Racial Gaps in Student Loan Repayment and Default: A Lifecycle Approach*

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EEA-ESEM, BSE, August 2023

*The views expressed here are the authors' and do not reflect the views of the Federal Reserve Board or the Federal Reserve Bank of Richmond.

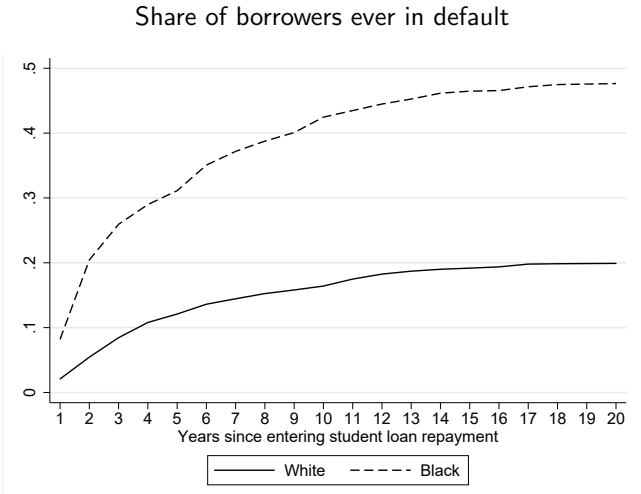
Motivation: Racial Gaps in Student Loan Default

Source: Beginning Postsecondary Students 1996 (BPS 96)

Student loan **default** defined as 270 days without payment, non-dischargeable

Black-White gaps in default:

- are large!
- arise immediately upon entering repayment
- widen over the lifecycle



This Paper

Question: To what extent can individual heterogeneity and financial circumstances at labor market entry and over the lifecycle account for Black-White default gaps?

Long-run goal: quantify the role of:

- Observable initial conditions - wealth; student debt
- Unobserved initial conditions - human capital and learning efficiency (HVY, 2011)
- Lifecycle wages - levels, risk, discrimination
- Lifecycle investment opportunities / Repayment options

Today:

- Build and calibrate model to match lifecycle moments for college graduates
- Understand implications of student debt repayment/default for lifecycle outcomes
- Study how initial conditions impact these choices across race groups

Road Map for Today's Talk

1. Empirical Evidence
2. Model and Calibration Strategy
3. Preliminary Quantitative Results

Key Facts: Borrowing and Default Across Race Groups

- Black students are slightly more likely to borrow than White students
- Black borrowers accumulate more student debt, but differences are not large
- Black borrowers more likely to use non-standard repayment plans
  - Black borrowers have slightly lower average monthly payments
  - Black borrowers pay off debt more slowly

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- Yet, Black borrowers are 2-4X more likely to default
  - Racial gap in default rate is even larger for CG than NG

Details (BPS data): BPS data | Debt and default moments | Debt by CG/NG | Default by CG/NG | Default by cohorts

Racial Gaps in Earnings and Wealth over the Lifecycle

Well-documented facts about B-W earnings and wealth (conditional on education):

- Black workers have lower average wages and lower wage growth over the lifecycle
- Black workers have greater earnings risk
- Black households have lower initial wealth and are less likely to invest in financial assets over the lifecycle

All of these may contribute to racial gaps in the ability to repay student debt

Details (CPS and SCF data): Lifecycle earnings | Initial wealth | Risky assets

Taking Stock

Collectively, the data on debt, earnings, and wealth raise several puzzling questions:

1. Why are there large gaps in default?
   - Black and White borrowers have very similar debt distributions
2. Why is B-W gap even larger for graduates than non-graduates?
   - College graduates generally earn large wage premia and are well insured against earnings shocks
3. Why is default so common?
   - For most borrowers, student debt is small relative to lifetime income and it is non-dischargeable

Our focus: Q1 & Q2

- Financial burden associated with student debt may affect the two groups in a different way in terms of decisions later in life

Takeaways for Constructing a Quantitative Model

Important Black-White differences the model should capture:

- Initial student debt distributions
- Initial wealth distributions
- Lifecycle wage processes

Model outcomes informative for our research question:

- Distributions of unobserved initial human capital and learning efficiency
- Lifecycle labor supply, human capital accumulation, and earnings
- Financial asset accumulation and portfolio choices
- Default decisions
- Repayment plans (in progress)

Model: Environment

Builds on HVY (2006, 2011), Ionescu (2009), AIN (2023)

Timing:

- Individuals begin lifecycle as college graduates (CG) or non-graduates (NG)
- Time indexed $t = 1, ..., R, ..., T$, where R = retirement and T = end of life

Preferences:

- Standard CRRA utility from consumption only

Initial Endowments:

- unobservable: learning efficiency, human capital - a, h_1
- observable: financial wealth, student debt - x_1 , d_1
- $(a, h_1, x_1) \sim F_i(a, h, x)$ and $d_1 \sim G_i(d/x_1)$, where i indicates group-specific dist. (White CG, White NG, Black CG, Black NG)

Model: Human Capital and Earnings

Risky human capital accumulation (*a la* Ben-Porath and Huggett, Ventura, & Yaron):

$$h_{t+1} = exp(z_{it})[h_t + a(h_t l_t)^{\alpha}]$$

Earnings:

$$y_{it} = \theta_i w_{it} h_t (1 - l_t)$$

where

- $z_{it} \sim N(\mu_{iz}, \sigma_{iz}^2)$ is iid shock to human capital
- w_{it} is the rental rate of human capital growing at rate g_i
- $(1 - l_t)$ is time spent working
- $\theta_i \leq 1$ is a parameter capturing racial wage discrimination

Model: Lifecycle Decisions

Repayment Phase

- Allocate time between labor and learning
- Choose consumption, borrowing/saving, asset allocation
- Choose repayment/default

Post-Repayment Phase

- Allocate time between labor and learning
- Choose consumption, borrowing/saving, asset allocation

Retirement Phase

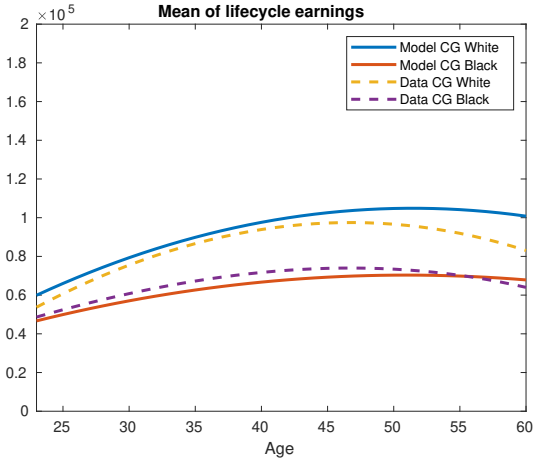
- Exogenous income - fraction of earnings in last working period
- Choose consumption, borrowing/saving, asset allocation

Details: Asset allocation | Repayment options | Repayment choice | Default choice | Repayment | Post-Repayment | Retirement

Calibration Strategy

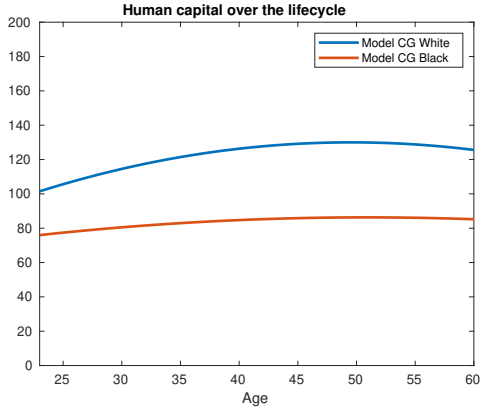
1. Set **common** exogenous "standard" parameters Details
2. Estimate observable **group-specific** parameters outside the model Details
   - initial wealth and student debt distributions
   - human capital and earnings process parameters; wage discrimination
3. Jointly calibrate **group-specific** parameters for unobservable initial conditions within the model to match key earnings moments (mean, skewness, Gini)
   - initial learning efficiency and human capital distributions Details Distrib

Model Fit: Lifecycle Earnings for White and Black College Graduates

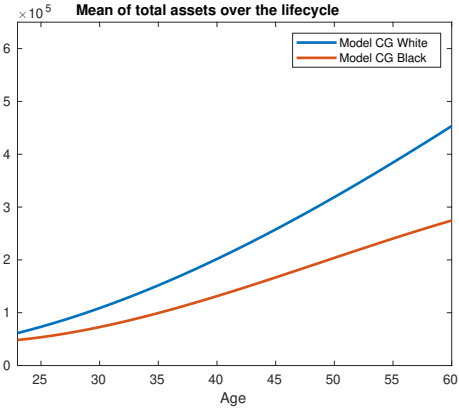


Additional earnings moments: Black CG White CG

Non-targeted lifecycle choices: human capital and financial assets



(a) Human capital



(b) Financial assets

Results: Benchmark predictions

1. What is the impact of **student debt** for lifecycle choices/outcomes?
   - human capital accumulation
   - earnings
   - financial assets
2. Who are the **defaulters**?
   - default gap is 1.7 (2 in BPS data - early default)
   - model overpredicts default for B&W (no late default, alternative repayment plans)

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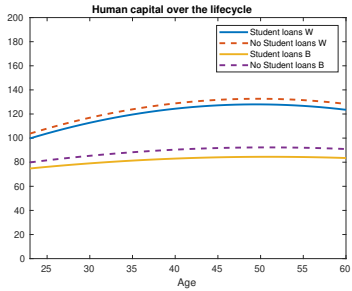
1. Student debt depresses lifecycle human capital, earnings, and wealth for B&W
   - effects larger for Black borrowers
2. Defaulters have lower human capital, earnings, wealth over the lifecycle for B&W
   - defaulters have lower levels of (a, h_1) for B&W
   - much larger differences for Black

Impact of student debt



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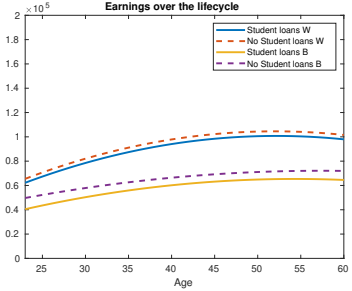
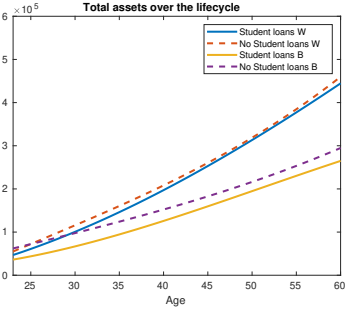


(b) Earnings



(c) Financial assets

Who are the defaulters?

Initial conditions

Characteristic	Description	White CG	Black CG
a_D	Mean defaulters	0.29	0.14
a_R	Mean repayers	0.30	0.27
h_D	Mean defaulters	60.8	32.05
h_R	Mean repayers	61.4	67.3

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h_D	Mean defaulters	60.8	32.05
h_R	Mean repayers	61.4	67.3
x_D	Mean defaulters	\$10,957	\$5,343
x_R	Mean repayers	\$9,969	\$13,057

Counterfactual experiments: Role of initial conditions

1. What is the contribution of initial conditions to the **default gap**?
   - unobservable: learning efficiency, initial human capital, (a, h_1)
   - observable: initial wealth, x_1

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   Most (83%) is coming from removing (a, h_1) differences

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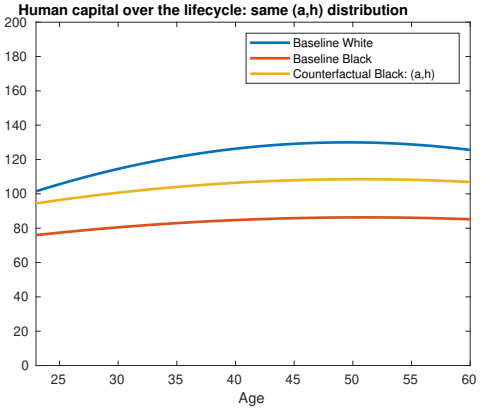
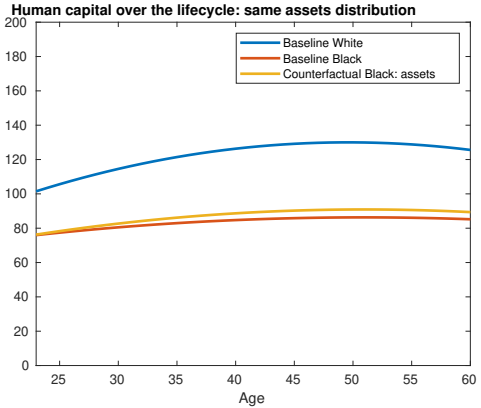
   - human capital accumulation
   - earnings
   - financial assets

   Initial (a, h_1, x_1) have very different effects:
   - Removing (a, h_1) differences has large impact for outcomes for Black borrowers
   - Removing x_1 differences has very little impact

How do initial conditions affect **human capital accumulation**?

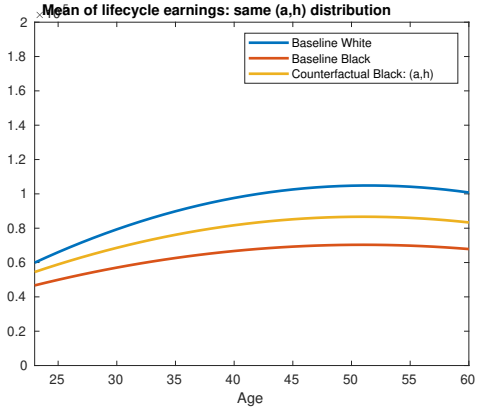


(a) Same initial (a,h) distribution



(b) Same initial asset distribution

How do initial conditions affect **lifecycle earnings**?



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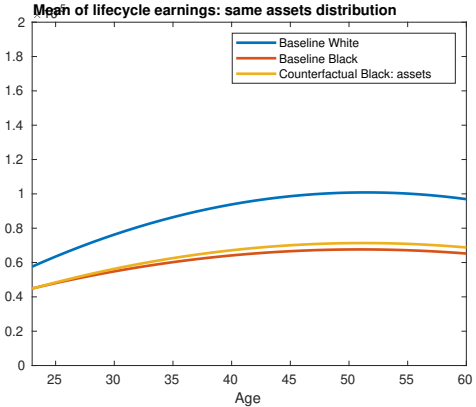
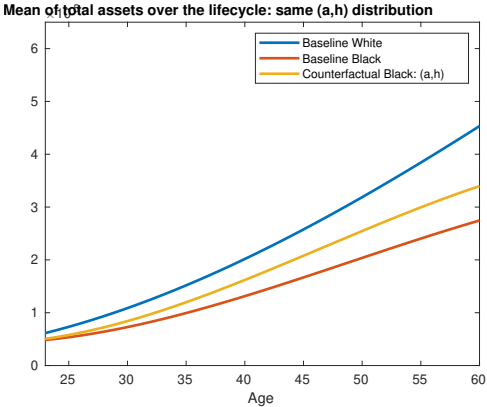


(b) Same initial asset distribution

How do initial conditions affect **financial asset accumulation**?



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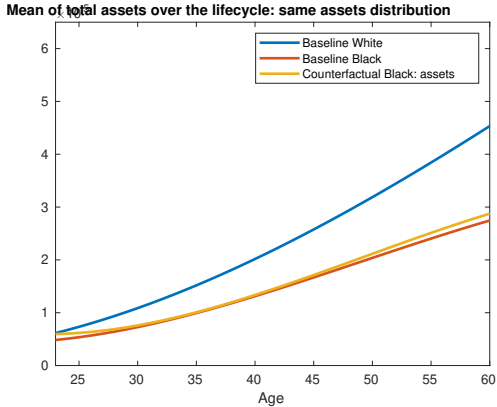

(b) Same initial asset distribution

Conclusion

- Established facts about student debt accumulation, repayment, default by race
- Built lifecycle model with risky human capital, student debt default, and portfolio choice estimated to capture observed lifecycle earnings dynamics by race
- Studied how student debt and default affect lifecycle outcomes across race groups
  - Student debt impacts lifecycle choices for both groups; effects larger for Black
  - Defaulters have lower earnings and accumulate less wealth for both W&B
- Quantified the role of observable and unobservable initial conditions for racial gap
  - Distributions of initial learning efficiency and human capital important for understanding racial gap
  - Initial assets have much smaller effects
- Suggests role for early life environs policies

Next steps

- Include and calibrate model with multiple repayment plans, non-graduates
- Quantitative decomposition: early vs. late factors
- Policy experiments (e.g., debt forgiveness, automatic income-based repayment)

EXTRA SLIDES

Student Loan Terminology

It is important to distinguish **default** from **delinquency** and **discharge**.

- A student loan is in **default** if you miss payments for 270 days. This results in large costs and severe consequences (next slide), but does *not* remove the debt.
- A student loan is **delinquent** if you miss just *one* monthly payment.
  No immediate consequences, but reported to credit bureaus after 90 days.
- Student loan **discharge** involves cancellation of the outstanding debt. This is rare, and generally occurs due to death or permanent disability, or under loan forgiveness programs for teachers or public service occupations.

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Consequences of Student Loan Default

- Entire unpaid balance (principle and interest) becomes immediately due
- Borrower is ineligible for additional federal student aid
- Reported to credit bureaus; can impede credit access for cars, real estate, etc.
- Tax refunds and federal benefit payments may be withheld for repayment
- Wages may be garnished and applied toward repayment
- Borrowers may incur collection fees, court costs, legal fees, etc.

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Student Loan Data Source: Beginning Postsecondary Students Survey

Beginning Postsecondary Students (BPS):

- Samples drawn from the National Postsecondary Student Aid Survey (NPSAS)
- We focus on cohorts who were first-year college students in 1996 and 2004

Nationally representative samples:

- $\approx$ 12,000 students in 1996 cohort
- $\approx$ 16,700 students in 2004 cohort

Survey Timing:

- Initial surveys during first year of college, follow-ups at 3 and 6 years
- 2015 supplement provides 12- and 20-year student loan performance data

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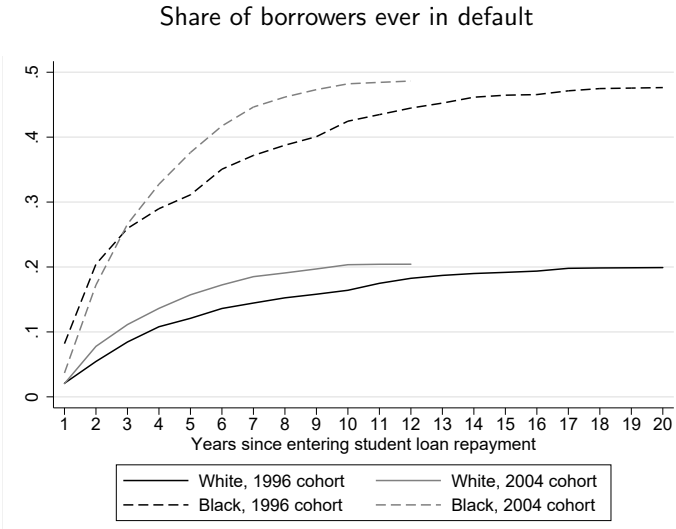
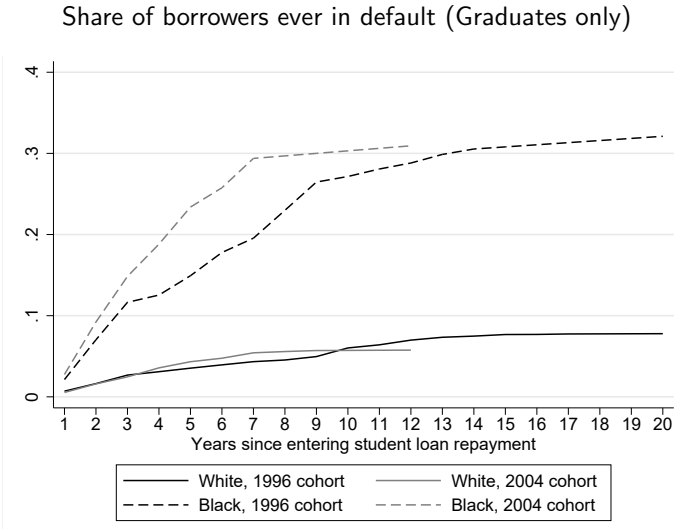
Student Loan Default Across Cohorts (All students)

Source: Beginning Postsecondary Students 1996 and 2004



Student Loan Default Across Cohorts (Graduates)

Source: Beginning Postsecondary Students 1996 and 2004



Student Loan Borrowing, Repayment, and Default

Source: Beginning Postsecondary Students 1996 (BPS 96)

	Graduates		Non-graduates	
	White	Black	White	Black
Share borrowing (%)	58.6	80.1	45.1	62.7
Mean cumulative undergrad loans ($)	15,575	19,836	12,225	13,103
Mean monthly payment in 6-year survey ($)	205	183	135	117
Share with loans fully paid at 20 years (%)	51.1	17.3	47.7	28.1
Mean amount owed/borrowed at 20 years (%)	73.1	113.6	98.1	114.6
Share ever in default at 20 years (%)	7.8	32.1	27.5	51.7

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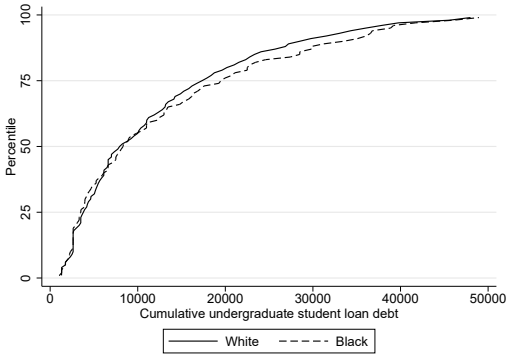
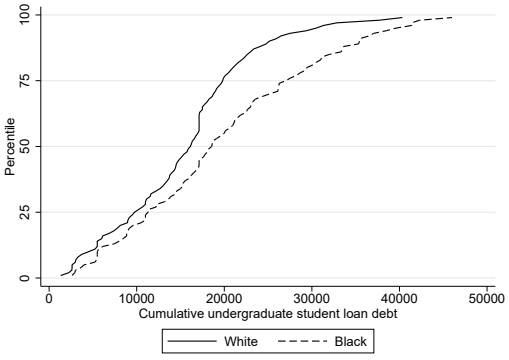
Cumulative Distributions of Undergraduate Student Debt (Principal only)

Source: Beginning Postsecondary Students 1996 (BPS 96), conditional on borrowing



(a) Non-graduates



(b) Graduates

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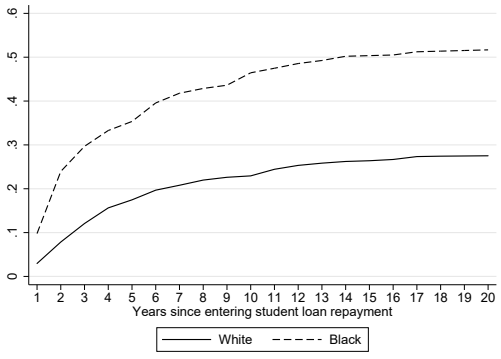
Cumulative Student Loan Default Rates by Graduation Status

Source: Beginning Postsecondary Students 1996 (BPS 96)



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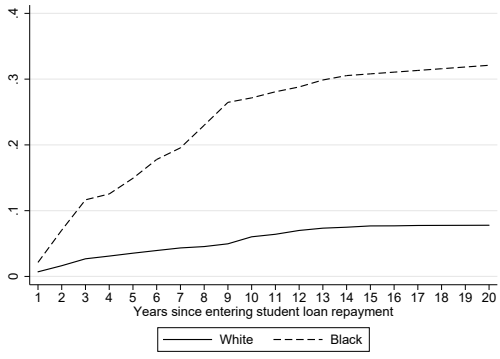

(b) Graduates

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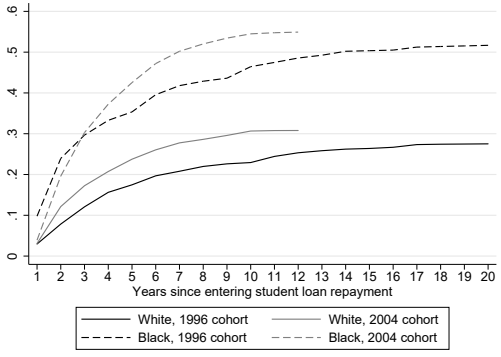
Cumulative Student Loan Default Rates: 1996 vs 2004 cohorts

Source: Beginning Postsecondary Students Surveys



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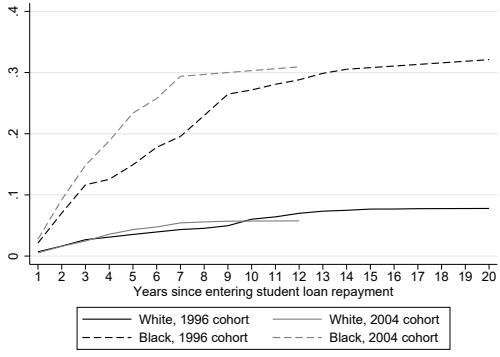

(b) Graduates

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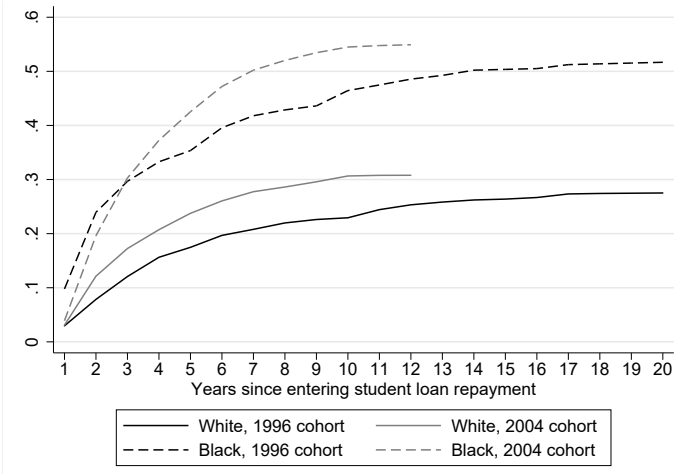
Student Loan Default Across Cohorts (Non-graduates)

Source: Beginning Postsecondary Students 1996 and 2004



Facts: Student Loan Borrowing, Repayment, and Default

Data from BPS 96

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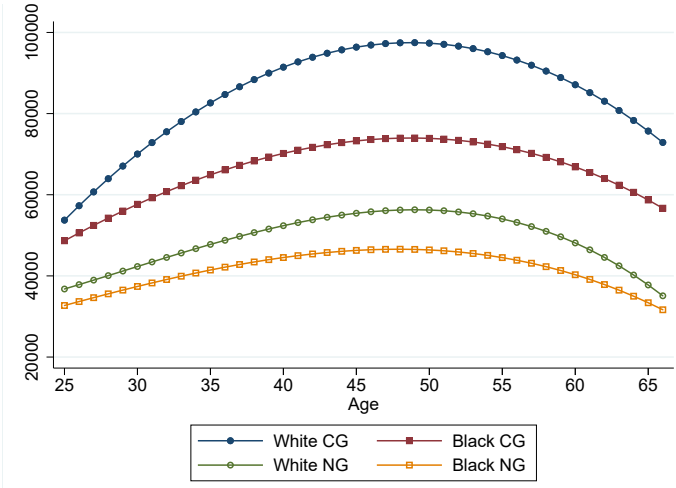
Share with loans fully paid by 20 years (%)	48.8	51.1	17.3	43.2	47.7	28.1
Avg amount owed/borrowed at 20 years (%)	79.8	73.1	113.6	101.7	98.1	114.6
Share ever in default by 20 years (%)	9.9	7.8	32.1	33.8	27.5	51.7

Average Lifecycle Earnings by Race and College Attainment

Source: Current Population Survey (CPS) 1968–2013, amounts in 2019 dollars



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Early Life ("Initial") Wealth

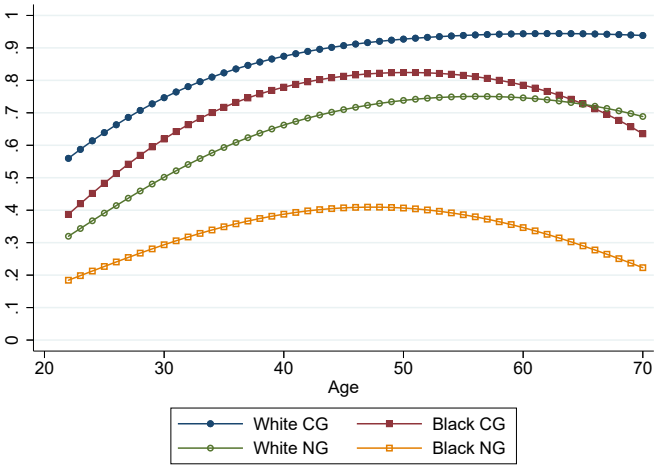
Source: Survey of Consumer Finances (1989–2019), age < 26, normalized to White college graduates

		Graduates		Non-graduates	
		White	Black	White	Black
Assets:	Mean	1.00	0.62	0.56	0.59
	Median	1.00	0.53	0.51	0.24
	S.D.	1.00	1.26	0.45	1.13
Net Worth:	Mean	1.00	0.43	0.58	0.84
	Median	1.00	-0.13	0.56	0.06
	S.D.	1.00	1.26	0.45	1.17

Back

Stock Market Participation Rates over the Lifecycle

Source: Survey of Consumer Finances (1989–2019)



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Model: Financial Assets

- Risk-free asset b_t
  - Savings ($b_t \geq 0$) earn risk-free rate R_f
  - Borrowing ($b_t < 0$) at rate $R_b = R_f + \phi$, non-defaultable, and subject to a limit $\underline{b}$
- Risky asset s_t
  - Earns return $R_{s,t+1} = R_f + \mu + \eta_{t+1}$
    - μ is mean excess return
    - $\eta_{t+1} \sim N(0, \sigma_\eta^2)$ is iid shock to excess return
  - Short sales constraint $s \geq 0$
- Financial wealth

$$x_t = R_j b_t + R_{s,t} s_t$$

with $R_j = R_f$ if $b_t \geq 0$ and $R_j = R_b$ if $b_t < 0$

Back to Lifecycle Overview

Model: Student Loan Repayment and Default Options

1. Standard repayment
   - 10 year term fully repays loan
   - fixed payments per period
2. Income-based repayment
   - 20 year term with any remaining principle forgiven
   - payments equal a fraction of current income above some threshold level
3. Default
   - No payment in period of default
   - Proportional penalty added to principle and subject to future wage garnishment

Back to Lifecycle Overview

Decision Problem: Retirement Phase

$$V^R(t,a,x,y_J+\tau_J) = \max_{b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_\eta V^R(t+1,a,x',y_J+\tau_J) \right\},$$

where

$$\begin{aligned} c+b'+s' &\leq \varphi(y_J+\tau_J)+x \\ b' &\geq \underline{b} \\ x' &= R_j b' + (R_f+\mu+\eta)s' \end{aligned}$$

and $R_j = R_f$ if $b \geq 0$, and $R_j = R_b$ if $b < 0$

Back to Lifecycle Overview

Decision Problem: Post-Repayment Phase

$$V^{PR}(t,a,h,x,z) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} V^{PR}(t+1,a,h',x',z') \right\}$$

where

$$\begin{aligned} c + b' + s' &\leq \theta w h (1-l) + x + \tau(t,y,x) \text{ for } t = t_P, .., J \\ l &\in [0,1] \\ h' &= exp(z')[h + a(hl)^{\alpha}] \\ b' &\geq \underline{b} \\ x' &= R_j b' + (R_f + \mu + \eta) s' \end{aligned}$$

and $R_j = R_f$ if $b \geq 0$, and $R_j = R_b$ if $b < 0$.

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Decision Problem: Repayment Phase without Default Choice

$$V^{SR}(t,a,h,x,z,d) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} V^{SR}(t+1,a,h',x',z',d') \right\}$$

where

$$\begin{aligned}
c + b' + s' &\leq \theta w h (1-l) + x + \tau(t,y,x) - p_{SR} \text{ for } t = 1,..,P \\
l &\in [0,1] \\
h' &= exp(z')[h + a(hl)^{\alpha}] \\
d' &= (d - p_{SR})(1 + r_g) \\
b' &\geq \underline{b} \\
x' &= R_j b' + (R_f + \mu + \eta) s'
\end{aligned}$$

and $R_j = R_f$ if $b \geq 0$, and $R_j = R_b$ if $b < 0$.

Decision Problem: Repayment Under Standard Plan

$$V^{SR}(t,a,h,x,z,d) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} \max[V^{SR}(t+1,a,h',x',z',d'), V^{D}(t+1,a,h',x',z'), V^{IR}(t+1,a,h',x',z')] \right\}$$

where

$$\begin{aligned} c + b' + s' &\leq \theta w h (1-l) + x + \tau(t,y,x) - p_{SR} \text{ for } t = 1,..,P \\ l &\in [0,1] \\ h' &= exp(z')[h + a(hl)^{\alpha}] \\ d' &= (d - p_{SR})(1 + r_g) \\ b' &\geq \underline{b} \\ x' &= R_j b' + (R_f + \mu + \eta) s' \end{aligned}$$

and $R_j = R_f$ if $b \geq 0$, and $R_j = R_b$ if $b < 0$.

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Decision Problem: Repayment Under Income-Based Plan

$$V^{IR}(t,a,h,x,z,d) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} V^{IR}(t+1,a,h',x',z',d') \right\}$$

where

$$\begin{aligned}
c + b' + s' &\leq \theta w h (1-l)(1-\gamma) + x + \tau(t,y,x) \text{ for } t = k,..,P' \\
l &\in [0,1] \\
h' &= exp(z')[h + a(hl)^{\alpha}] \\
d' &= (d - p_{IR})(1 + r_g),\ d > 0 \\
b' &\geq \underline{b} \\
x' &= R_j b' + (R_f + \mu + \eta) s'
\end{aligned}$$

and $R_j = R_f$ if $b \geq 0$, and $R_j = R_b$ if $b < 0$.

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Decision Problem: Default in Current Period

$$V_i^D(t,a,h,x,z,d) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} V^{AD}(t+1,a,h',x',z',d') \right\}$$

where

$$\begin{aligned}
c + b' + s' &\leq \theta w h (1-l)(1-\rho) + x + \tau(t,y,x) \text{ for } t = q \\
l &\in [0,1] \\
h' &= exp(z')[h + a(hl)^{\alpha}] \\
d' &= d(1+\chi)(1+r_g), \;\; d > 0 \\
b' &\geq \underline{b} \\
x' &= R_j b' + (R_f + \mu + \eta) s'
\end{aligned}$$

Back to Lifecycle Overview

Decision Problem: Periods After Default

$$V^{AD}(t,a,h,x,z,d) = \max_{c,l,b',s'} \left\{ \frac{c^{1-\sigma}}{1-\sigma} + \beta \mathbb{E}_{\eta,z'} V^{AD}(t+1,a,h',x',z',d') \right\} \text{ for } t = q+1,..,P$$

where

$$\begin{aligned}
c + b' + s' &= \theta w h (1-l) + x + \tau(t,y,x) - p_{AD} \\
l &\in [0,1] \\
h' &= exp(z')[h + a(hl)^{\alpha}] \\
d' &= (d - p_{AD})(1 + r_g),\ d > 0 \\
b' &\geq \underline{b} \\
x' &= R_j b' + (R_f + \mu + \eta) s'
\end{aligned}$$

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Calibration: Common Exogenous Parameters

Parameter	Description	Value
T	Model periods (years)	54
J	Working periods	34
β	Discount factor	0.96
σ	Coeff. of risk aversion	2
α	Human capital elasticity	0.7
$\underline{\tau}$	Minimal income level	$\$17,936$
φ	Fraction of income in retirement	0.93
R_f	Risk-free rate	1.02
R_b	Borrowing rate	1.11
μ	Mean equity premium	0.06
σ_η	S.D. of shocks to risky asset return	0.157
P	Standard student loan repayment period	10
R_g	Student loan interest rate	1.04

Back to calibration

Calibration: Group-Specific Parameters Estimated Outside the Model

Parameter	Description	White CG	Black CG
g	Growth of human capital rental rate	0.0014	0.0013
μ_z	Mean human capital shock	-0.022	-0.019
σ_z	SD of human capital shock	0.105	0.110
μ_x	Mean initial wealth	\$88,080	\$37,901
σ_x	SD of initial wealth	\$761,556	\$956,280
$\underline{b}$	Consumer credit limit	\$38,400	\$21,425
θ	Wage discrimination	1.00	0.88

Back to calibration

Calibration: Group-Specific Student Loan Distributions

Empirical student loan distributions used in model simulations (decile midpoints):

Decile	White NG	Black NG	White CG	Black CG
1	1,844	1,807	2,933	4,063
2	2,969	2,734	6,686	7,632
3	4,063	3,540	10,030	12,073
4	5,396	5,139	12,766	15,195
5	7,041	7,475	15,217	17,691
6	9,644	10,313	16,688	19,910
7	13,063	14,362	17,943	23,365
8	17,713	19,665	19,995	27,777
9	24,750	28,156	23,215	32,764
10	38,849	42,019	33,121	40,741

Calibration: Group-Specific Parameters Estimated Within the Model

Parametric approach: For each group i, assume joint log-normal distribution characterized by the vector of parameters $\gamma_i = (\mu_a, \sigma_a, \mu_h, \sigma_h, \rho_{ah})$.

- Find γ_i that solves

$$\min_{\gamma_i} \left(\sum_{j=1}^{J} |log(m_{j,i}/m_j(\gamma_i))|^2 + |log(g_{j,i}/g_j(\gamma_i))|^2 + |log(d_{j,i}/d_j(\gamma_i))|^2 \right)$$

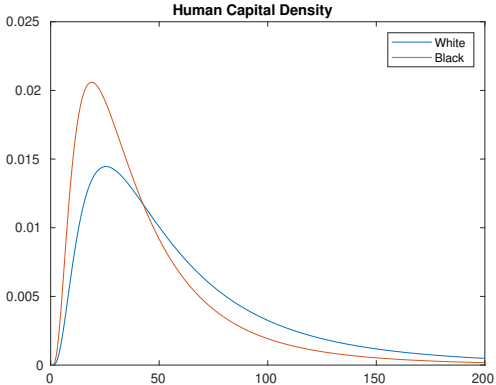
where m_j, g_j, and d_j are the mean, dispersion, and inverse skewness of earnings

Calibration: Jointly chosen parameters for initial (a,h) distribution

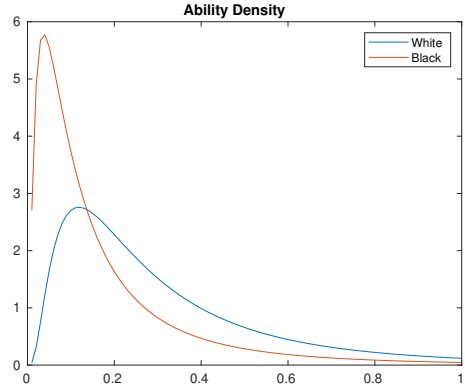
Parameter	Description	White CG	Black CG
μ_a	Mean learning efficiency	0.35	0.20
σ_a	S.D. of learning efficiency	0.36	0.29
$\frac{\sigma_a}{\mu_a}$	C.V. of learning efficiency	1.03	1.44
μ_h	Mean human capital	65.2	45.5
σ_h	S.D. of human capital	60.9	40.6
$\frac{\sigma_h}{\mu_h}$	C.V. of human capital	0.93	0.89
ϱ_{ah}	Corr (a,h)	0.57	0.61
ϱ_{ax}	Corr (a,x)	0.54	0.18
ϱ_{hx}	Corr (h,x)	0.47	0.15

Back to calibration

Unobserved heterogeneity: initial human capital and productivity



(a) Initial Human Capital



(b) Learning Efficiency

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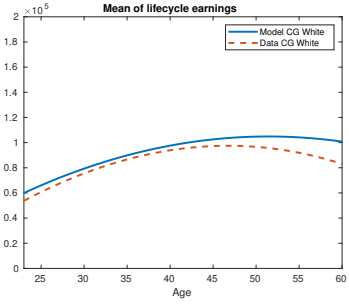
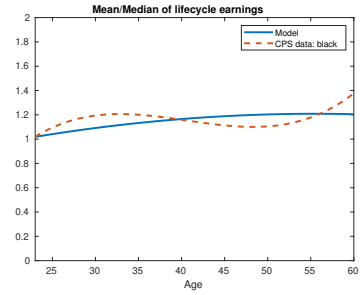
Targeted Moments: Lifecycle Earnings for Black Graduates



(a) Mean

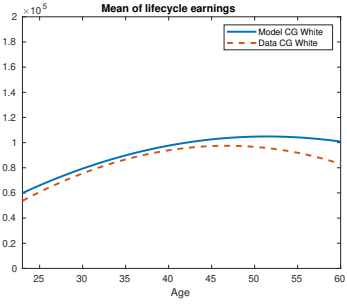


(b) Mean/Median

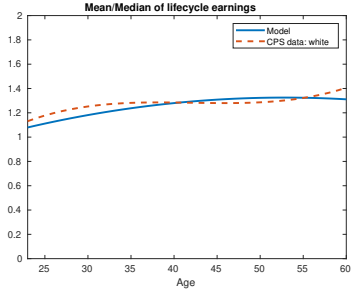
(c) Gini

Back to model fit

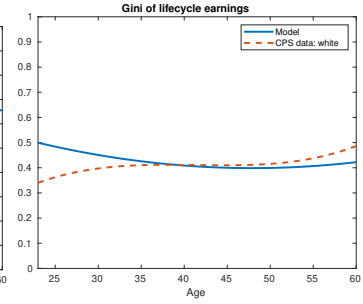
Targeted Moments: Lifecycle Earnings for White Graduates



(a) Mean



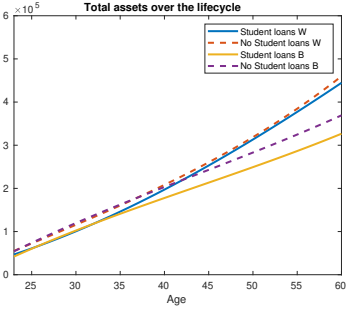
(b) Mean/Median



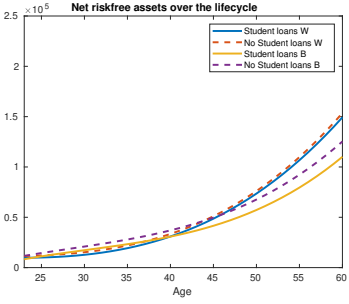
(c) Gini

Back to model fit

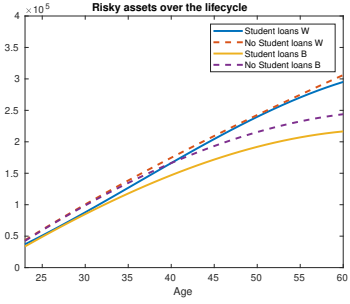
Impact of student debt: financial asset accumulation



(a) Total assets



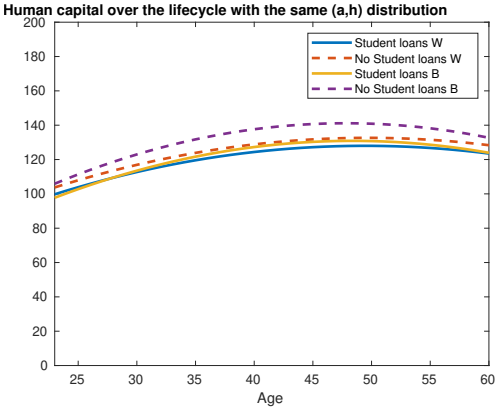
(b) Risk-free assets



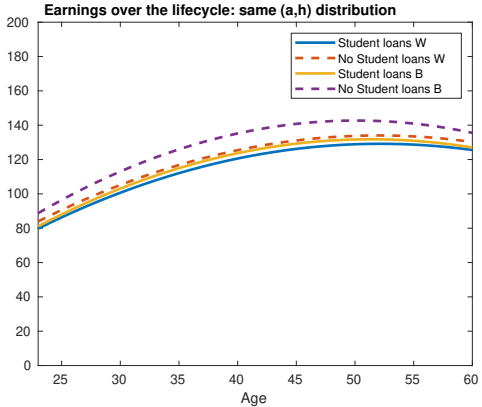
(c) Risky assets

Back

How do **student loans** interact with initial conditions (a,h)?

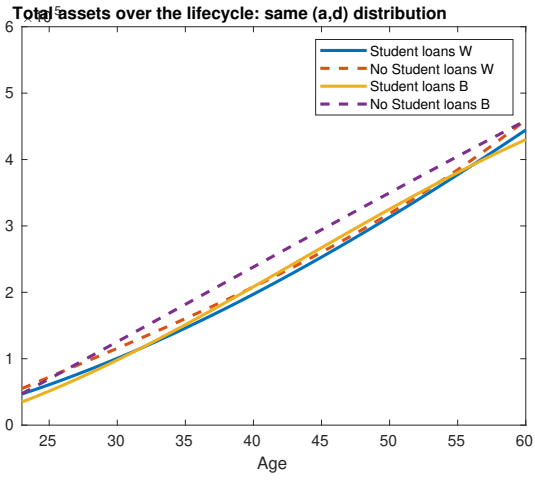


(a) Impact on human capital



(b) Impact on lifecycle earnings

How do **student loans** interact with initial conditions (a,h)?



Impact on asset accumulation

Omitted from the Model

Many other dimensions may also matter for student loan repayment/default:

- Marriage/divorce rates, household composition
- Consumption shocks, risk sharing arrangements
- Differences in risk aversion, discount rates
- Inter vivos transfers over the lifecycle
- Graduate education, graduate school debt
- Heterogeneity in retirement age, life expectancy
- Large consumption purchases (houses, cars, etc.)
- Intergenerational dynamics (parenthood, children's edu, bequests, etc.)

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