Trade Policy and Wage Inequality: A Structural Analysis with Occupational and Sectoral Mobility

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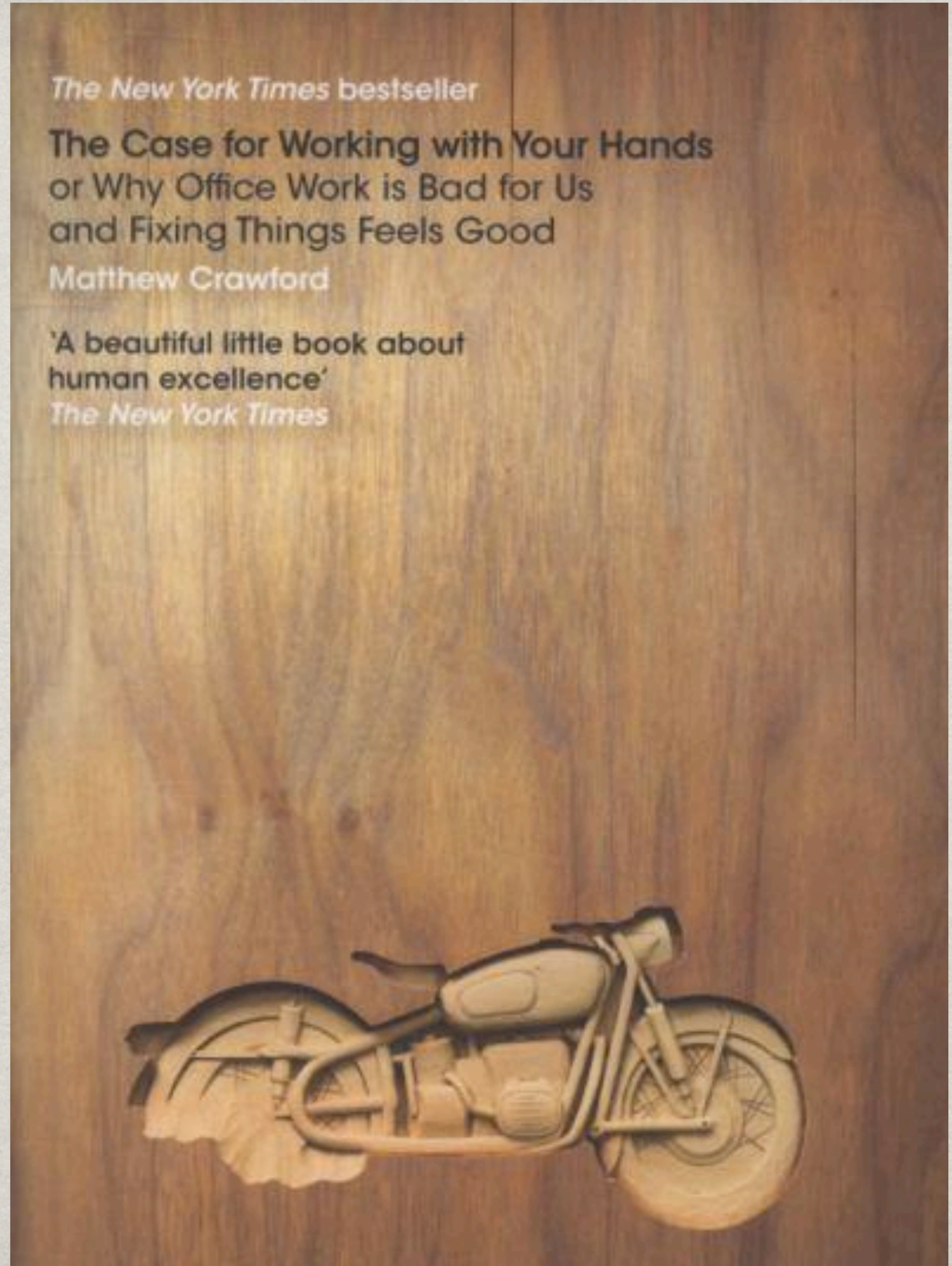
(with John McLaren)

Key Question:

- Who gains and who loses from trade liberalization?
- Question of how you slice the data.

- *Educational class*.
  - Stolper-Samuelson approach.
- *Industry.*
  - Revenga, Attanasio-Goldberg-Pavnik, Artuç-Chaudhuri-McLaren (2010), Dix-Carneiro (2011).
- *Locality.*
  - Topalova (2009), Autor, Dorn and Hanson (2011), Hakobyan and McLaren (2011).

- *Age.*
  - Artuç (2009).
- Recent trend: *Occupation.*
  - Ebenstein, Harrison, McMillan, Phillips (2009); Peri and Sparber (2009); Liu and Trefler (2011).


The New York Times bestseller
The Case for Working with Your Hands
or Why Office Work is Bad for Us
and Fixing Things Feels Good
Matthew Crawford
'A beautiful little book about
human excellence'
The New York Times

"Matthew Crawford got a PhD in Political Philosophy from the University of Chicago. Then he abandoned academia after a year, abandoned a Washington DC think-tank job after five months, and opened a one-man motorcycle repair shop. He thinks more now than when he worked at think-tank. He's part of a vibrant, intuitive, well-educated community. He's proud of his work, which matters deeply to his customers. His decisions aren't arbitrarily changed by a superior. His job won't suddenly be shipped to India. Of course, most people assume fixing motorcycles was the only job he could get."

-Business Insider, May 24, 2009

What we are doing.

- Look more closely at role of occupation.
- If we allow workers to choose occupation *and* industry optimally, in equilibrium who benefits from liberalization?

Occupational switching cost matters:

- Consider 2-good model.
- High-skill and low-skill workers.
- Each good is produced from two tasks: One industry is task-1 intensive.

Occupational switching cost matters:

- Case 1: Only H-workers can do task 1.
- Case 2: Any worker can do either task just as well.
- Case 3: Any worker can do either task just as well, and you can always switch industry, but once you've picked an occupation, you're stuck with it.

Model.

- I sectors, K occupations.
- I times K sector-occupation *cells*.
- Workers: College-education ($s = c$) or not ($s = n$).
- Common discount factor β.
- Wage in cell (i,k): w_t^{iks}.

- Each period, if I'm in (i,k), I get the wage there w_t^{iks}.

- And the *common*, non-pecuniary benefit η_t^{iks}.

- Then, I can choose to move.

- At the end of the period, I get an *idiosyncratic* benefit ε_t^{nik}.

- Creates a kind of idiosyncratic moving cost: ε_t^{nik}-ε_t^{njl}.

If I switch cells, I also pay a switching cost C common to all workers:

$$\begin{aligned} C_t(i,k,j,l,s,\xi_t^{ikjls}) &= 0 \text{ if } i=j,\ k=l; \\ &= C_t^{1,j,s} + \xi_t^{ikjls} \text{ if } i \neq j,\ k=l; \\ &= C_t^{2,l,s} + \xi_t^{ikjls} \text{ if } i=j,\ k \neq l; \\ &= C_t^{1,j,s} + C_t^{2,l,s} + C_t^{3,s} + \xi_t^{ikjls} \text{ if } i \neq j,\ k \neq l, \end{aligned}$$

Worker's payoff:

$$
\begin{aligned}
U_t^{iks}(\varepsilon_t^n) &= w_t^{iks} + \eta_t^{iks} + \max_{j,l}\{\varepsilon_t^{njl} - C_t(i,k,j,l,s) + \beta E_t[V_{t+1}^{jls}]\} \\
&= w_t^i + \eta_t^{iks} + \beta E_t[V_{t+1}^{iks}] + \max_{j,l}\{\varepsilon_t^{njl} - C_t(i,k,j,l,s) + \beta V_{t+1}^{jls} - \beta V_{t+1}^{iks}\}.
\end{aligned}
$$

Bellman Equation:

$$
\begin{aligned}
V_t^{iks} &= E\left[w_t^{iks} + \eta_t^{iks}\right] + \beta E_t[V_{t+1}^{iks}] + E\left[\max_{j,l}\{\varepsilon_t^{njl} - C_t(i,k,j,l,s) + \beta\left(V_{t+1}^{jls} - V_{t+1}^{iks}\right)\}\right] \\
&\equiv E\left[w_t^{iks} + \eta_t^{iks}\right] + \beta E_t[V_{t+1}^{iks}] + \Omega_t^{iks}, \qquad (5)
\end{aligned}
$$

- Assume that ε_t^{nik}. is distributed extreme-value.

- Variance parameter ν.

$$m_t^{ikjls} = \frac{exp\left[\frac{1}{\nu}\left(\beta E_t\left(V_{t+1}^{jls} - V_{t+1}^{iks}\right) - C_t(i,k,j,l,s)\right)\right]}{\Sigma_{j'=1\ldots I, l'=1\ldots K} exp\left[\frac{1}{\nu}\left(\beta E_t\left(V_{t+1}^{j'l's} - V_{t+1}^{iks}\right) - C_t(i,k,j',l',s)\right)\right]}, \quad (6)$$

The "gross flows" of labor from cell (*i*,*k*) to cell (*j*,*l*).

Data & Estimation

Data: Sample Selection

- Current Population Survey (March): From 1980 to 2001: White male workers between 23 and 58, transition probabilities corrected using NLSY.

- Bureau of Economic Analysis: Industry input shares used to calibrate production functions (not used in estimation).

- **"White Collar:"**
    - 1. Managerial and Professional Specialty Occupations (3-199)
- **"Service Blue Collar:"**
    - 2. Technical, Sales and Administrative Support Occupations (203-389)
    - 3. Service Occupations (403-469)
    - 5. Precision Production, Craft and Repair (503-699)
- **"Production Blue Collar:"**
    - 4. Farming, Forestry and Fishing Occupations (473-499)
    - 6. Operators, Fabricators, and Laborers (703-889).

Data: Distribution of Workers

		Share in Sector	Share in Occupation	Ratio of College Grads.
White	*Agri/Cons*	0.17	0.07	0.43
	Manuf	0.26	0.21	0.58
	Non-Traded	0.29	0.19	0.52
	Traded	0.44	0.52	0.72
BlueS	*Agri/Cons*	0.5	0.14	0.07
	Manuf	0.39	0.23	0.12
	Non-Traded	0.59	0.28	0.16
	Traded	0.42	0.36	0.23
BlueP	*Agri/Cons*	0.33	0.19	0.06
	Manuf	0.35	0.44	0.03
	Non-Traded	0.11	0.11	0.05
	Traded	0.14	0.26	0.05

Data, Key Features: Occupation Transition Matrices

No College			
	White	***Blue S***	***Blue P***
White	96.5%	2.7%	0.8%
Blue S	0.9%	97.6%	1.5%
Blue P	0.5%	3.0%	96.5%

College			
	White	***Blue S***	***Blue P***
White	98.5%	1.3%	0.2%
Blue S	3.9%	95.6%	0.5%
Blue P	4.5%	5.2%	90.3%

Data, Key Features: Sector Transition Matrix

	Agr/Cons	*Manuf*	*Non-traded*	*Traded*
Agr/Cons	94.8%	1.4%	1.4%	2.5%
Manuf	0.6%	97.0%	0.7%	1.7%
Trade	0.6%	0.8%	95.6%	2.9%
Service	0.7%	0.9%	1.3%	97.1%

Table 6: Regression Results - Stage 1

C/ν - Non-College						
Sector/Occ	***Mean***	***Change***	***Min***	***Max***	***Max StdE***	***Min StdE***
White	6.209	-0.102	5.576	6.902	*(0.199)*	*(0.332)*
BlueS	3.712	-0.647	3.269	4.605	*(0.198)*	*(0.327)*
BlueP	5.546	0.308	4.972	5.947	*(0.198)*	*(0.328)*
Aggr/Cons	5.130	0.739	4.708	5.654	*(0.170)*	*(0.242)*
Manuf	5.616	-0.342	5.303	6.155	*(0.167)*	*(0.244)*
NonTraded	4.866	-0.066	4.532	5.226	*(0.165)*	*(0.228)*
Traded	4.254	-0.207	3.885	4.590	*(0.157)*	*(0.213)*
Ch All	-4.124	0.004	-4.623	-3.866	*(0.125)*	*(0.179)*

C/ν - College						
Sector/Occ	***Mean***	***Change***	***Min***	***Max***	***Max StdE***	***Min StdE***
White	5.031	0.821	4.469	5.982	*(0.323)*	*(0.534)*
BlueS	3.836	-0.486	2.787	4.400	*(0.324)*	*(0.536)*
BlueP	5.652	0.932	4.448	6.548	*(0.338)*	*(0.581)*
Aggr/Cons	5.972	-0.357	4.800	7.154	*(0.296)*	*(0.574)*
Manuf	5.710	-0.434	5.007	6.557	*(0.253)*	*(0.417)*
NonTraded	5.028	0.257	4.299	5.737	*(0.236)*	*(0.416)*
Traded	3.799	-0.305	2.850	4.432	*(0.225)*	*(0.390)*
Ch All	-3.886	0.259	-4.269	-3.445	*(0.179)*	*(0.278)*

Simulations.

- Assume that initially manufacturing has a 25% tariff, otherwise free trade.
- Initially, steady state with the tariff expected to be permanent.
- At date t=0, the tariff is suddenly and permanently removed.
- Study transitional dynamics to new steady state.
- Compute change in *lifetime expected utility* of each worker.

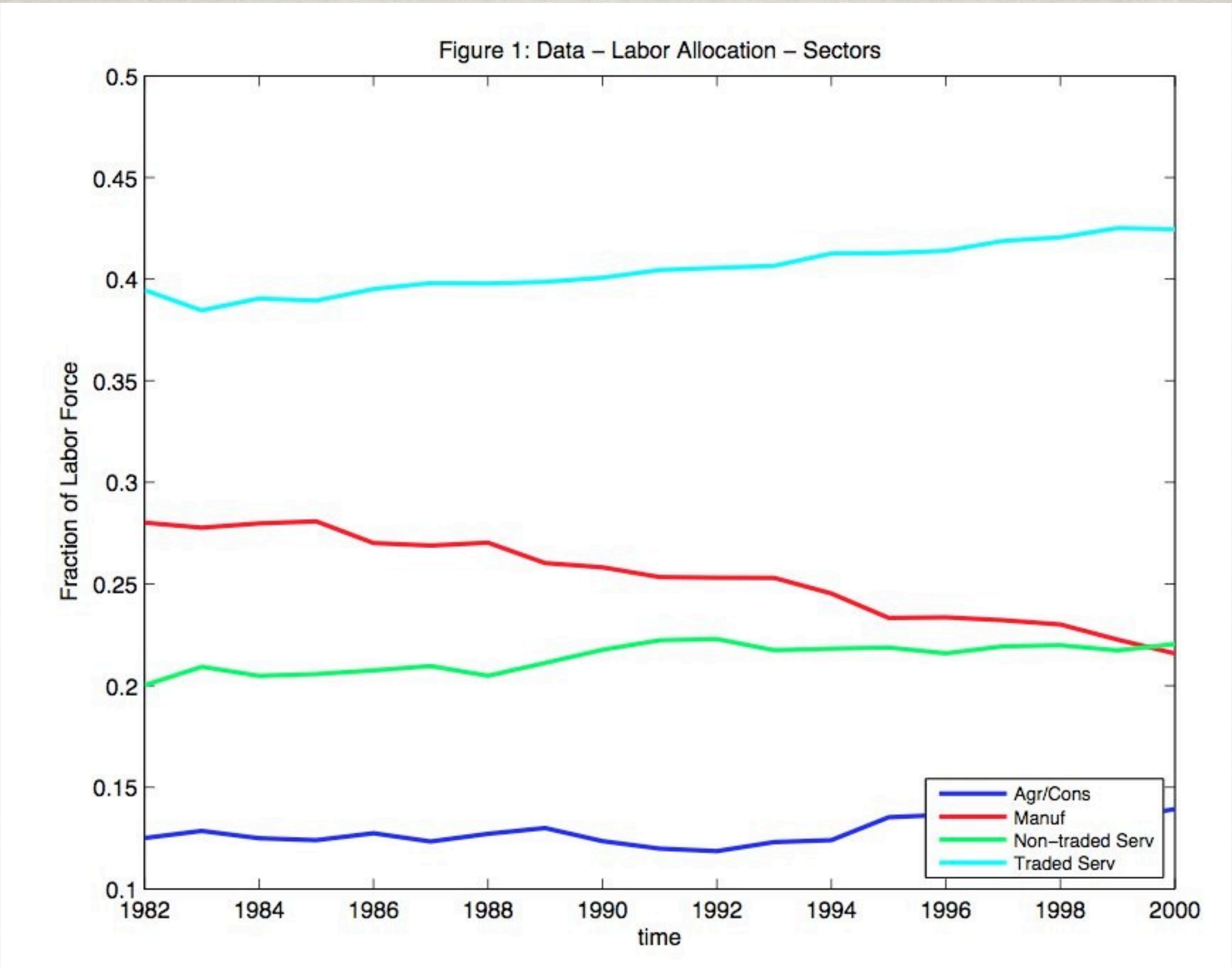


Figure 1: Data – Labor Allocation – Sectors
Fraction of Labor Force
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
time
Agr/Cons
Manuf
Non–traded Serv
Traded Serv

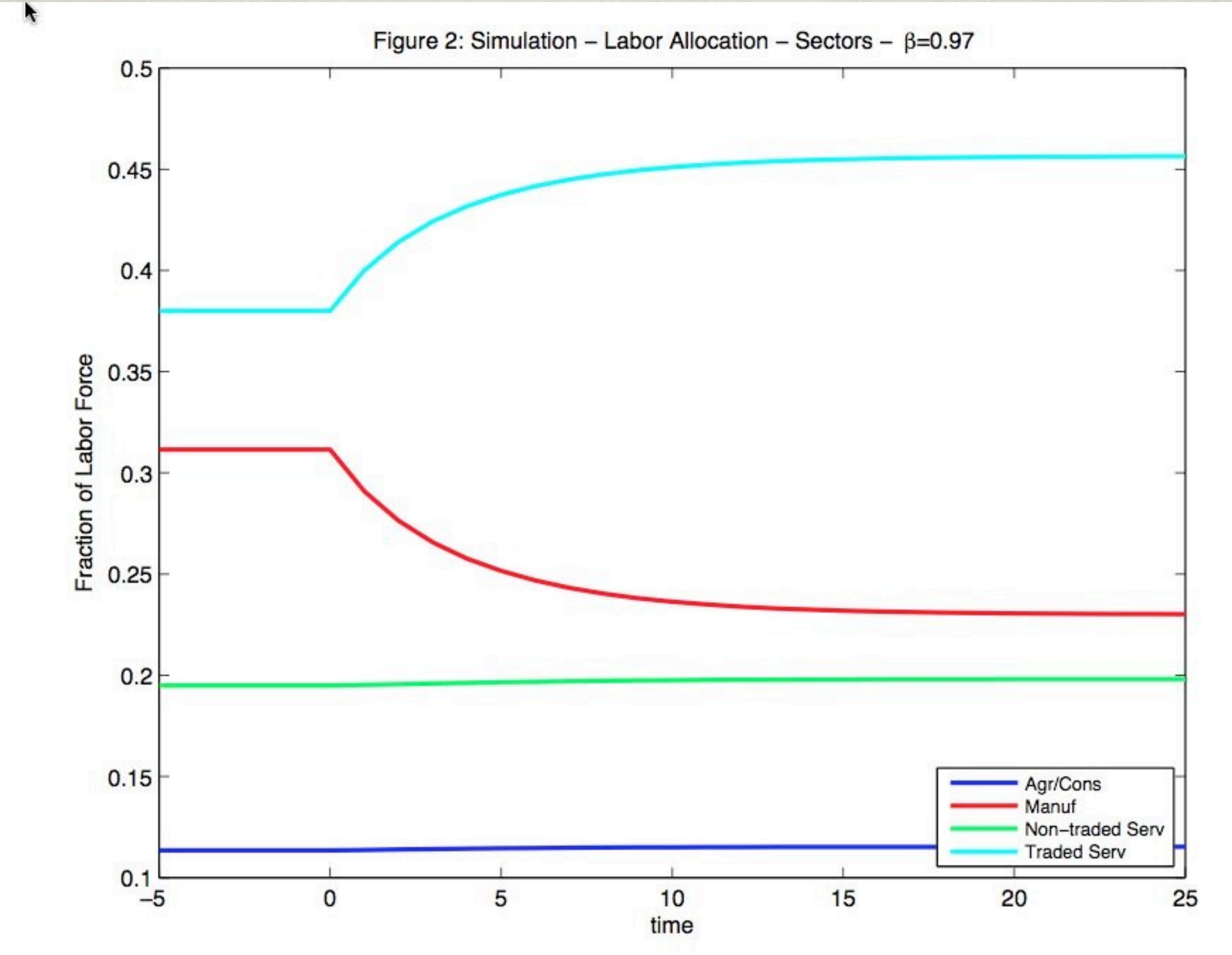


Figure 2: Simulation – Labor Allocation – Sectors – β=0.97
Fraction of Labor Force
time
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
–5
0
5
10
15
20
25
Agr/Cons
Manuf
Non–traded Serv
Traded Serv

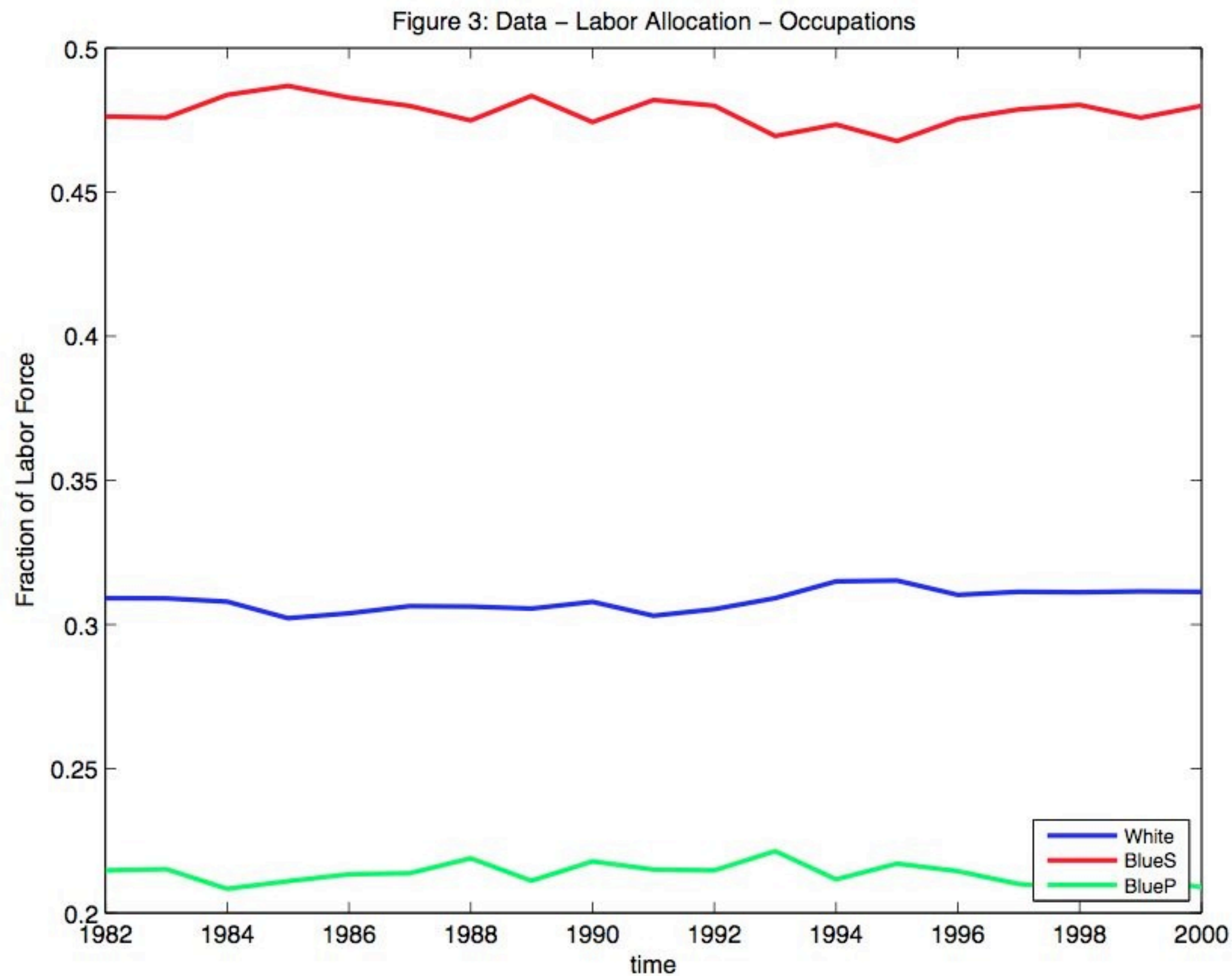


Figure 3: Data – Labor Allocation – Occupations
0.5
0.45
0.4
0.35
0.3
0.25
0.2
Fraction of Labor Force
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
time
White
BlueS
BlueP

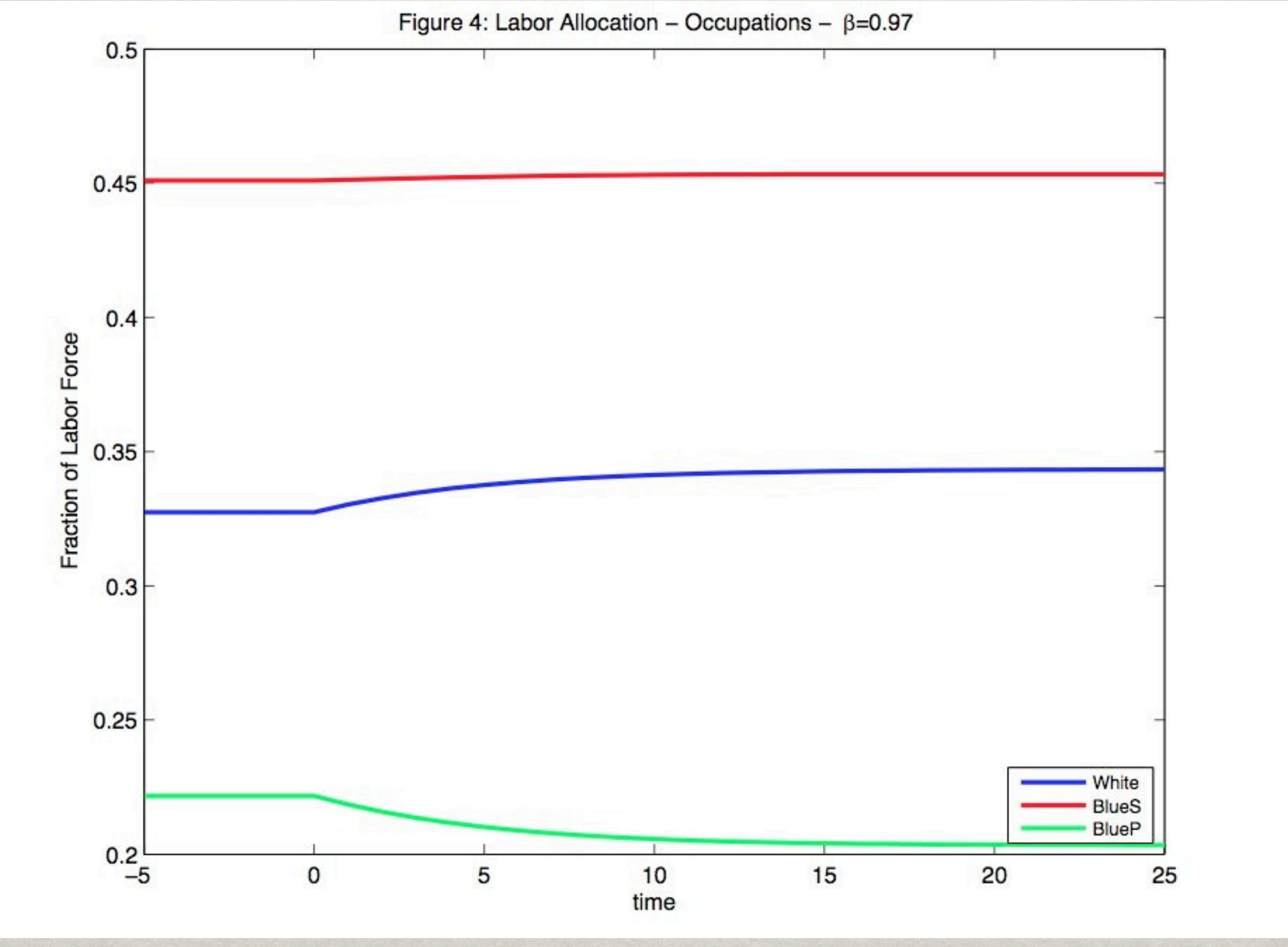


Figure 4: Labor Allocation – Occupations – β=0.97
Fraction of Labor Force
0.5
0.45
0.4
0.35
0.3
0.25
0.2
–5
0
5
10
15
20
25
time
White
BlueS
BlueP

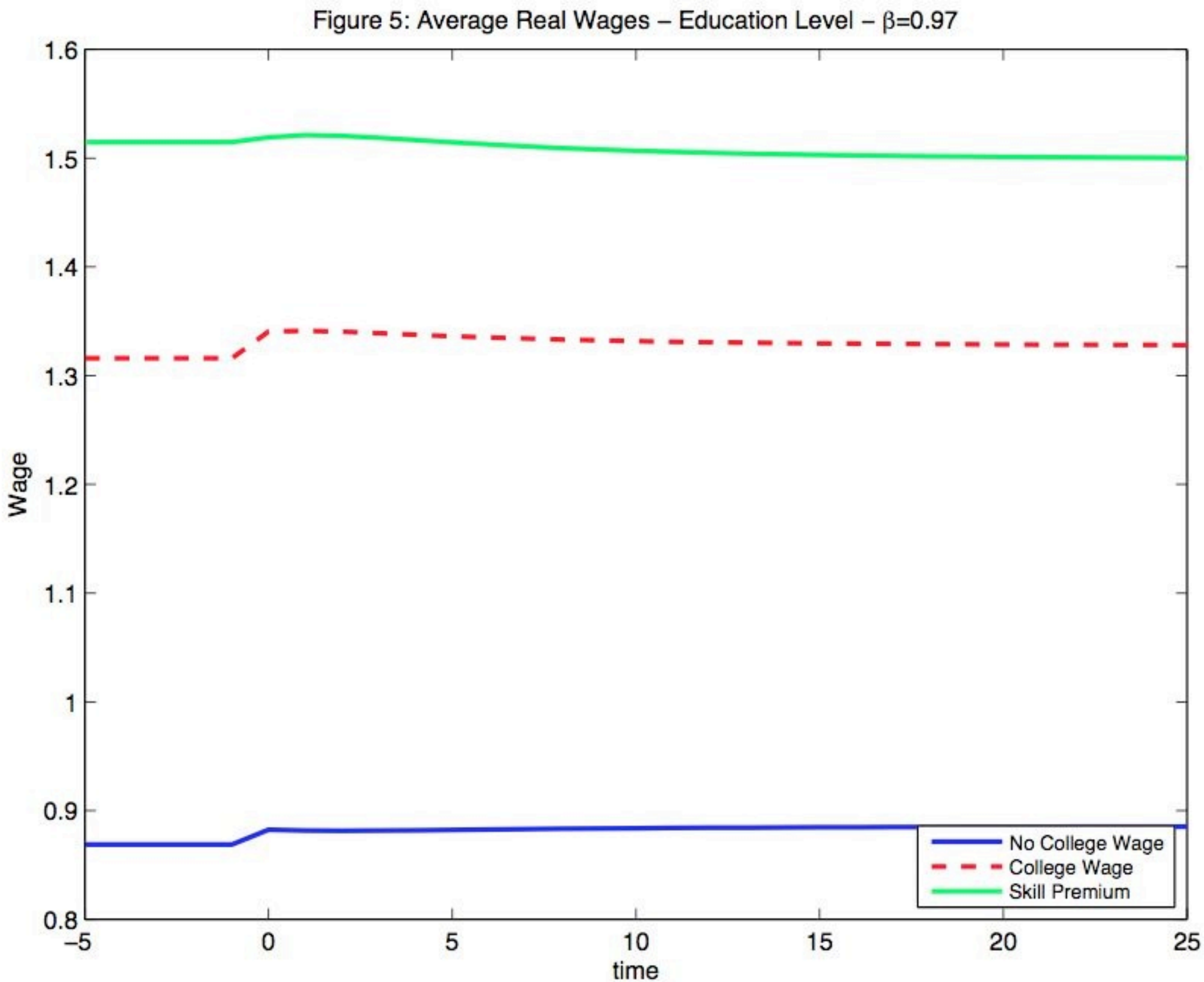


Figure 5: Average Real Wages – Education Level – β=0.97
Wage
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
–5
0
5
10
15
20
25
time
No College Wage
College Wage
Skill Premium

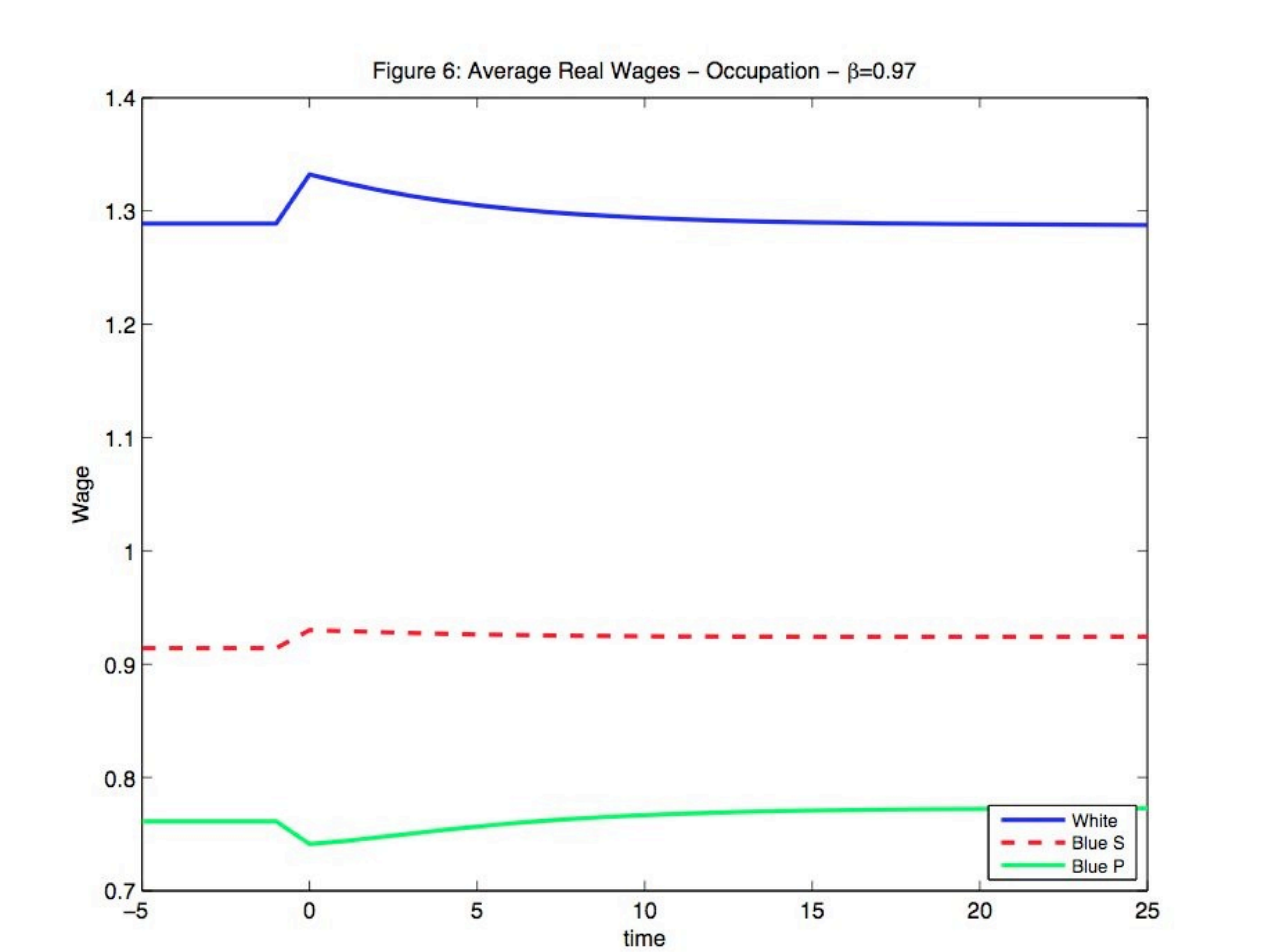


Figure 6: Average Real Wages – Occupation – β=0.97
Wage
time
White
Blue S
Blue P
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
–5
0
5
10
15
20
25

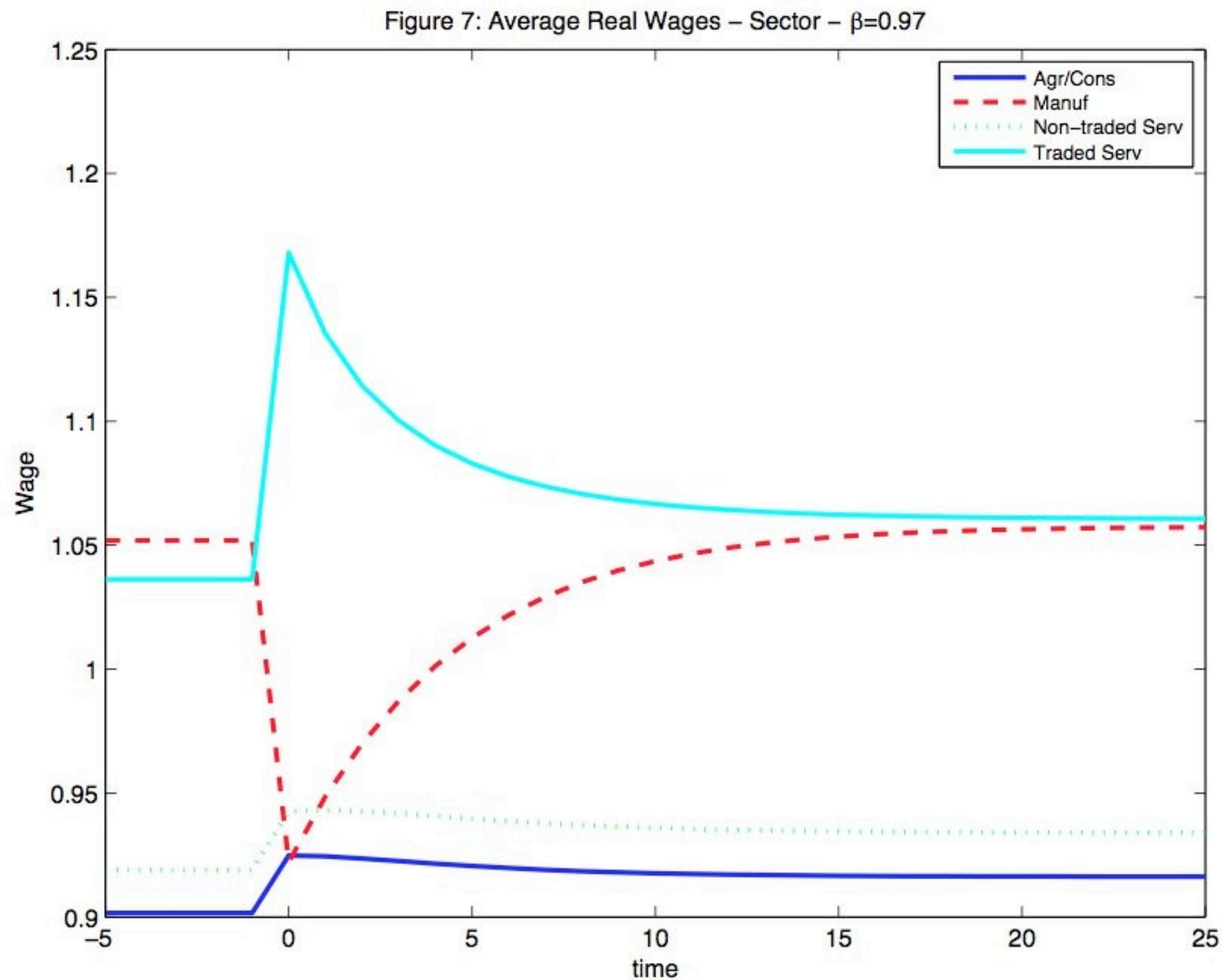


Figure 7: Average Real Wages – Sector – β=0.97
Agr/Cons
Manuf
Non–traded Serv
Traded Serv
Wage
1.25
1.2
1.15
1.1
1.05
1
0.95
0.9
–5
0
5
10
15
20
25
time

SHORT RUN (IMPACT)

Change in Wages, $\beta = 0.90$				
	Aggr/Cons	***Manuf***	***NonTraded***	***Traded***
White	2.58	-12.34	2.58	12.71
BlueS	2.58	-12.34	2.58	12.71
BlueP	2.58	-12.34	2.58	12.71

Change in Welfare, No-College, $\beta = 0.90$				
	Aggr/Cons	***Manuf***	***NonTraded***	***Traded***
White	1.92	-2.33	1.82	4.16
BlueS	1.58	-2.41	1.57	3.43
BlueP	1.31	-2.53	1.33	3.08

Change in Welfare, College, $\beta = 0.90$				
	Aggr/Cons	***Manuf***	***NonTraded***	***Traded***
White	2.09	-2.54	2.08	4.41
BlueS	1.79	-2.26	1.83	4.15
BlueP	1.48	-1.81	1.68	3.01

LONG RUN

Change in Wage, $\beta = 0.90$				
	Aggr/Cons	*Manuf*	*NonTraded*	*Traded*
White	1.35	0.63	1.58	2.08
BlueS	1.71	0.50	1.83	2.57
BlueP	2.20	0.56	2.12	2.85

Change in Welfare, No-College, $\beta = 0.90$				
	Aggr/Cons	*Manuf*	*NonTraded*	*Traded*
White	1.30	0.79	1.26	1.62
BlueS	1.26	0.59	1.25	1.58
BlueP	1.21	0.51	1.22	1.58

Change in Welfare, College, $\beta = 0.90$				
	Aggr/Cons	*Manuf*	*NonTraded*	*Traded*
White	1.38	0.80	1.41	1.73
BlueS	1.34	0.71	1.37	1.87
BlueP	1.27	0.66	1.32	1.56

Thank you …