

Wealth, Wages, and Employment

Preliminary

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10th Anniversary Macroeconomics Theory and Policy Conference

The Canon Institute for Global Studies

May 27th and 28th 2019

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 - Wages are an increasing function of worker wealth.
 - Not time-consistent: bargaining with commitment makes no sense.
 - Not numerically well-behaved.
- We offer an alternative: competitive job search with commitment to a wage (or wage schedule) while the job lasts.

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 - Use new potent tools to address the study of fluctuations in complicated economies ?

WHAT ARE THE USES?

- The study of Business cycles including gross flows in and out of employment, unemployment and outside the labor force
- Policy analysis where now risk, employment, wealth (including its distribution) and wages are all responsive to policy.

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3. **On the Job Search** workers may get outside offers and take them.
(Some in ?). **Fluctuations.**

No (Endogenous) Quits Model

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- General equilibrium: Workers own firms.

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5. **Job Matching** : $M(V, U)$: Some vacancies meet some unemployed job searchers. A match becomes operational the following period.
Job finding and job filling rates $\psi^h(\theta) = \frac{M(V, U)}{U}$, $\psi^f(\theta) = \frac{M(V, U)}{V}$.

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$$V^e(a, w) = \max_{c, a'} u(c) + \beta [(1 - \delta)V^e(a', w) + \delta V^u(a)]$$

$$\text{s.t. } c + a' = a(1 + r) + w, \quad a \geq 0$$

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- Problem of the unemployed: Choose which wage to look for

$$V^u(a) = \max_{c, a', w} u(c) + \beta \{ \psi^h[\theta(w)] V^e(a', w) + [1 - \psi^h[\theta(w)]] V^u(a') \}$$
$$\text{s.t. } c + a' = a(1 + r) + b, \quad a \geq 0$$

$\theta(w)$ is an equilibrium object

FIRMS POST VACANCIES: CHOOSE WAGES & FILLING PROBABILITIES

- Value of a job with wage w : uses constant \bar{k} capital that depreciates at rate δ^k

$$\Omega(w) = z - \bar{k}\delta^k - w + \frac{1 - \delta^f}{1 + r} [(1 - \delta^h)\Omega(w) + \delta^h \bar{k}]$$

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- Value of creating a firm: $\psi^f[\theta(w)] \Omega(w) + [1 - \psi^f[\theta(w)]] \Omega$
- Free entry condition requires that for all offered wages

$$\bar{c} + \bar{k} = \psi^f[\theta(w)] \frac{\Omega(w)}{1 + r} + [1 - \psi^f[\theta(w)]] \frac{\Omega}{1 + r},$$

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- A stationary equilibrium is functions $\{V^e, V^u, \Omega, g'^e, g'^u, w^u, \theta\}$, an interest rate r , and a stationary distribution x over (a, w) , s.t.

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3. An interest rate r clears the asset market

$$\int a \, dx = \int \Omega(w) \, dx.$$

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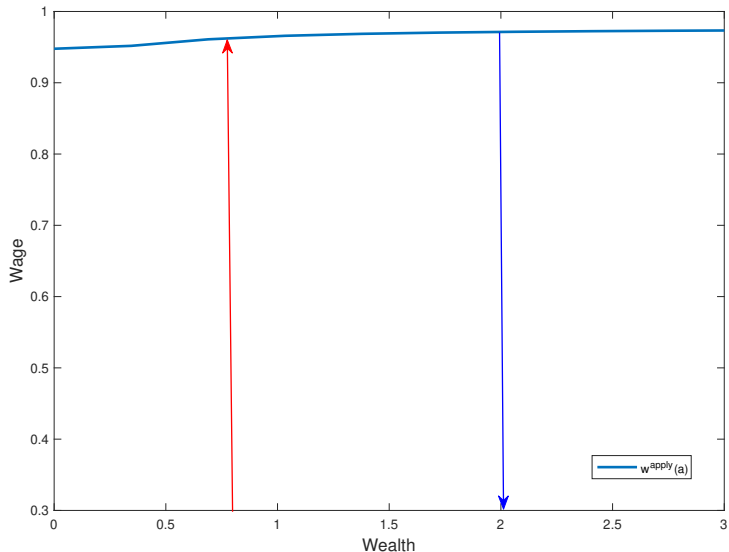
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- Households with more wealth are able to insure better against unemployment risk.
- As a result they apply for higher wage jobs and we have dispersion

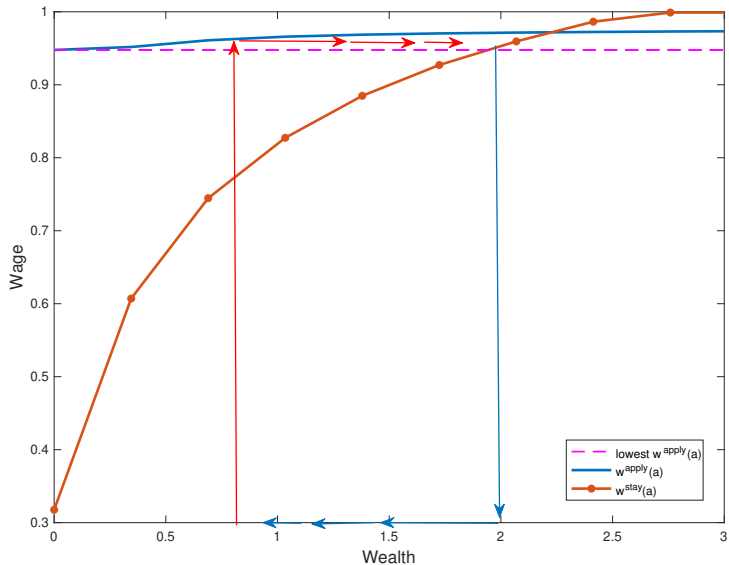
HOW DOES THE MODEL WORK

WORKER'S WAGE APPLICATION DECISION



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WORKER'S SAVING DECISION



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2. In the following we examine the implications of a quitting choice

Endogenous Quits

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4. Conditional on wealth, high wage workers quit less often.
5. **But Selection (correlation 1 between wage and wealth when hired) makes wealth trump wages and those with higher wages have higher wealth which makes them quite more often: Wage inequality collapses.**

ENDOGENOUS QUILTS: BEAUTY OF EXTREME VALUE SHOCKS

1. Temporary Shocks to the utility of working or not working: Some workers quit.
2. Workers may or may not have an intrinsic taste for leisure.
3. Adds a (smoothed) quitting motive so that higher wage workers quit less often: Firms may want to pay high wages to retain workers.
4. Conditional on wealth, high wage workers quit less often.
5. **But Selection (correlation 1 between wage and wealth when hired) makes wealth trump wages and those with higher wages have higher wealth which makes them quite more often: Wage inequality collapses.**
6. We end up with a model with little wage dispersion but with endogenous quits that respond to the cycle.

QUITTING MODEL: TIME-LINE

1. Workers enters period with or without a job: $\{e, u\}$.
2. Production occurs and consumption/saving choice ensues:
3. Exogenous job/firm destruction happens.
4. **Quitting:**
 - e draw shocks $\{\epsilon^e, \epsilon^u\}$ and make quitting decision.
Job losers cannot search this period.
 - u draw shocks $\{\epsilon_1^u, \epsilon_2^u\}$. No decision but same expected means.
5. **Search:** New or **Idle** firms post vacancies. Choose $\{w, \theta\}$.
Wealth is not observable. (Unlike ?).
Yet it is still **Block Recursive**
6. Matches occur

QUITTING MODEL: WORKERS

- Workers receive i.i.d shocks $\{\epsilon^e, \epsilon^u\}$ to the utility of working or not

QUITTING MODEL: WORKERS

- Workers receive i.i.d shocks $\{\epsilon^e, \epsilon^u\}$ to the utility of working or not
- Value of the employed right before receiving those shocks:

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V^e and V^u are values after quitting decision as described before.

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higher parameter $\alpha \rightarrow$ lower chance of quitting.

- Hence higher wages imply longer job durations. Firms could pay more to keep workers longer.

- Problem of the employed: just change \widehat{V}^e for V^e

$$V^e(a, w) = \max_{c, a'} u(c) + \beta \left[(1 - \delta) \widehat{V}^e(a', w) + \delta V^u(a) \right]$$

s.t. $c + a' = a(1 + r) + w, \quad a \geq 0$

- Problem of the unemployed is like before except that there is an added term $E\{\max[\epsilon_1^u, \epsilon_2^u]\}$

So that there is no additional option value to a job.

QUITTING MODEL: VALUE OF THE FIRM

- $\Omega^j(w)$: Value with with j -tenured worker.
Free entry condition requires that for all offered wages

$$\bar{c} + \bar{k} = \frac{1}{1+r} \{ \psi^f[\theta(w)] \Omega^0(w) + [1 - \psi^f[\theta(w)]] \Omega \},$$

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- Probability of retaining a worker with tenure j at wage w is $\ell^j(w)$.
(One to one mapping between wealth and tenure)

$$\ell^j(w) = 1 - q^e[g^{e,j}(a, w), w]$$

$g^{e,j}(a, w)$ savings rule of a j – tenured worker that was hired with wealth a

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- Firm's value

$$\Omega^j(w) = z - \bar{k}\delta^k - w + \frac{1 - \delta^f}{1+r} \{ \ell^j(w)\Omega^{j+1}(w) + [1 - \ell^j(w)] \Omega \}$$

$$\Omega^0(w) = (z - w - \delta^k k) Q^1(w) + (1 - \delta^f - \delta_k)k Q^0(w),$$

$$Q^1(w) = 1 + \sum_{\tau=0}^{\infty} \left[\left(\frac{1 - \delta^f}{1 + r} \right)^{1+\tau} \prod_{i=0}^{\tau} \ell^i(w) \right],$$

$$Q^0(w) = \sum_{\tau=0}^{\infty} \left[\left(\frac{1 - \delta^f}{1 + r} \right)^{1+\tau} [1 - \ell^\tau(w)] \left(\prod_{i=0}^{\tau-1} \ell^i(w) \right) \right].$$

- New equilibrium objects $\{Q^0(w), Q^1(w)\}$. Rest is unchanged.

QUITTING MODEL: SOLVING FORWARD FOR THE VALUE OF THE FIRM

$$\Omega^0(w) = (z - w - \delta^k k) Q^1(w) + (1 - \delta^f - \delta_k) k Q^0(w),$$

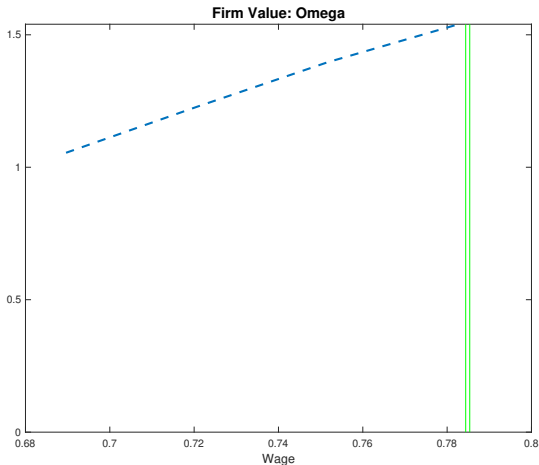
$$Q^1(w) = 1 + \sum_{\tau=0}^{\infty} \left[\left(\frac{1 - \delta^f}{1 + r} \right)^{1+\tau} \prod_{i=0}^{\tau} \ell^i(w) \right],$$

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- New equilibrium objects $\{Q^0(w), Q^1(w)\}$. Rest is unchanged.
- It is Block Recursive because wealth can be inferred from w and j . (No need to index contracts by wealth (as in ?)).

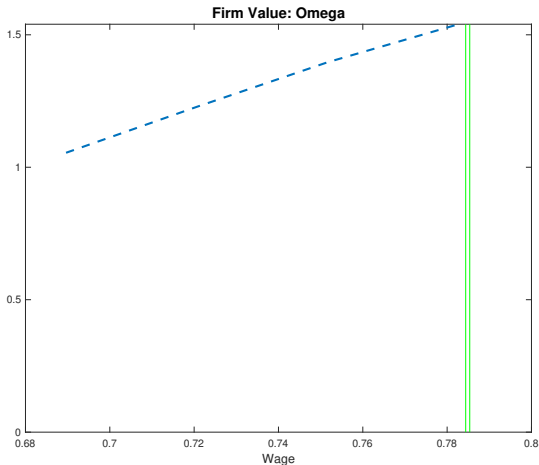
VALUE OF THE FIRM AS WAGE VARIES: THE POOR

- For the poorest, employment duration increases when wage goes up.



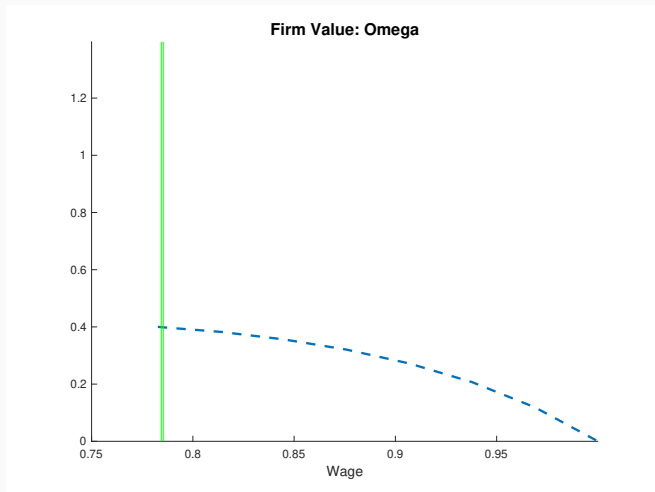
VALUE OF THE FIRM AS WAGE VARIES: THE POOR

- For the poorest, employment duration increases when wage goes up.
- Firms value is increasing in the wage



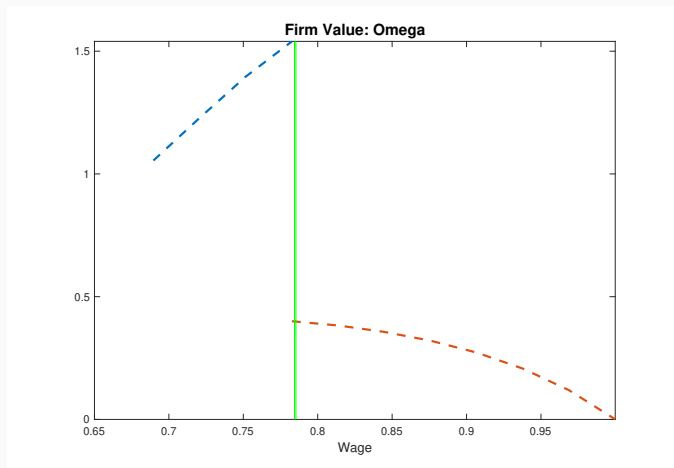
VALUE OF THE FIRM AS WAGE VARIES: THE RICH

- For the richest, employment duration increases but not fast enough.
- Firm value is slowly decreasing in wages (less than static profits).



VALUE OF THE FIRM: ACCOUNTING FOR WORKER SELECTION

- Large drop from below to above equilibrium wages.
- In Equilibrium wage dispersion **COLLAPSES** due to selection.



- Related to the Diamond dispersion paradox but for very different reasons.

EFFECT OF QUITTING: THE MECHANISM

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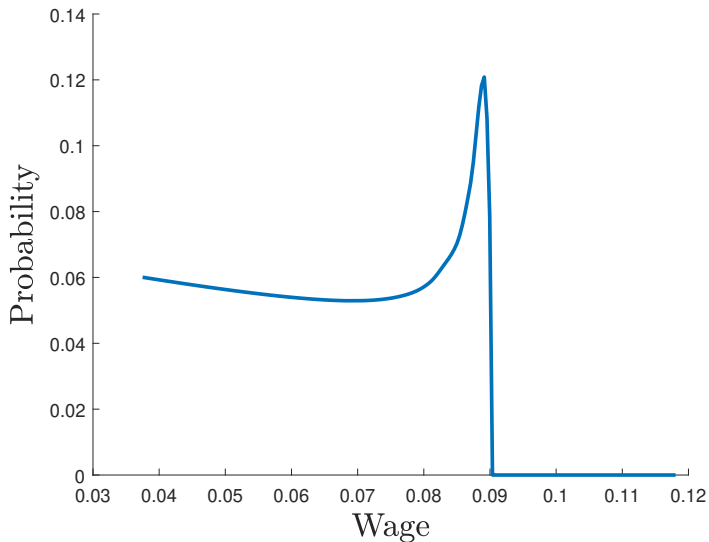
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EFFECT OF QUITTING: THE MECHANISM

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 - Agents quit less at higher paid jobs, which enlarge the spectrum of wages that firms are willing to pay (for a given range of vacancy filling probability).
 - However, by paying higher wages, firms attract workers with more wealth.
- Wealthy people quit more often, shrink employment duration.
- In equilibrium, the wage gap is narrow (disappears?) and the effect of wealth dominates.
- Need to weaken link between wages and wealth but not today (this is achieved via *aiming* (extreme value) shocks).

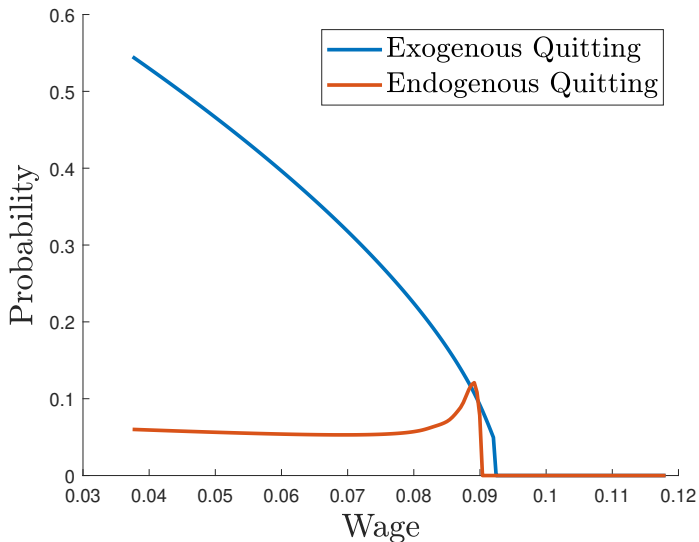
VALUE OF THE FIRM: ZERO PROFIT JOB FINDING PROBABILITY

- Increasing in Wage (up to Grid calculation): Unique wage.



QUITTING MAKES A BIG DIFFERENCE

- Job finding prob with Endo



On the Job Search

ON THE JOB SEARCH MODEL: TIME-LINE

1. Workers enter period with or without a job: V^e, V^u .
2. Production & Consumption:
3. Exogenous Separation
4. **Quitting? Searching? Neither?:** Employed draw shocks ($\epsilon^e, \epsilon^u, \epsilon^s$) and make decision to quit, search, or neither. Those who quit become u' , those who search join the u , in case of finding a job become $\{e', w'\}$ but in case of no job finding remain e' with the same wage w and those who neither become e' with w . $\widehat{V}^E(a', w)$, is determined with respect to this stage.
5. **Search :** Potential firms decide whether to enter and if so, the market (w) at which to post a vacancy; u and s assess the value of all wage applying options, receive match specific shocks $\{\epsilon^{w'}\}$ and choose the wage level w' to apply. Those who successfully find jobs become e' , otherwise become u' .
6. $\widehat{V}^u(a'), \{\Omega^j(w)\}$ are determined with respect to this stage.
7. Match

- After saving, the unemployed problem is

$$\widehat{V}^u(a') = \int \max_{w'} \left[\psi^h(w') V^e(a', w') + (1 - \psi^h(w')) V^u(a') + \epsilon^{w'} \right] dF^\epsilon$$

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- After saving, the employed choose whether to quit, search or neither

$$\widehat{V}^e(a', w) = \int \max \{ V^e(a', w) + \epsilon^e, V^u(a') + \epsilon^u, V^s(a', w) + \epsilon^s \} dF^\epsilon$$

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$$\widehat{V}^e(a', w) = \int \max \{ V^e(a', w) + \epsilon^e, V^u(a') + \epsilon^u, V^s(a', w) + \epsilon^s \} dF^\epsilon$$

- The value of searching is

$$V^s(a', w) = \int \max_{w'} \left[\psi^h(w') V^e(a', w') + [1 - \psi^h(w')] V^e(a', w) + \epsilon^{w'} \right] dF^\epsilon$$

- The probabilities of quitting and of searching

$$q(a', w) = \frac{1}{1 + \exp(\alpha[V^e(a', w) - V^u(a')]) + \exp(\alpha[V^s(a', w) - V^u(a') + \mu^s])},$$

$$s(a', w) = \frac{1}{1 + \exp(\alpha[V^u(a') - V^s(a', w)]) + \exp(\alpha[V^e(a', w) - V^s(a', w) - \mu^s])}.$$

$\mu^s < 0$ is the mode of the shock ϵ^s which reflects the search cost.

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- Households solve

$$V^e(a, w) = \max_{a' \geq 0} u[a(1+r) + w - a'] + \beta \left[\delta V^u(a') + (1-\delta) \widehat{V}^e(a', w) \right]$$

$$V^u(a) = \max_{c, a' \geq 0} u[a(1+r) + b - a'] + \beta \widehat{V}^u(a')$$

- The value of the firm is again given like in the **Quitting** Model

$$\Omega^0(w) = (z - w - \delta^k k) Q^1(w) + (1 - \delta - \delta_k) k Q^0(w),$$

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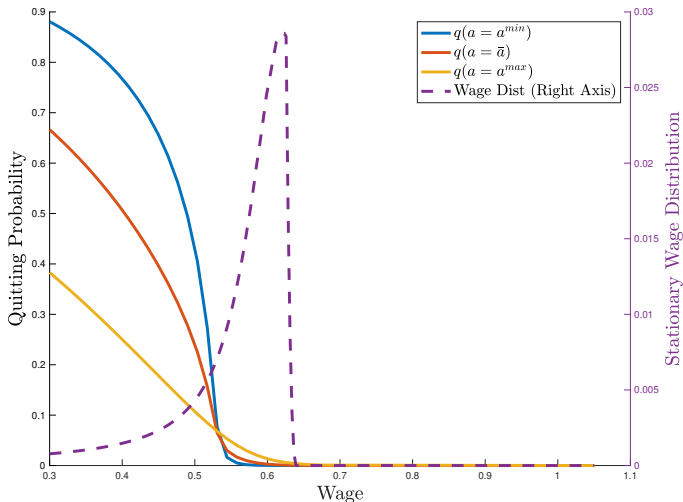
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- Except that now the probability of keeping a worker after j periods is

$$\ell^j(w) = 1 - \int h(w; a) q[g^{e \cdot j}(a, w), w] dx^u(a) - \int h(w; a) s[w; g^{e \cdot j}(a, w)] \left[\int \hat{h}[\tilde{w}; g^{e \cdot j}(a, w), w] \xi \phi^h(\tilde{w}) d(\tilde{w}) \right] dx^u(a)$$

OJS QUITTING PROBABILITIES, VARIOUS WEALTHS & WAGE DENSITY



- The rich pursue often other activities (leisure?)

Extensions:

Wages depend on the Aggregate State
Firms Choose Search Intensity

WAGES MOVE SOME WITH THE AGGREGATE STATE OF THE ECONOMY

- Wages are indexed to the Aggregate state z
- The firm is hard wired to pay not w but

$$w[1 + \gamma(z - 1)]$$

- It will reduce (depending on γ the incentive to quit and look for another job in an expansion)
- Very easy to implement
- Same steady state

FIRMS CHOOSE SEARCH INTENSITY

- The number of vacancies posted is chosen by firms
- Easy to implement
- Slightly Different steady state

- Let $v(\bar{c})$ be a technology to post vacancies where \bar{c} is the cost paid.

FREE ENTRY WITH VARIABLE RECRUITING INTENSITY

- Let $v(\bar{c})$ be a technology to post vacancies where \bar{c} is the cost paid.
- Then the free entry condition requires that for all offered wages

$$0 = \max_{\bar{c}} \left\{ v(\bar{c}) \psi^f[\theta(w)] \frac{\Omega(w)}{1+r} + [1 - v(\bar{c}) \psi^f[\theta(w)]] \frac{\bar{k}(1 - \delta_k)}{1+r} - \bar{c} - \bar{k} \right\},$$

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- With FOC given by

$$v_{\bar{c}}(\bar{c}) \left\{ \psi^f[\theta(w)] \left[\frac{\Omega(w)}{1+r} - \frac{\bar{k}(1 - \delta_k)}{1+r} \right] \right\} = 1,$$

- If $v(\bar{c}) = \frac{v_1 \bar{c}^2}{2} + v_2 \bar{c}$, we have

$$(v_1 \bar{c} + v_2) \left\{ \psi^f[\theta(w)] \left[\frac{\Omega(w)}{1+r} - \frac{\bar{k}(1-\delta_k)}{1+r} \right] \right\} = 1,$$

HOW TO MAKE IT CONSISTENT WITH THE CURRENT STEADY STATE

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- By Choosing v so that for the numbers that have now

$$\left\{ \left[\frac{v_1 \bar{c}^2}{2} + v_2 \bar{c} \right] \psi^f[\theta(w)] \frac{\Omega(w)}{1+r} + \left[1 - \frac{v_1 \bar{c}^2}{2} - v_2 \bar{c} \right] \psi^f[\theta(w)] \frac{\bar{k}(1-\delta_k)}{1+r} \right\} = \bar{c} + \bar{k}$$

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- Solving for $\{v_1, v_2\}$ that satisfy both equations given our choice of \bar{c} we are done

- Limited Comparable Results
- Right now we have three Economies
 1. Only Exogenous Quitting
 2. Endogenous Quitting
 3. 4 On the Job Search With Aiming and Quitting
- Yearly Potential output is Normalized to 1.

IN HALF QUARTER UNITS

- $K = 3, Y = 1/8, r = 0.37\%$
- firm destruction rate $\delta^f = 0.36\%$
- Exogenous Quits rate $\delta^h = 1.07\%$
- capital maintenance rate $\delta^k = 0.8\%$ from $I/Y = 25\%$.
- $\eta = 0.62$
- $\chi = 0.15$ to match $u = 10\%$.
- $\beta = 0.99928$

β

interest rate

avg consumption

avg wage

wage of newly hired unemployed

avg wealth

stock market value

avg labor income

consumption to wealth ratio

labor income to wealth ratio

quit ratio

Job Losers

Job to Job Movers

unemployment rate

std consumption

std wage

std wealth

mean-min consumption

mean-min wage

UE transition

EE transition

total vacancies

avg unemp duration

avg emp duration

Steady States $r = 3.0\%$ 1/2 quarter- Same β

	Exogenous Quits
β	0.994
interest rate	0.030
avg consumption	0.685
avg wage	0.705
wage of newly hired unemployed	0.705
avg wealth	2.974
stock market value	3.026
avg labor income	0.656
consumption to wealth ratio	0.230
labor income to wealth ratio	0.221
quit ratio	0.085
Job Losers	0.114
Job to Job Movers	-
unemployment rate	0.120
std consumption	0.014
std wage	0.001
std wealth	3.031
mean-min consumption	2.282
mean-min wage	1.012
UE transition	0.118
EE transition	-
total vacancies	0.576
avg unemp duration	1.012
avg emp duration	7.469

Steady States $r = 3.0\%$ 1/2 quarter- Same β

	Endogenous Quits
β	0.994
interest rate	0.030
avg consumption	0.713
avg wage	0.733
wage of newly hired unemployed	0.733
avg wealth	4.468
stock market value	2.651
avg labor income	0.670
consumption to wealth ratio	0.160
labor income to wealth ratio	0.150
quit ratio	0.046
Job Losers	0.069
Job to Job Movers	-
unemployment rate	0.145
std consumption	0.015
std wage	0.000
std wealth	5.132
mean-min consumption	2.376
mean-min wage	1.000
UE transition	0.072
EE transition	-
total vacancies	0.135
avg unemp duration	1.887
avg emp duration	10.57

Steady States $r = 3.0\%$ 1/2 quarter- Same β

	AQ OJS
β	0.994
interest rate	0.030
avg consumption	0.623
avg wage	0.637
wage of newly hired unemployed	0.544
avg wealth	1.251
stock market value	4.040
avg labor income	0.612
consumption to wealth ratio	0.498
labor income to wealth ratio	0.489
quit ratio	0.052
Job Losers	-
Job to Job Movers	0.300
unemployment rate	0.076
std consumption	0.010
std wage	0.010
std wealth	0.957
mean-min consumption	2.078
mean-min wage	2.124
UE transition	0.093
EE transition	0.280
total vacancies	2.874
avg unemp duration	0.781
avg emp duration	9.920

Steady States $r = 3.0\%$ 1/2 quarter- Same β

	Exogenous Quits	Endogenous Quits	AQ OJS
β	0.994	0.994	0.994
interest rate	0.030	0.030	0.030
avg consumption	0.685	0.713	0.623
avg wage	0.705	0.733	0.637
wage of newly hired unemployed	0.705	0.733	0.544
avg wealth	2.974	4.468	1.251
stock market value	3.026	2.651	4.040
avg labor income	0.656	0.670	0.612
consumption to wealth ratio	0.230	0.160	0.498
labor income to wealth ratio	0.221	0.150	0.489
quit ratio	0.085	0.046	0.052
Job Losers	0.114	0.069	-
Job to Job Movers	-	-	0.300
unemployment rate	0.120	0.145	0.076
std consumption	0.014	0.015	0.010
std wage	0.001	0.000	0.010
std wealth	3.031	5.132	0.957
mean-min consumption	2.282	2.376	2.078
mean-min wage	1.012	1.000	2.124
UE transition	0.118	0.072	0.093
EE transition	-	-	0.280
total vacancies	0.576	0.135	2.874
avg unemp duration	1.012	1.887	0.781
avg emp duration	7.469	10.57	9.920

- A lot more wealth in Endogenous quitting
- Higher wages
- Yet less quits (need to recalibrate to get the same)
- Little wealth in OJS and also lower wages
- Excessive Unemployment duration

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

β

interest rate

avg consumption

avg wage

wage of newly hired unemployed

avg wealth

stock market value

avg labor income

consumption to wealth ratio

labor income to wealth ratio

quit ratio

Job Losers

unemployment rate

std consumption

std wage

std wealth

mean-min consumption

mean-min wage

UE transition

total vacancy

avg unemp duration

avg emp duration

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

No Quits

β	0.994
interest rate	0.030
avg consumption	0.686
avg wage	0.706
wage of newly hired unemployed	0.706
avg wealth	3.026
stock market value	3.026
avg labor income	0.659
consumption to wealth ratio	0.225
labor income to wealth ratio	0.212
quit ratio	0.086
Job Losers	0.114
unemployment rate	0.121
std consumption	0.014
std wage	0.001
std wealth	3.052
mean-min consumption	2.287
mean-min wage	1.012
UE transition	0.119
total vacancy	0.581
avg unemp duration	1.008
avg emp duration	7.354

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

	Endogenous Quits
β	0.992
interest rate	0.030
avg consumption	0.696
avg wage	0.715
wage of newly hired unemployed	0.715
avg wealth	2.732
stock market value	2.732
avg labor income	0.677
consumption to wealth ratio	0.255
labor income to wealth ratio	0.248
quit ratio	0.045
Job Losers	0.069
unemployment rate	0.113
std consumption	0.009
std wage	0.000
std wealth	2.876
mean-min consumption	2.306
mean-min wage	1.001
UE transition	0.084
total vacancy	0.387
avg unemp duration	1.059
avg emp duration	10.68

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

	Aiming
β	0.996
interest rate	0.030
avg consumption	0.657
avg wage	0.688
wage of newly hired unemployed	0.688
avg wealth	4.688
stock market value	4.688
avg labor income	0.627
consumption to wealth ratio	0.140
labor income to wealth ratio	0.134
quit ratio	0.079
Job Losers	-
unemployment rate	0.072
std consumption	0.014
std wage	0.001
std wealth	3.231
mean-min consumption	2.215
mean-min wage	2.234
UE transition	0.136
total vacancy	2.135
avg unemp duration	0.675
avg emp duration	6.984

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

	Aiming& Quits
β	0.995
interest rate	0.030
avg consumption	0.667
avg wage	0.675
wage of newly hired unemployed	0.597
avg wealth	3.334
stock market value	3.334
avg labor income	0.635
consumption to wealth ratio	0.200
labor income to wealth ratio	0.191
quit ratio	0.045
Job Losers	-
unemployment rate	0.106
std consumption	0.016
std wage	0.003
std wealth	3.566
mean-min consumption	2.224
mean-min wage	2.250
UE transition	0.084
total vacancy	0.612
avg unemp duration	0.943
avg emp duration	10.73

Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

	No Quits	Endogenous Quits	Aiming	Aiming& Quits
β	0.994	0.992		
interest rate	0.030	0.030		
avg consumption	0.686	0.696		
avg wage	0.706	0.715		
wage of newly hired unemployed	0.706	0.715		
avg wealth	3.026	2.732		
stock market value	3.026	2.732		
avg labor income	0.659	0.677		
consumption to wealth ratio	0.225	0.255		
labor income to wealth ratio	0.212	0.248		
quit ratio	0.086	0.045		
Job Losers	0.114	0.069		
unemployment rate	0.121	0.113		
std consumption	0.014	0.009		
std wage	0.001	0.000		
std wealth	3.052	2.876		
mean-min consumption	2.287	2.306		
mean-min wage	1.012	1.001		
UE transition	0.119	0.084		
total vacancy	0.581	0.387		
avg unemp duration	1.008	1.059		
avg emp duration	7.354	10.68		

Vacations: Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

β	0.990
interest rate	0.030
avg consumption	0.673
avg wage	0.731
avg wealth	2.088
Stock Market	2.565
avg labor income	0.653
consumption to wealth ratio	0.322
labor income to wealth ratio	0.313
quit ratio	0.073
OJS search ratio	0.000
unemployment rate	0.181
wage of newly hired unemployed	0.731
std consumption	0.011
std wage	0.000
std wealth	1.568
mean-min consumption	2.243
mean-min wage	1.001
mean-min wealth	Inf
UE transition	0.098
EE transition	0.000
total vacancy	0.185
avg unemp duration	1.822
avg emp duration	8.242

Vacations: Steady States: $r = 1.5\%$ 1/2 quarter Closed Economies

	Vacation & Quits
β	0.990
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UE transition	0.098
EE transition	0.000
total vacancy	0.185
avg unemp duration	1.822
avg emp duration	8.242

SUMMARY, CLOSED ECONOMIES

- Less wealth in Endogenous quitting
- Higher wages,
- Much higher Consumption
- Yet less quits (need to recalibrate to get the same)
- In endogenous quits, the quits are judicious

Aggregate Fluctuations

WHAT IS NEEDED?

- Two steps

WHAT IS NEEDED?

- Two steps
 1. Compute the TRUE impulse response to an MIT Shock

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WHAT IS NEEDED?

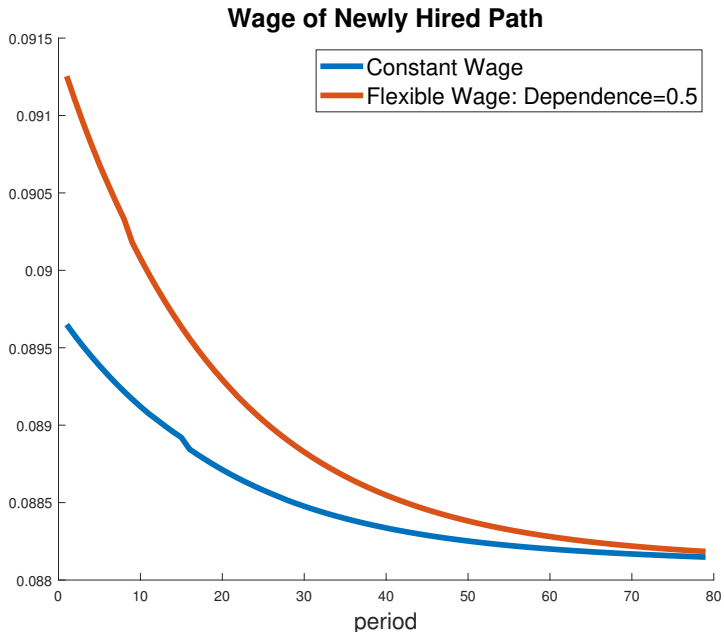
- Two steps
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 - Firms need to know functions $\{Q_t^0(w), Q_t^1(w), \psi^f(w)\}$ at each stage (no block recursivity)
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WHAT IS NEEDED?

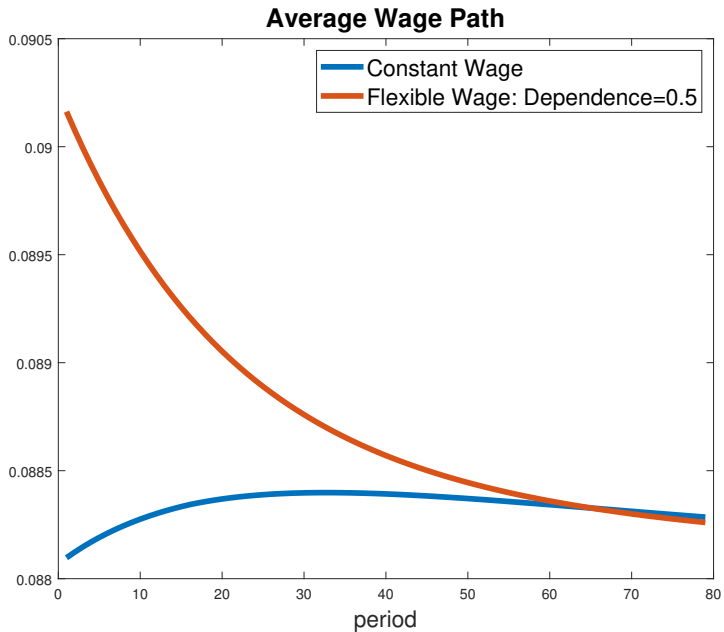
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 - Households need to know $\phi_t^h(w)$ job finding probabilities every period.
 - Also need to know sequence of interest rates (not today)

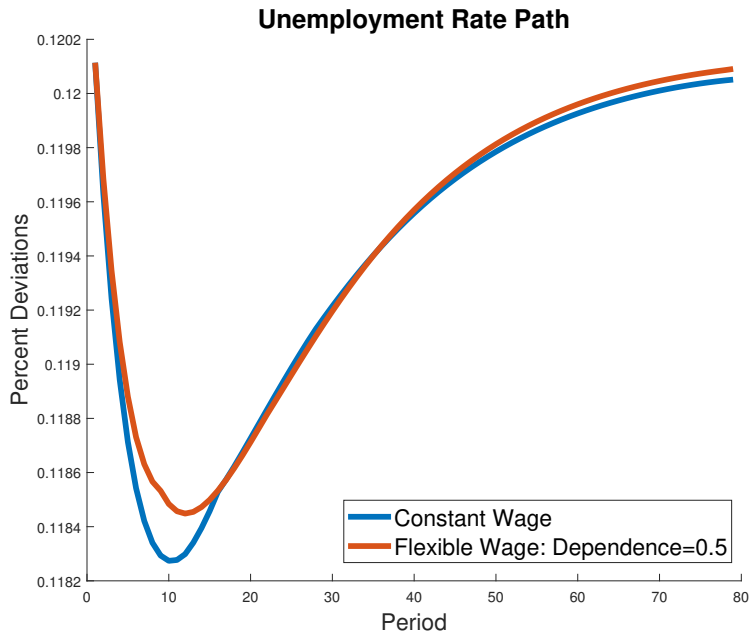
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- Two steps
 1. Compute the TRUE impulse response to an MIT Shock
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 - Households need to know $\phi_t^h(w)$ job finding probabilities every period.
 - Also need to know sequence of interest rates (not today)
- So it is a second order difference functional equation.



No QUILTS. 5% TFP SHOCK ($\rho = .95$)

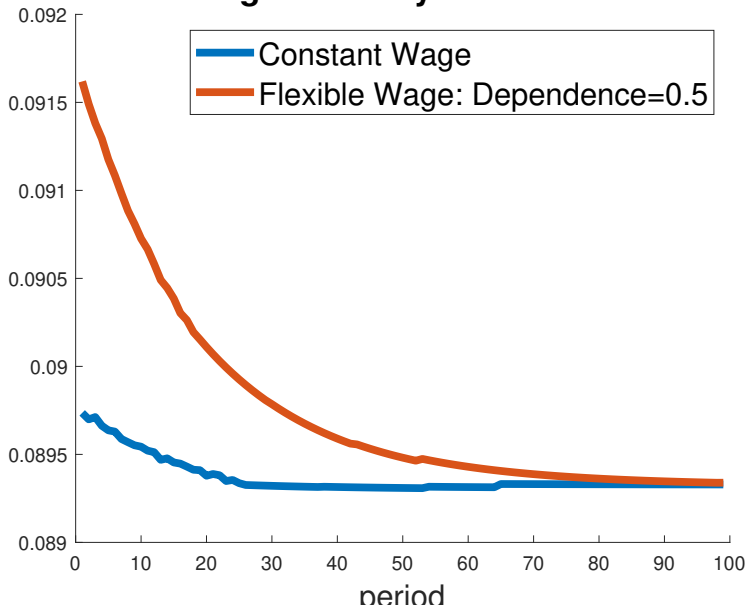




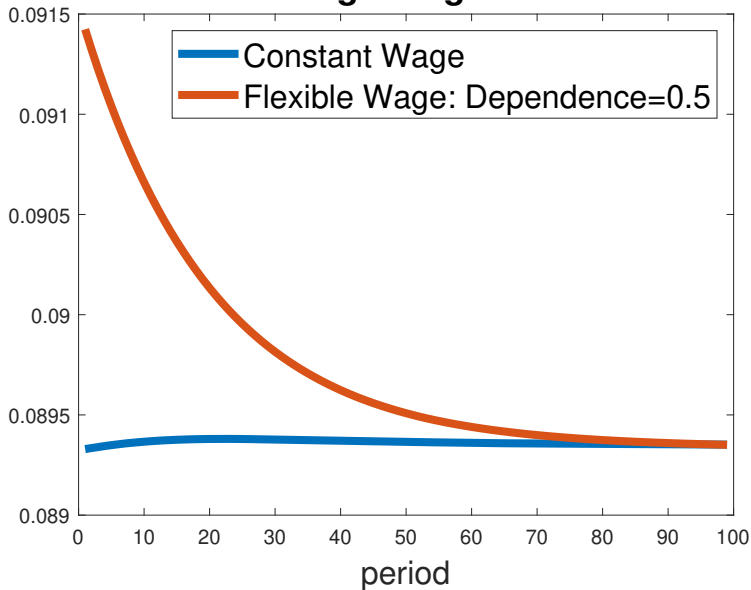
SUMMARY, EXOGENOUS QUILTS

- Large Shock creates little employment .15% (out of 5%)
- Also small wage increases if constant (1.5%) larger if adjusted 3%
- Big bottleneck in job market (Curvature of matching function)
- Yet less quits (need to recalibrate to get the same)
- In endogenous quits, the quits are judicious

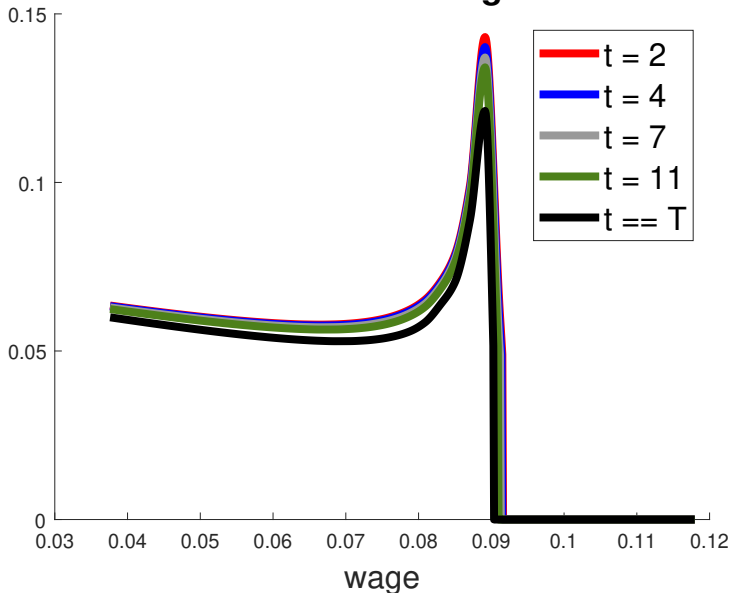
Wage of Newly Hired Path

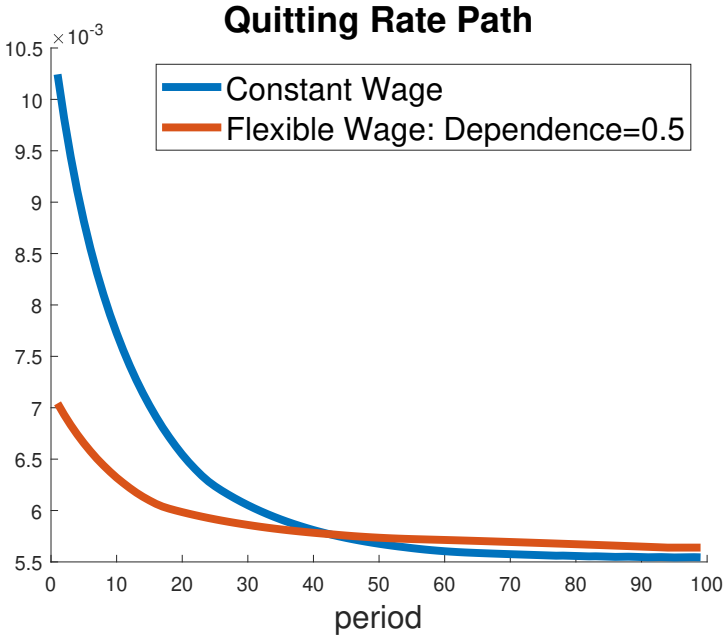


Average Wage Path

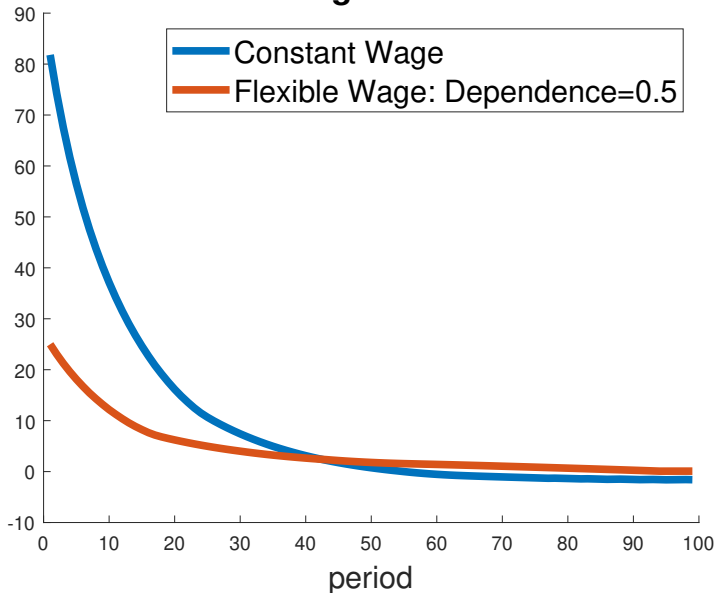


Path of Job Finding Prob

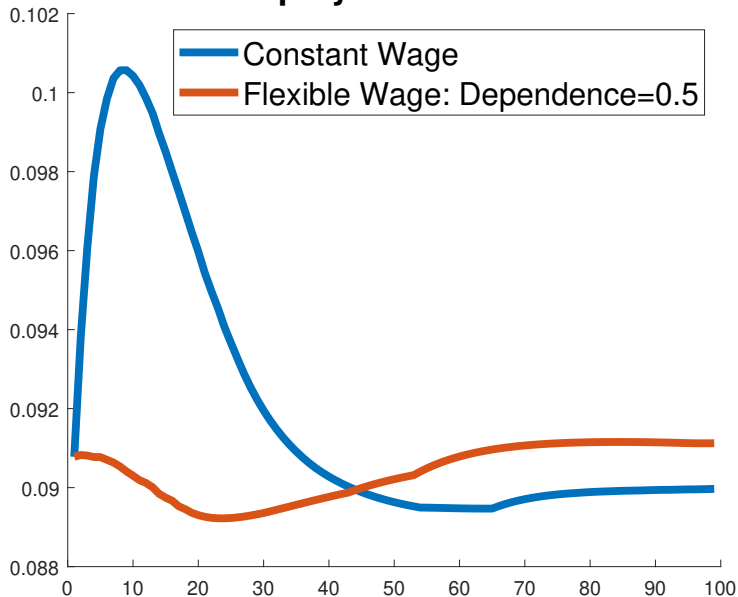




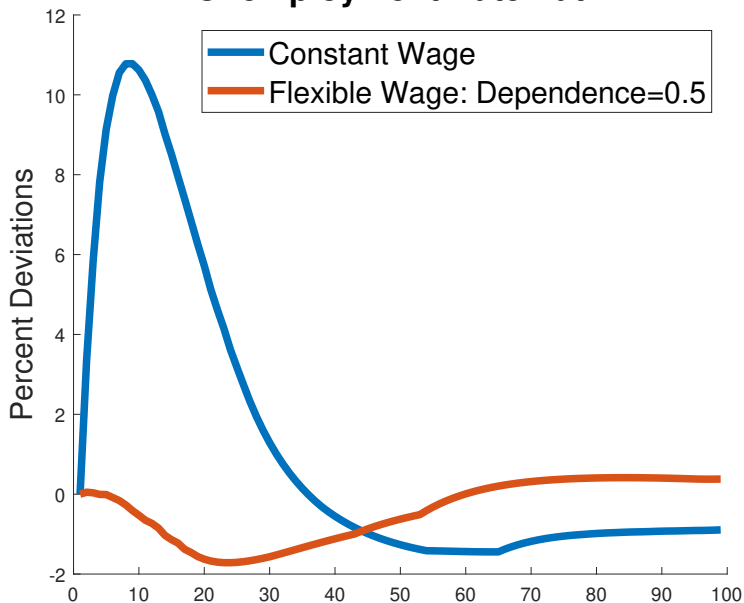
Quitting Rate Path



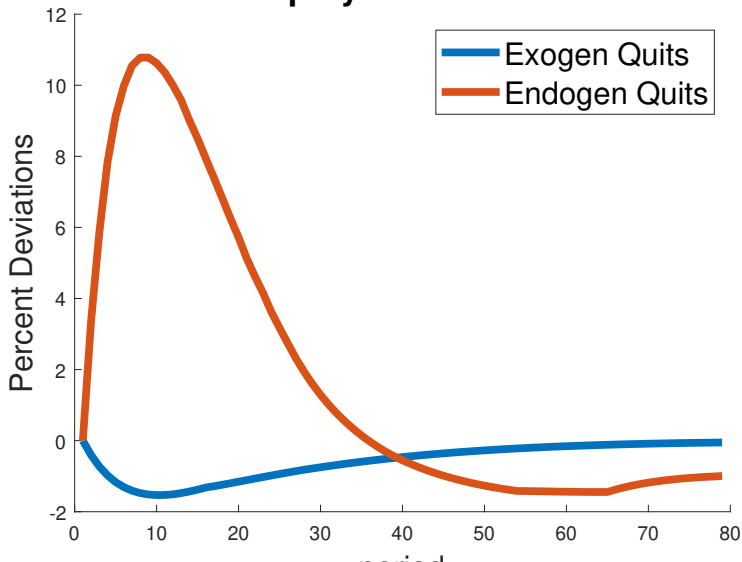
Unemployment Rate Path

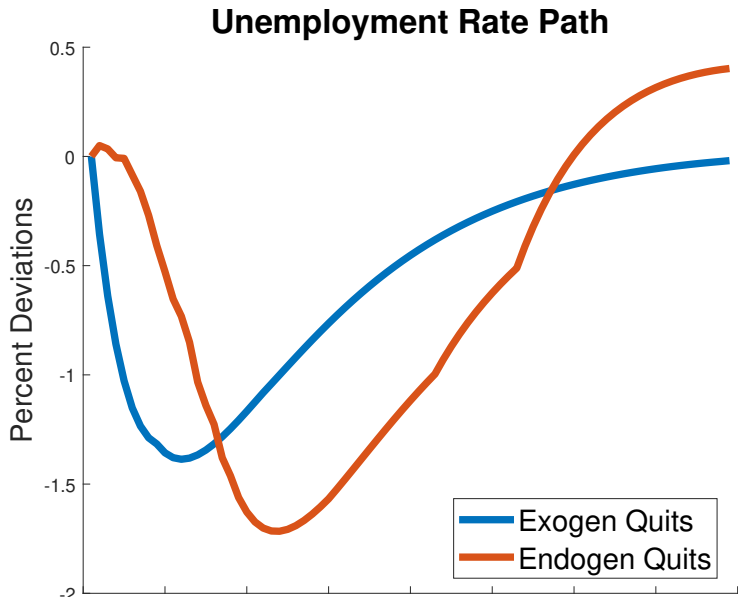


Unemployment Rate Path



Unemployment Rate Path

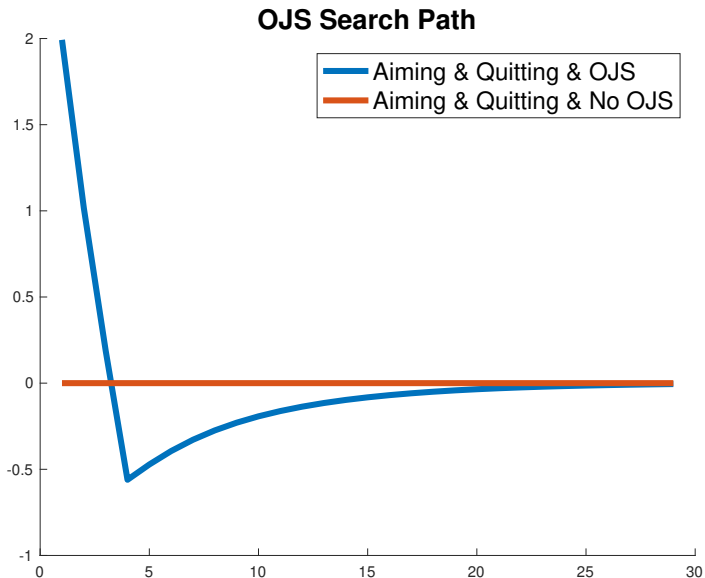




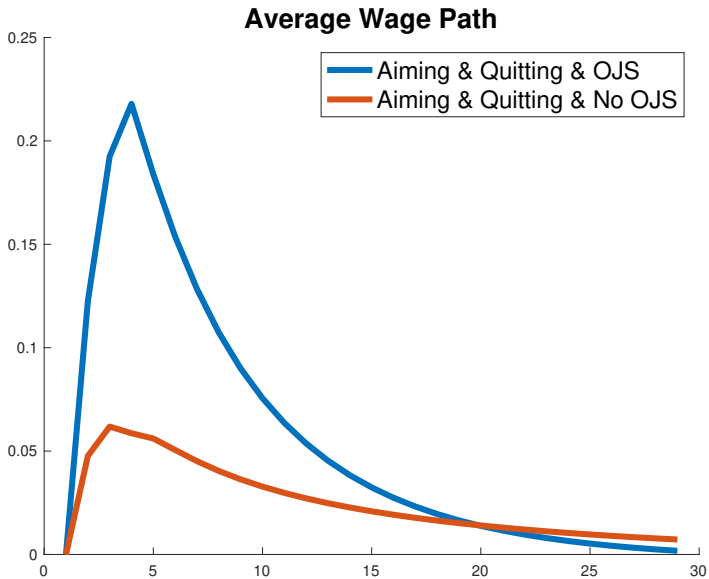
Business Cycle Behavior of On the Job Search

- Very Preliminary Assessment
- Shocks are truncated at $t = 5$
 - Eliminating future shocks reins in the massive initial quits
 - Converge faster and less computational burden
- OJS Switches are Pro-cyclical
- OJS search amplifies the responses of wages and employment

OJS 5% TFP SHOCK ($\rho = .9$, TRUNCATED AT T=5) OJS SEARCH RATE, PERCENT DEVIATIONS

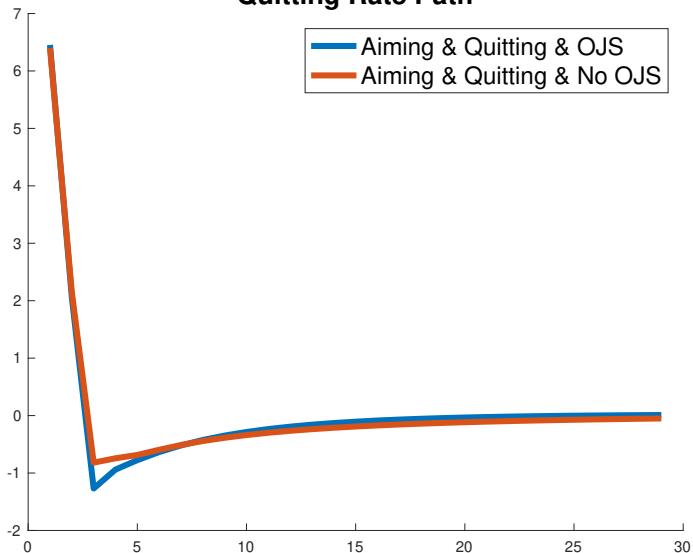


OJS 5% TFP SHOCK ($\rho = .9$, TRUNCATED AT T=5) AVG WAGE, PERCENT DEVIATIONS

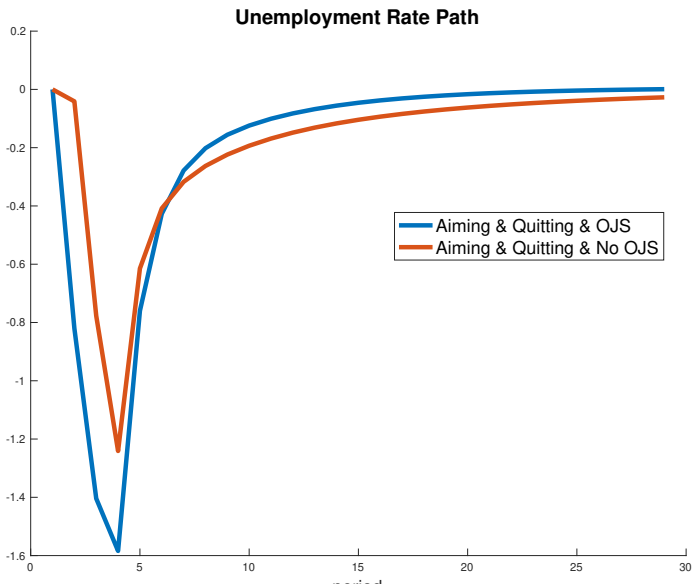


OJS 5% TFP SHOCK ($\rho = .9$, TRUNCATED AT T=5) QUILTS, PERCENT DEVIATIONS

Quitting Rate Path



OJS 5% TFP SHOCK ($\rho = .9$, TRUNCATED AT T=5) UNEMPLOYMENT, PERCENT DEVIATIONS



CONCLUSIONS I

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 - Quits
 - Employment
 - Investment and Consumption
 - Wages

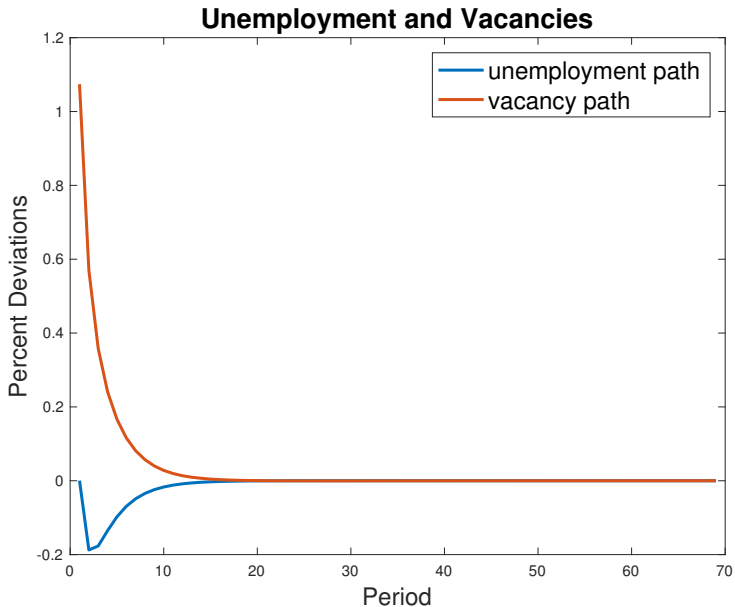
- Exciting set of continuation projects:
 1. Endogenous Search intensity on the part of firms
 2. Aiming Shocks to soften correlation between wages and wealth
 3. Efficiency Wages: Endogenous TFP (firms use different technologies with different costs of idleness)
 4. Move towards more sophisticated life cycle movements

Appendix

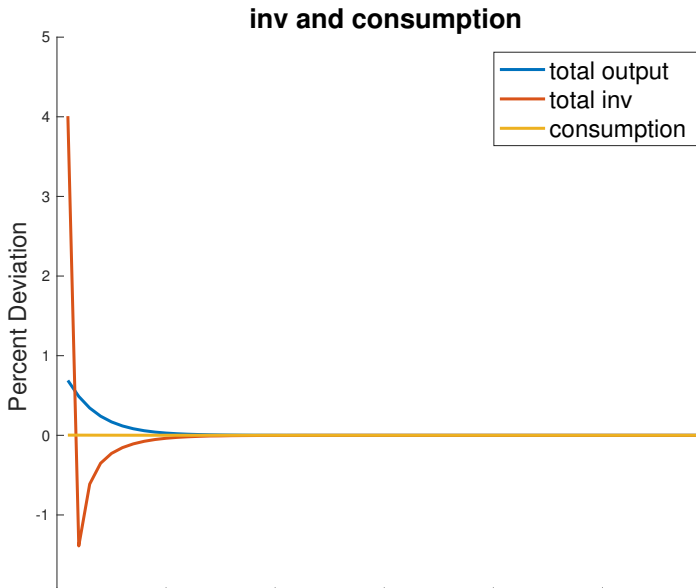
APPENDIX A: INSUFFICIENT EMPLOYMENT VOLATILITY

- The model features strong response of investment but insufficient response of employment.
 - We examine the mechanics of this.
- Consider for simplicity the model with aiming shocks but no quitting shocks (ANQ model). For a 1% productivity shock (with persistence 0.7), it generates
 - 1% increase of vacancies
 - 0.2% decrease of unemployment, which translates to only 0.01% increase of employment
 - and 4% increase of investment

ANQ: 1% TFP SHOCK ($\rho = .7$) UNEMPLOYMENT AND VACANCIES

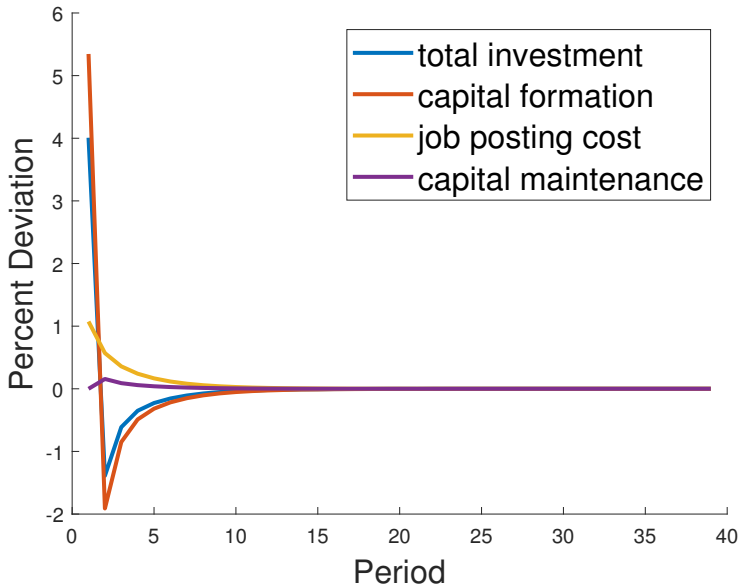


ANQ: 1% TFP SHOCK ($\rho = .7$) OUTPUT, INVESTMENT AND CONSUMPTION



ANQ: 1% TFP SHOCK ($\rho = .7$) DECOMPOSITION OF THE INVESTMENT

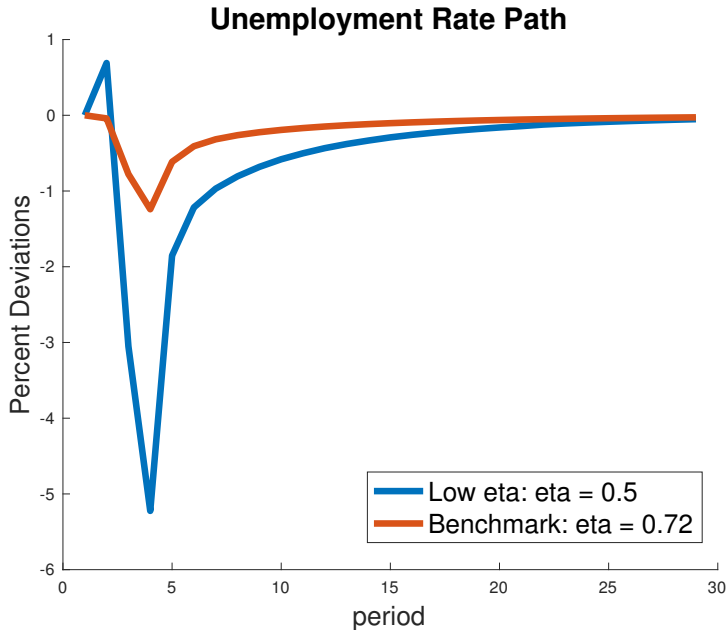
Investment Path



APPENDIX A: INSUFFICIENT EMPLOYMENT VOLATILITY

- Why does 1% increase of vacancies v generate 4% increase of investment?
 - At the steady state, about 80% of the vacancies are posted by old idle firms and 20% by newly created firms.
 - Investment = wage posting cost + capital maintenance cost + new capital formation
 - As the shock hits the economy, firstly it only increases the creation of new firms, generating massive movements of investment in the form of capital formation (ek).
- Why does 1% increase of vacancies v generate only 0.01% increase of employment?
 - As an approximation, $\hat{m} = (1 - \eta)\hat{v} + \eta\hat{u}$.
 - Upon facing the shock, at first u does not move. So the response of matches depend on the response of v and the parameter η .
 - $\hat{m} \approx (1 - 0.72) \times 1\% = 0.28\%$, and $\frac{\Delta m}{1-u} = \frac{0.28\% \times 0.03}{0.95} \approx 0.01\%$
 - Lower η relieves the problem (see the next page).

LOWER η AND TRUNCATED 5% SHOCK: AQ ECONOMY



	vnanq _o js _t est _s tst ₉ 988000	vnanq _o js _t est _s tst ₉ 988000 ₂
beta	0.990	0.990
interest rate	0.030	0.030
avg consumption	0.688	0.696
avg wage	0.702	0.710
avg wealth	1.213	1.308
M	3.021	3.018
avg labor income	0.676	0.683
consumption to wealth ratio	0.567	0.532
labor income to wealth ratio	0.557	0.522
quit ratio	0.086	0.086
OJS search ratio	4.196	4.136
unemployment rate	0.064	0.065
wage of newly hired unemployed	0.667	0.678
std consumption	0.010	0.009
std wage	0.004	0.002
std wealth	0.697	0.722
mean-min consumption	2.293	2.319
mean-min wage	1.069	1.059
mean-min wealth	Inf	Inf
UE transition	0.125	0.125
EE transition	0.172	0.355
total vacancy	0.616	0.736
avg unemp duration	0.456	0.523
avg emp duration	7.469	7.469
OJS move rate	0.184	0.380

Table 1: Model 4 Statistics