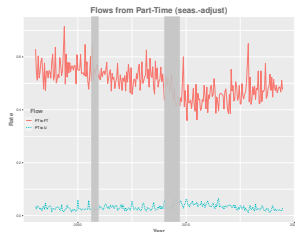


Figure: Unemployment

- ▶ Would PT improve fit?



## Question

- ▶ How much of part and full-time employment is driven by
  - ▶ aggregate shocks?
  - ▶ match quality composition.
- ▶ What are the consequences of ignoring part-time employment?
- ▶ Policy analysis
  - ▶ UI vs. job-keeper
- ▶ Today: first part.

# What We Do

- ▶ Develop a search and matching model of the labor market with
  - ▶ endogenous part and full-time employment.
  - ▶ endogenous transitions (PT/FT and to unemployment).
- ▶ Mortensen-Pissarides (1994) with
  - ▶ procyclical productivity that is higher for full-time jobs;
  - ▶ acyclical costs that are asymmetric between part and full-time jobs;
  - ▶ aggregate shocks.

# Preview of Findings

- ▶ How much of part and full-time employment is driven by
  - ▶ aggregate shocks?
    - ▶ Primarily drives job-finding.
  - ▶ match quality composition.
    - ▶ Drives almost all fluctuations in part and full-time.
- ▶ What are the consequences of ignoring part-time employment?
  - ▶ Understates the cost of business cycles & magnitudes.
- ▶ Policy analysis
  - ▶ UI vs. job-keeper
    - ▶ Job keeper very effective at limiting size of recession.

# Model Environment

- ▶ Random search and matching with endogenous separations.
- ▶ Continuous time, discount rate  $r$ .
- ▶ Agents:
  - ▶ Unemployed and employed workers.
  - ▶ Matched and unmatched firms.
- ▶ Technology:
  - ▶ Random matching in labor markets.
  - ▶ Production:  $zY_T\epsilon$  (agg, type, idiosyncratic).
  - ▶ Endogenous transitions: between emp. types & unemp.
- ▶ For simplicity: assume agg. productivity ( $z$ ) fixed (for now).

# Agents

- ▶ Workers:
  - ▶ May be unemployed, or employed part or full-time.
  - ▶ Nash bargained wages, i.e., share of current match surplus.
- ▶ Firms:
  - ▶ Post single-worker vacancies at cost  $\kappa$ .
  - ▶ Pay wages and costs depending on part or full-time worker.
  - ▶ Costs:  $\tau_F$  and  $\tau_P$  for part and full-time.
- ▶ Jointly decide if match is full-time, part-time, or separate any time a shock occurs.

# Search and Matching Technology

- ▶ Random matching w/ sep. (Mortensen and Pissarides, 1994):
  - ▶ Matches random: productivity  $\epsilon$  not known before contact.
  - ▶ Matches separate if  $\epsilon$  is/falls below threshold (here  $\epsilon_P$ )
- ▶ No OTJS.
- ▶ Matching technology:
  - ▶ # of matches in labor market:  $M = M(u, v)$  (CRS).
  - ▶ Labor Market Tightness:  $\theta(\cdot) = \frac{v}{u}$
  - ▶ Worker finding rate:  $q(\theta) = \frac{M(u, v)}{v}$
  - ▶ Job finding rates:  $p(\theta) = \frac{M(u, v)}{u} = \theta q(\theta)$

# Workers

- ▶ Either part-time or full-time ( $T = \{P, F\}$ ).
- ▶ iid productivity: draw  $\epsilon \sim_{iid} F(\epsilon)$ ; evolve at rate  $\lambda_T$
- ▶ Wages determined by Nash Bargaining (bargaining power  $\alpha$ ).
- ▶ Value of unemployment:

$$r U = b + p(\theta) \int_{\underline{\epsilon}}^{\bar{\epsilon}} [\max\{\max\{W^F(x), W^P(x)\}, 0\} - U] dF(x).$$

- ▶ Value of employment:

$$r W^T(\epsilon) = w + \lambda_T \alpha \int_{\underline{\epsilon}}^{\bar{\epsilon}} [\max\{\max\{S^F(x), S^P(x)\}, 0\} - S^T(\epsilon, H)] dF(x)$$

- ▶  $S^T(x)$ : joint surplus of firm & worker.

## Firms

- ▶ Post vacancy at cost  $\kappa$ .
- ▶ Pay flow cost  $\tau_T$  by type once employed.
- ▶ Value of a filled vacancy:

$$r J^T(\epsilon) = zY_T\epsilon - \tau_T - w \\ + \lambda_T(1 - \alpha) \int_{\underline{\epsilon}}^{\bar{\epsilon}} [\max\{\max\{S^F(x), S^P(x)\}, 0\} - S^T(\epsilon)] dF(x)$$

- ▶ Value of unfilled vacancy:

$$r V = -\kappa + q(\theta) \int_{\underline{\epsilon}}^{\bar{\epsilon}} [\max\{\max\{J^F(x), J^P(x)\}, 0\} - V] dF(x)$$

- ▶ Free entry ( $V = 0$ )  $\rightarrow$  match rate:  $q(\theta) = \frac{\kappa}{\int_{\epsilon_P} J(x, H) dF(x)}$
- ▶ Market tightness:  $\theta = q^{-1}\left(\frac{\kappa}{\int J dF(x)}\right)$



# Surplus and Employment Thresholds

▶ Surplus  $S^T(\epsilon) = W^T(\epsilon) - U + J^T(\epsilon) - V$

▶ Surplus of match for either  $T = \{P, F\}$ :

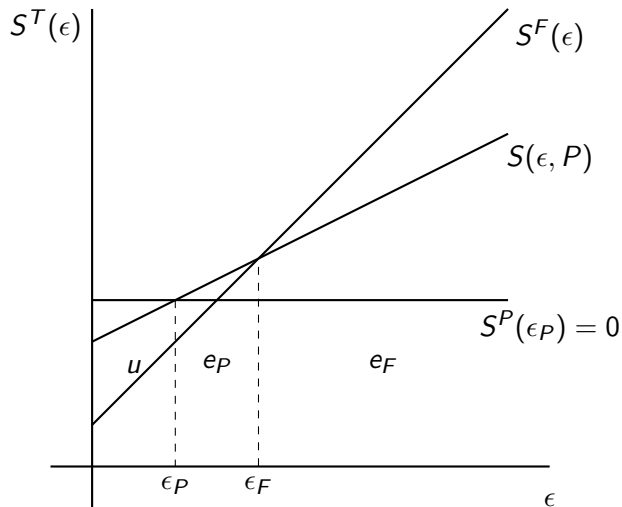
$$(r + \lambda_T) S^T(\epsilon) = z\epsilon Y_T - \tau_T - b - \frac{\alpha}{1 - \alpha} \theta \kappa \\ + \lambda_T \left[ \int_{\epsilon_F}^{\bar{\epsilon}} S^F(x) dF(x) + \int_{\epsilon_P}^{\epsilon_F} S^P(x) dF(x) \right]$$

▶ Existence: assume  $\exists$  some  $\epsilon_F$  and  $\epsilon_P$  st

1.  $zY_{F\epsilon_F} - \tau_F > zY_{P\epsilon_F} - \tau_P$  and

2.  $zY_{P\epsilon_P} - \tau_P > 0$ :

# Employment Thresholds



## Policy Functions

- ▶ Super messy for different  $\lambda_T$ . Show for  $\lambda_T = \lambda$ .
- ▶ The part-time treshold is given by the indifference equality:  $S^P(\epsilon_P) = 0$ :

$$\epsilon_P = \frac{\tau_P + b + \frac{\alpha}{1-\alpha}\theta(z)\kappa}{zY_P} - \frac{\frac{\lambda z Y_F}{r+\lambda} \left( \int_{\epsilon_F}^{\bar{\epsilon}} [1 - F(x)] dx + \frac{Y_P}{Y_F} \int_{\epsilon_P}^{\epsilon_F} [1 - F(x)] dx \right)}{zY_P}$$

- ▶ And the full-time threshold is given by the indifference condition  $S^F(\epsilon_F) = S^P(\epsilon_F)$

$$\epsilon_F = \frac{\tau_F - \tau_P}{z(Y_F - Y_P)}.$$

- ▶  $W^* = \alpha S$  and  $\theta^* = q^{-1}\left(\frac{\kappa}{(1-\alpha)S}\right)$  determined by SS surplus.

# Steady-State Employment

► Flows:

1.  $u \rightarrow PT, u \rightarrow FT;$
2.  $PT \rightarrow FT, PT \rightarrow u;$
3.  $FT \rightarrow PT, FT \rightarrow u.$

► Must all be equal to 0 in equilibrium.

► Steady-state employment:

$$e^P = \frac{(P(\theta)u + \lambda_F e^F) [F(\epsilon_F) - F(\epsilon_P)]}{(\lambda_P [1 - F(\epsilon_F) + F(\epsilon_P)])},$$

$$e^F = \frac{(P(\theta)u + \lambda_P e^P) [1 - F(\epsilon_F)]}{(\lambda_F F(\epsilon_F))},$$

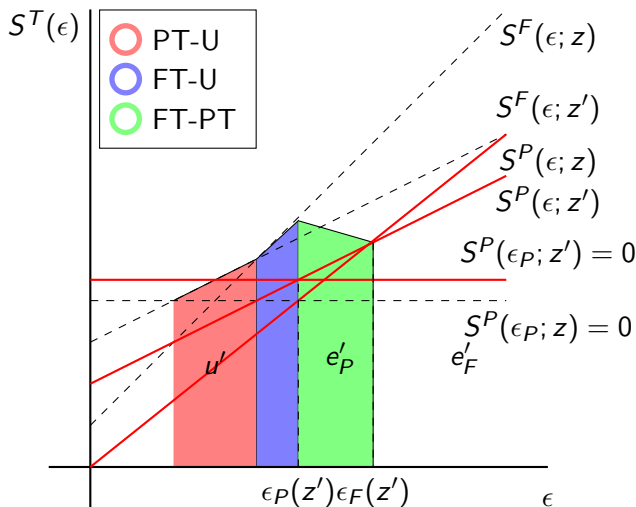
$$u = \frac{\lambda_P F(\epsilon_P) e^P + \lambda_F F(\epsilon_P) e^F}{\rho(\theta) [1 - F(\epsilon_P)]}.$$

# Steady-State Equilibrium

- Equilibrium is defined by the functions  $(\theta^*, w^*, \epsilon_F, \epsilon_P)$ , corresponding value functions, the steady-state tuple:  $(e_P, e_F, u)$  such that
1.  $\theta$  is defined by the free entry condition,  $V = 0$ , given other equilibrium objects,  $\theta^* = q^{-1}\left(\frac{\kappa}{(1-\alpha)S}\right)$ .
  2.  $\epsilon_P$  defines the point at which  $S^P(\epsilon_P) = 0$ .
  3.  $\epsilon_F$  defines the point at which  $S^F(\epsilon_F) = S^P(\epsilon_F)$
  4. Wages are given by a surplus sharing rule,  $w^T(\epsilon) = \alpha S^T(\epsilon)$

# Employment Threshold Dynamics

- Suppose  $z \downarrow$



# Calibration

- ▶ Discretize model at weekly frequency.
- ▶ Preset parameters to ubiquitous values in literature.
- ▶ Estimate parameters related to novel features of the model.
- ▶ Target:
  - ▶ Steady state employment rates;
  - ▶ Steady state employment flows.
- ▶ Simulate model 1000 times, with length of 320 quarters each.
- ▶ Average over 1000 simulations, toss first 200 quarters.

# Outline for Findings

- ▶ Describe how model fits data.
  
- ▶ Decompose into match quality and aggregate shocks.



# Employment Rates

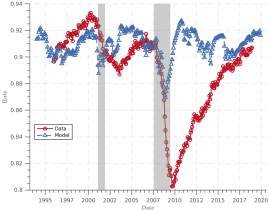


Figure: Full-Time

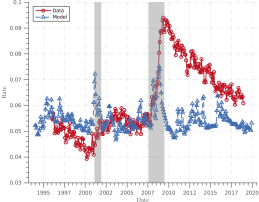


Figure: Part-Time

# Employment Flows

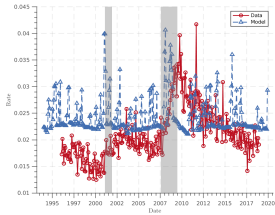


Figure: Full-time to part-time

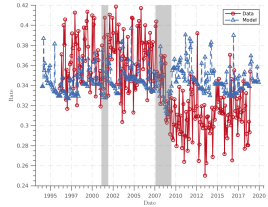


Figure: Part-time to full-time

# Findings

- ▶ Decompose into contribution of match quality and aggregate shocks:
  - ▶ Fix share of part and full-time to steady-state values.
  - ▶ Set  $\delta_t = \frac{e_t \rightarrow u_{t+1}}{e_t}$ , and  $\rho(\theta_t) = \frac{u_t \rightarrow e_{t+1}}{u_t}$
- ▶ Fluctuations in pt and ft driven by aggregate shocks. ie within variation.

# Employment

- ▶ Part-time employment too volatile.
- ▶ Employers hoard part-time workers instead of firing them.

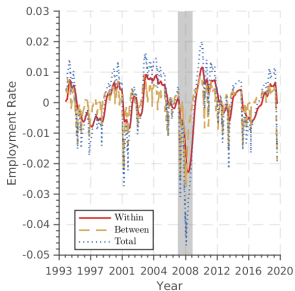


Figure: Full-Time

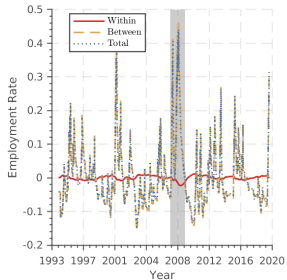


Figure: Part-Time

# Wages and output

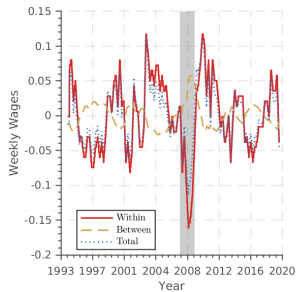


Figure: Wages.

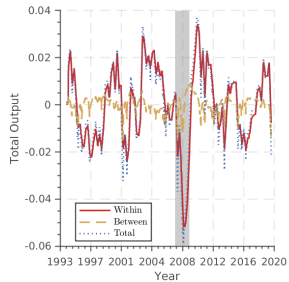


Figure: Aggregate output.

# Paper Findings Summary

- ▶ Extend Mortensen and Pissarides (1994) to include
  - ▶ two types of employment (part and full-time)
  - ▶ different acyclical costs by employment type.
- ▶ Run calibrated example.
- ▶ Findings:
  - ▶ Match quality explains fluctuations in part and full-time employment.
  - ▶ Job-keeper scheme more effective than UI.

## Next Time

- ▶ Hosios condition!
  
- ▶ Reminder:
  - ▶ HW6 due 5/8. ONLY Q1, not Q2!

## Preset-Parameters

- ▶ AR(1) aggregate shocks & log-normal iid productivity:

$$z_{t+1} = \rho z_t + \nu_z \quad (1)$$

$$\nu_z \sim LN(0, \sigma_z) \quad (2)$$

$$\epsilon \sim Ln(0, \sigma_\epsilon) \quad (3)$$

- ▶ Cobb-Douglas Matching:  $M(u, v) = Au^\eta v^{1-\eta}$ .
- ▶ Preset parameters estimated in related papers.

Parameter	Value	Source
$b$	0.4	UI Percent of Output (Shimer, 2005)
$\eta$	0.7	Matching function elasticity (Shimer, 2005)
$\alpha$	0.7	Hosios Condition
$A$	0.113	Matching efficiency (Shimer, 2005)
$\sigma_\epsilon$	0.16	Variance of match productivity shock (Fujita and Ramey, 2012)
$\rho$	0.9895	Persistence of aggregate shocks (Fujita and Ramey, 2012)
$\sigma_z$	0.004	Variance of aggregate shocks (Fujita and Ramey, 2012)

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# Fit

- ▶ Matches moments well.

Table: Fit

Moment	Data	Model
Wage Ratio (Full-Time to Part-Time)	1.150	1.166
Full-Time Employment Rate	0.769	0.767
Part-Time Employment Rate	0.180	0.167
Unemployment Rate	0.051	0.067
Separation Rate	0.014	0.014

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## Estimated Parameters

Parameter	Value	Source
$\tau_P$	0.18	Acyclical cost for part-time workers
$\tau_F$	0.79	Acyclical cost for full-time workers
$Y_P$	1.89	Part-time productivity
$Y_F$	2.60	Full-time productivity

- ▶  $Y_F/Y_P \approx 1.38$ .
- ▶ FT vs. PT hours (data): 40 hrs. vs. 28 hrs ( $\approx 1.43$ ).
- ▶  $\tau_F/\tau_P \approx \$3.18/hour$ .
- ▶ FT vs. PT costs (data): 9.75/hr. vs. 3.2/hr. ( $\approx \$3.05/hour$ ).

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