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Applying Longitudinal Data Analysis Methods to Examine Poverty as a Predictor of Wage Trajectories

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Acknowledgements

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Overview

- Many research and policy questions are essentially questions about variation and change
- We can understand variation and change using multilevel growth models
- Applied example using growth models to understand wage data from the Maryland Longitudinal Data System (MLDS)
- Discussion

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Many research and policy questions are essentially questions about variation and change

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Examples from the MLDS Research Agenda

- What are the workforce outcomes for students who earn a high school diploma but do not transition to postsecondary education or training?
- Are exiters of Maryland colleges successful in the workforce?

⇒ ***How do individuals' wages change upon attainment of college degrees?***

- Other examples: impact of new policy or intervention

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We can understand variation and change using multilevel growth models

Modeling variation and change

- Multilevel approach: Repeated measures nested within individuals

- Outcome = intercept + slope(time) *(Recall Y = mX + B)*
  - Intercept: Average starting point
  - Slope: Average rate of change over time

- How does that trajectory change based on:
  - Events such as degree attainment
  - Demographic characteristics such as race and gender

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Applied example: Using growth models to understand wage data from the MLDS

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Research questions

1. What is the average quarterly wage in the first quarter after attainment of high school diploma? How much do wages change over time, on average?

2. How do wage trajectories vary by county and industry sector?

3. How do wage trajectories change upon enrollment in college and attainment of college degrees?

4. How do wage trajectories and college enrollment and degree effects vary by race, gender, and past poverty experiences?

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The MD Longitudinal Data System

- Links individuals' PK-12, postsecondary, and wage data
- All individuals with an education record (public PK-12 and/or postsecondary) in Maryland
- Starting in 2007-2008 school year
- Wage data come from data files submitted to the state by all employers subject to Unemployment Insurance (excludes federal government, military, independent contractors)
- College data come from MD colleges and National Student Clearinghouse

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Description of sample

- Students in 6th grade in 2007-2008 who did not transfer out of MD public schools
  - With at least one quarter of wage data
  - Never enrolled in college *or* only attended one type of college in MD (n=33,460)
- 12 quarters of wage data on average
- Total 384,806 observations
- 51% female, 49% male
- 35% Black, 65% not Black
- Poverty (FARMS eligibility grades 6-12)
  - 52% never FARMS, 48% ever FARMS

Using growth models with MLDS

- Quarterly wage data post-HS graduation
  - Quarterly log wages = intercept + slope(time)
  - Formally: $Y_{ti} = \pi_{0i} + \pi_{1i}time_{ti} + e_{ti}$

    $\pi_{0i} = \beta_{00} + u_{0i}$ $\pi_{1i} = \beta_{10} + u_{1i}$
- Multilevel approach allows for partitioning of variance
  - Within individual (between occasions) vs. between individuals
  - 46% of variance in wages is due to variation within individuals over time (ICC = 0.46)
  - 54% of variance in wages is due to variation between individuals

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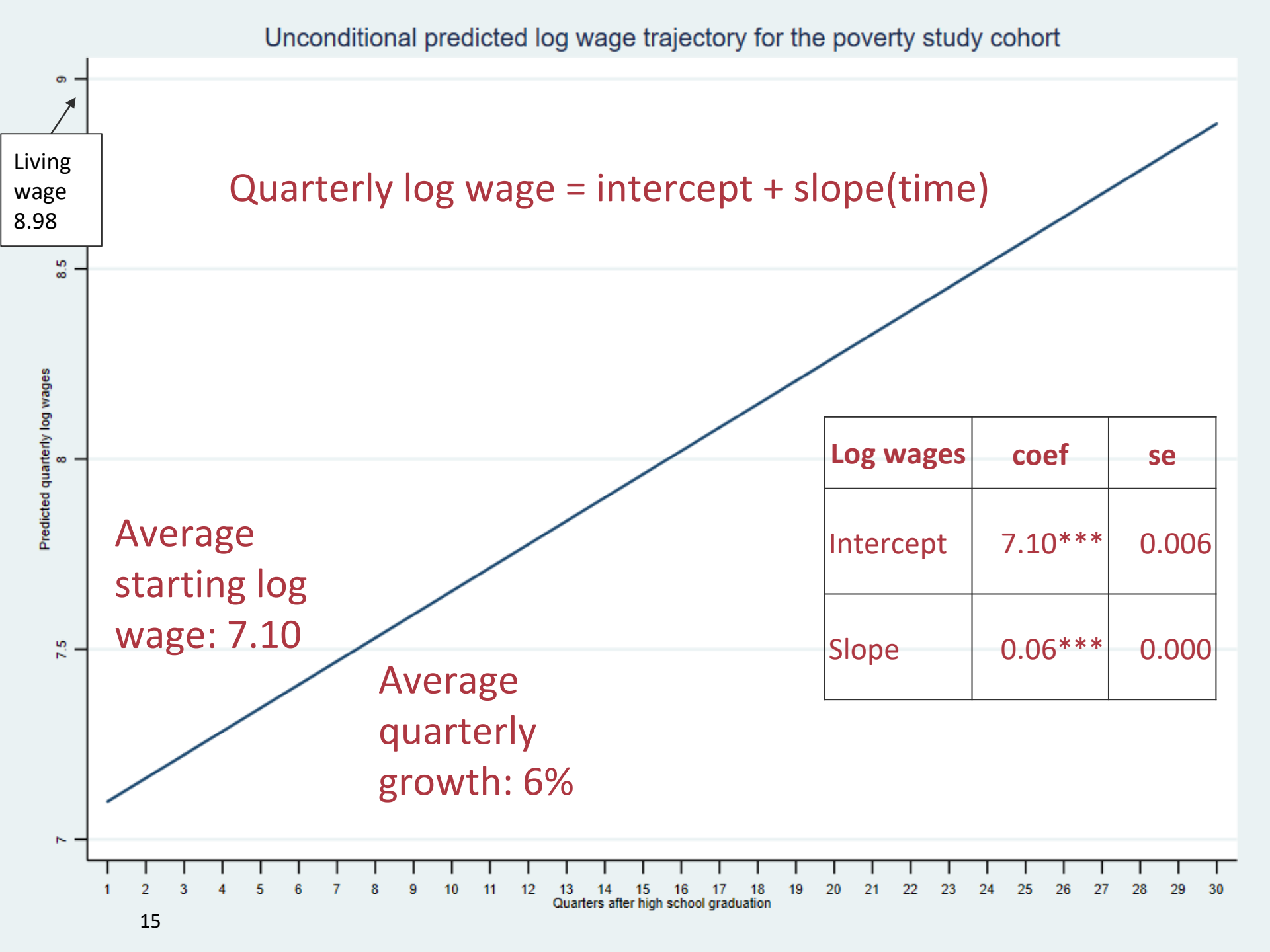
Research questions

1. What is the average quarterly wage in the first quarter after attainment of high school diploma? How much do wages change over time, on average?


Unconditional predicted log wage trajectory for the poverty study cohort
Living wage 8.98
Quarterly log wage = intercept + slope(time)
Average starting log wage: 7.10
Average quarterly growth: 6%
Log wages | coef | se
Intercept | 7.10*** | 0.006
Slope | 0.06*** | 0.000
Predicted quarterly log wages
Quarters after high school graduation


Unconditional predicted wage trajectory for the poverty study cohort
Living wage $7,913
Converted from log wages to dollar wages
Predicted quarterly wages
0
2000
4000
6000
8000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Quarters after high school graduation

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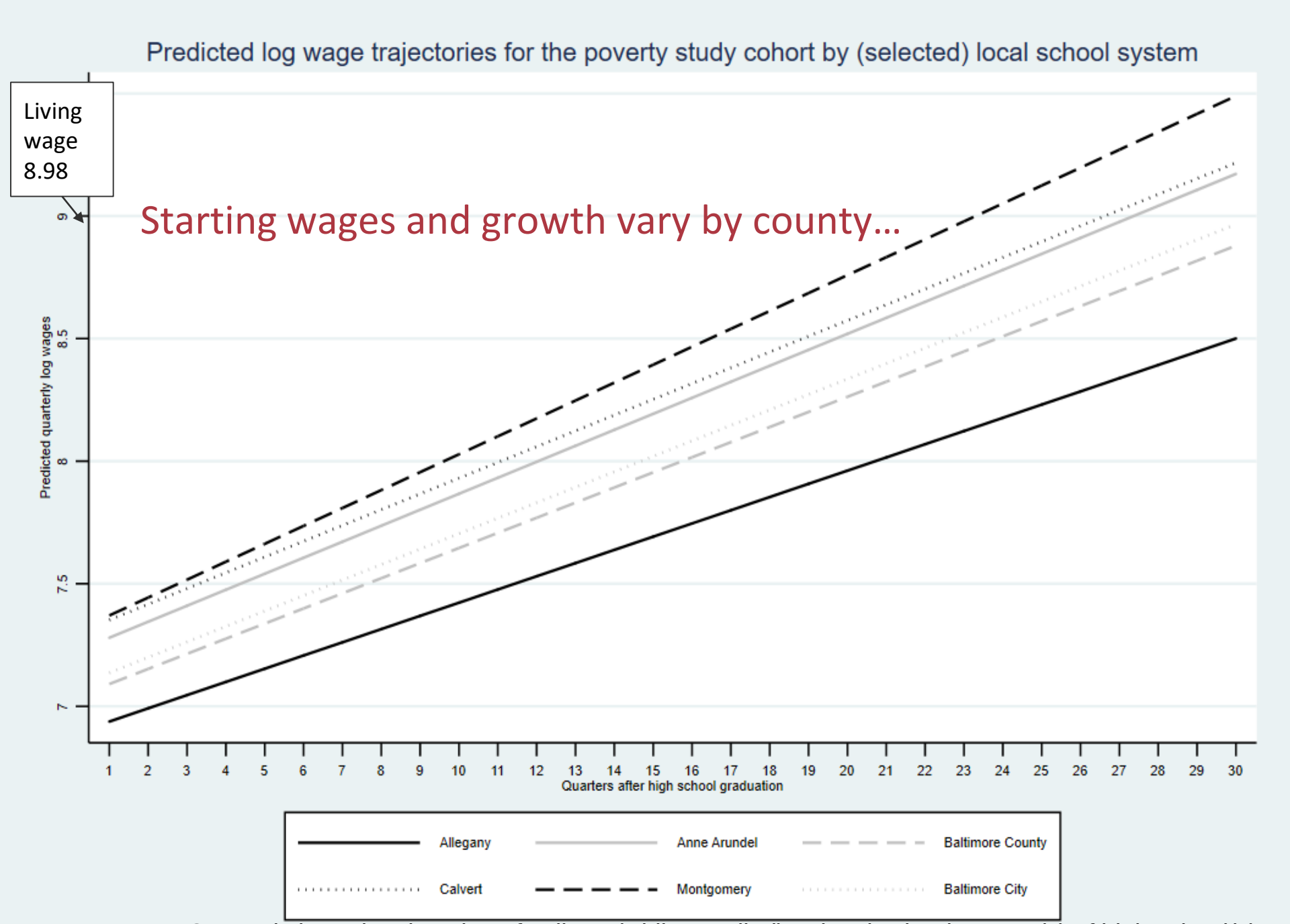
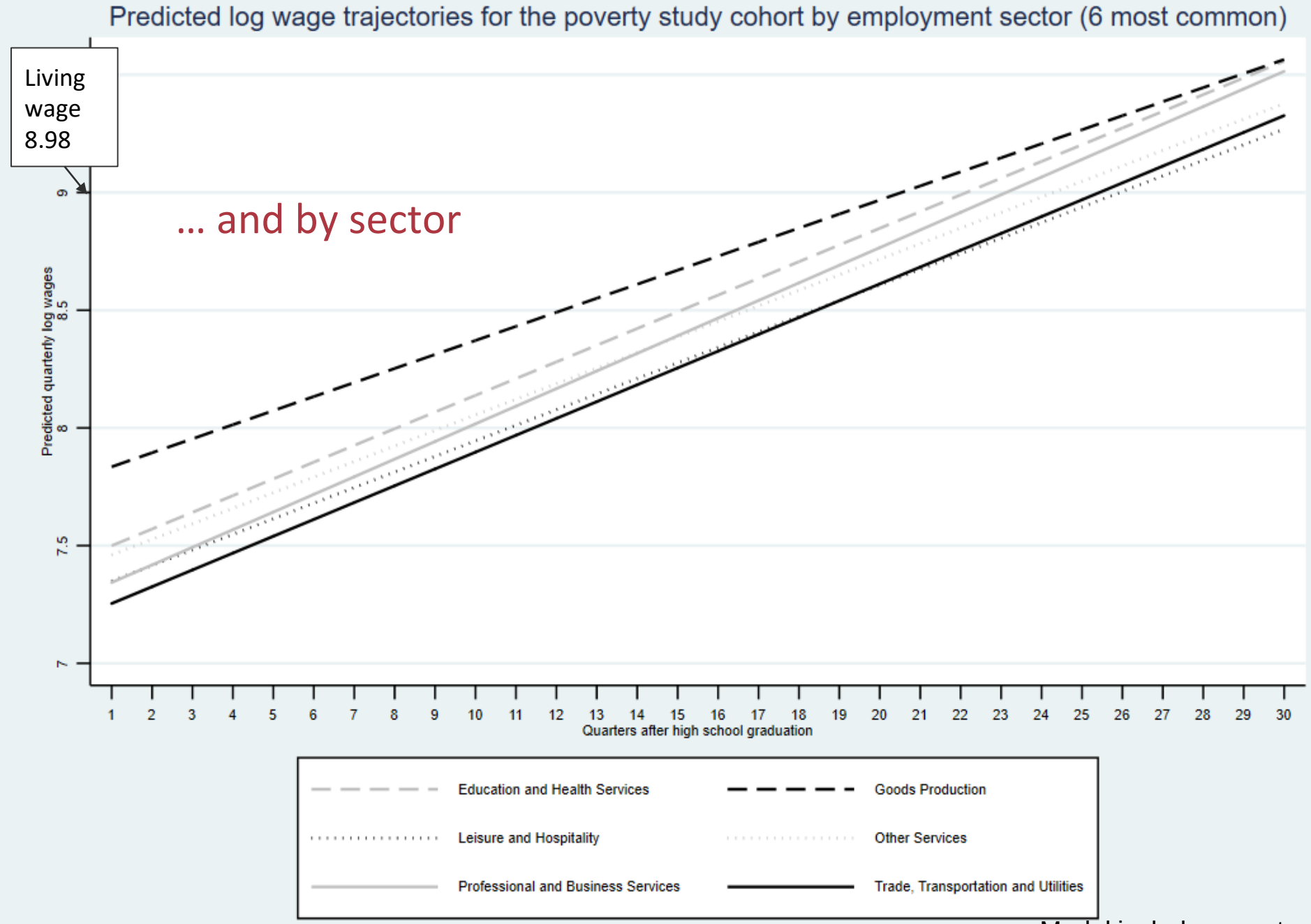
Research questions

2. How do wage trajectories vary by county and industry sector?



 County is based on location of college (while enrolled) or local school system(s) of high school(s).



Model includes county.

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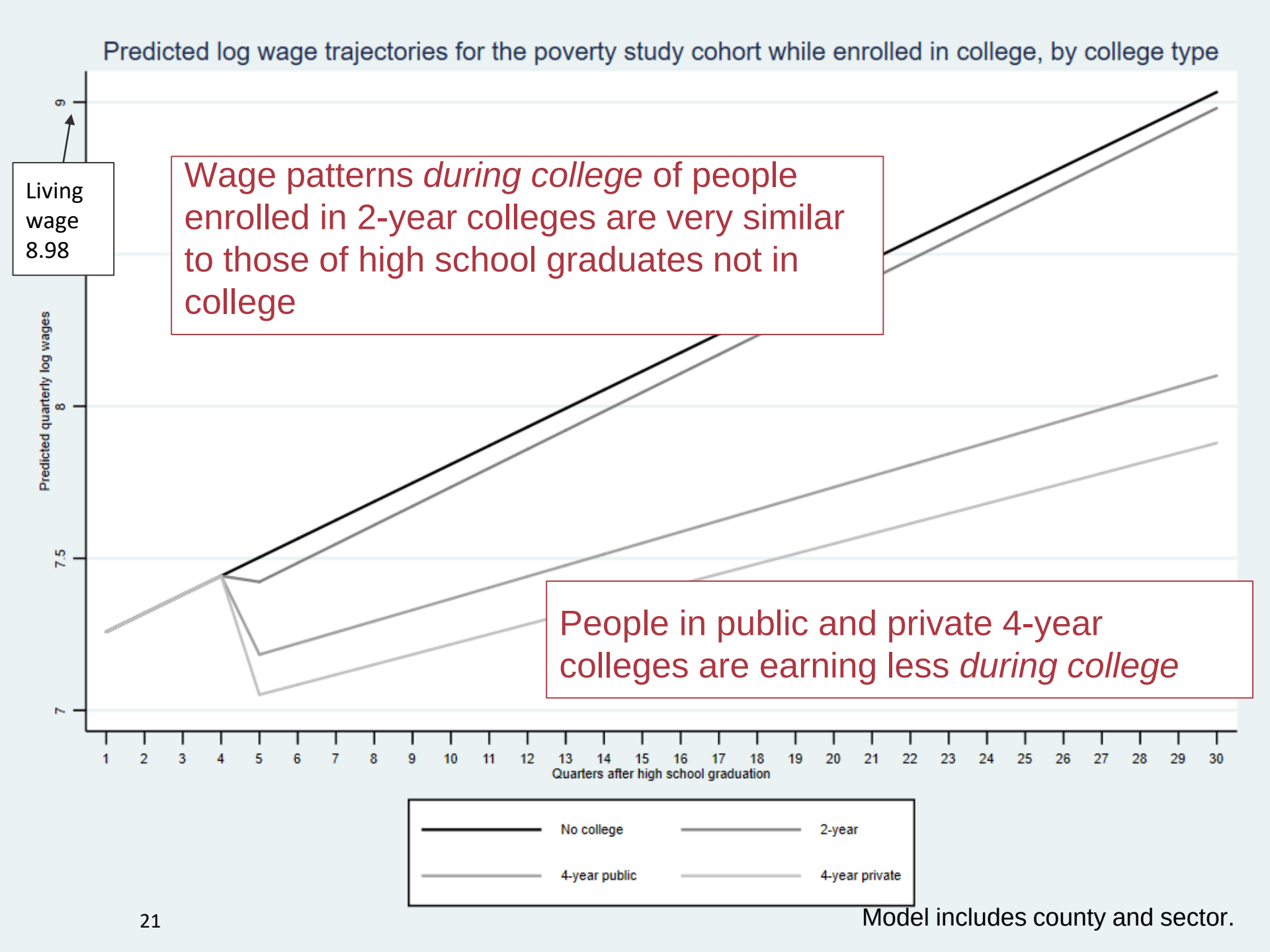
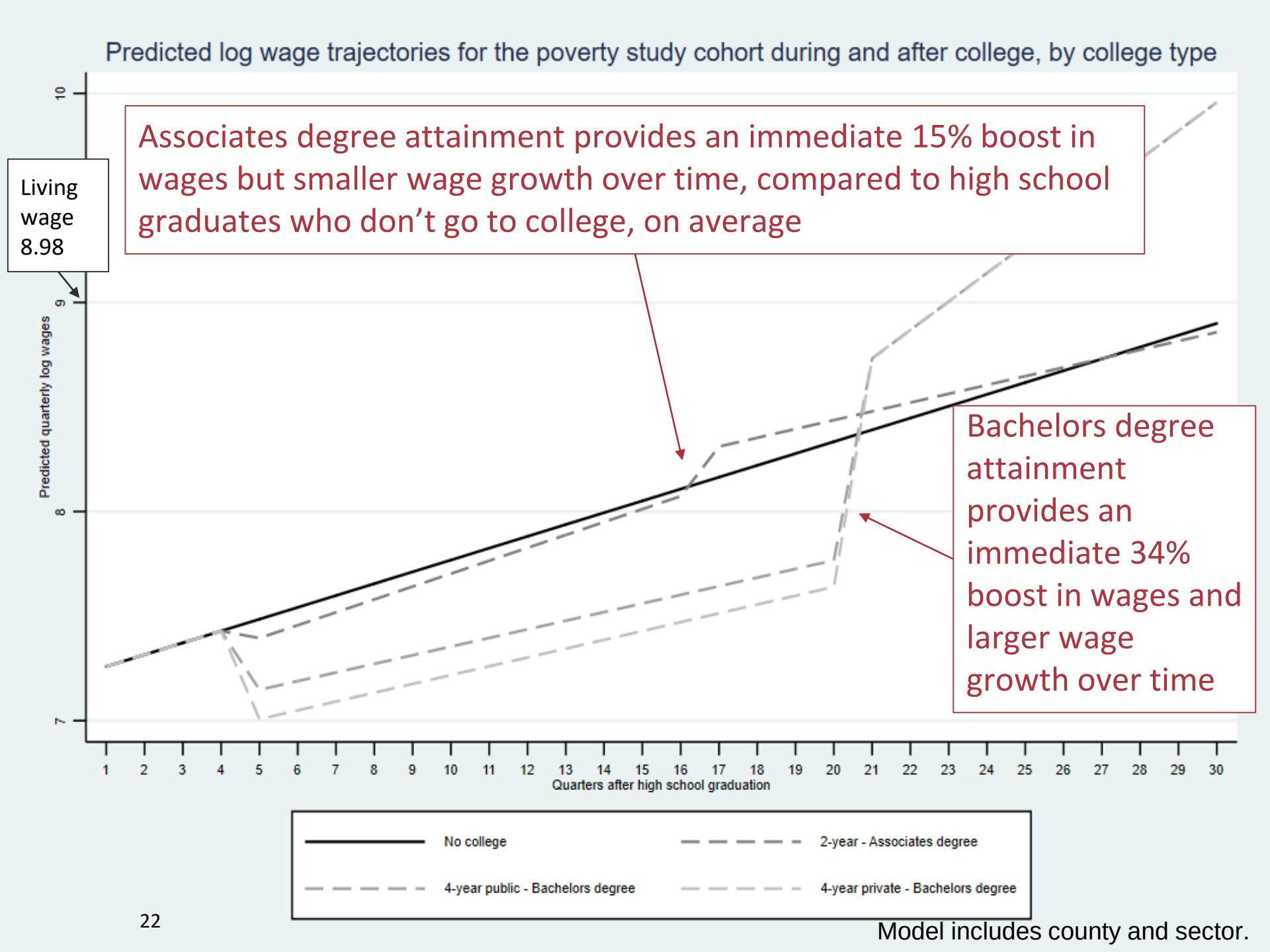
Research questions

3. How do wage trajectories change upon enrollment in college and attainment of college degrees?



Model includes county and sector.



Model includes county and sector.

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Research questions

4. How do wage trajectories and college enrollment and degree effects vary by race, gender, and past poverty experiences?

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Race, gender, and poverty

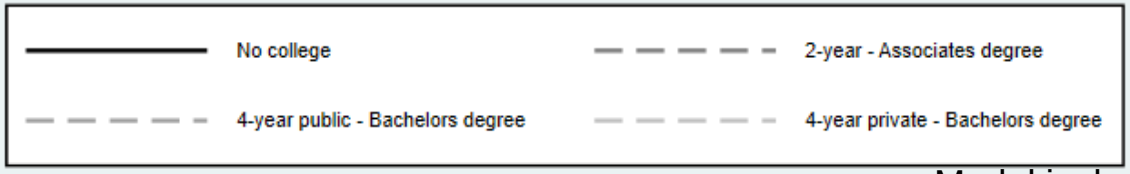
	Enrollment in college				College degree	
	Post-HS	**2-yr**	**4-yr priv**	**4-yr pub**	**Assoc**	**Bach**
Black						
Intercepts	**-0.150*** **	-0.030*	0.063	0.037	0.081	**0.152*** **
Slopes	-0.006***	0.011***	0.014*	0.013***	0.011	-0.075**
Female						
Intercepts	**-0.131*** **	0.089***	**0.122***	0.061***	0.029	**0.125*** **
Slopes	-0.002*	0.001	-0.003	0.003	-0.004	0.060**
Ever FARMS						
Intercepts	**0.139*** **	-0.011	0.037	**0.109*** **	-0.002	-0.076
Slopes	-0.004**	0.002	-0.003	0.001	-0.006	-0.045

* $p < .05$ ** $p < .01$ *** $p < .001$ Model includes county and sector.

Prototypical predicted log wage trajectories for the poverty study cohort females

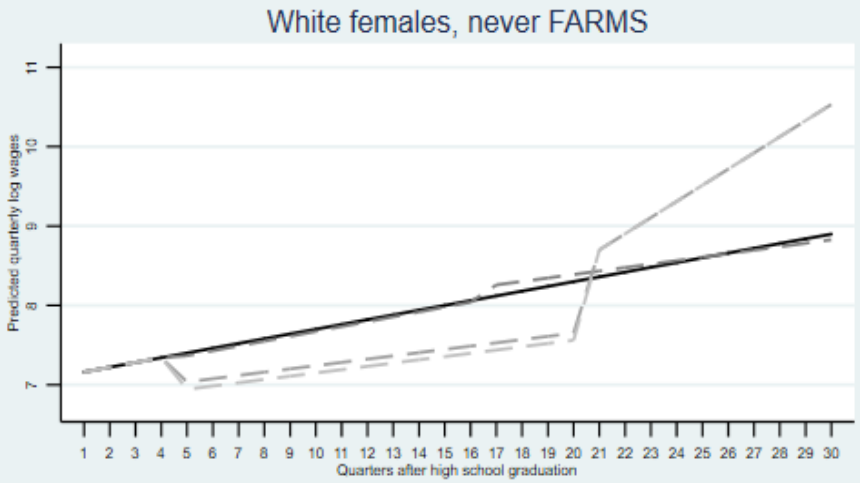
For Blacks compared to whites of the same gender and poverty:

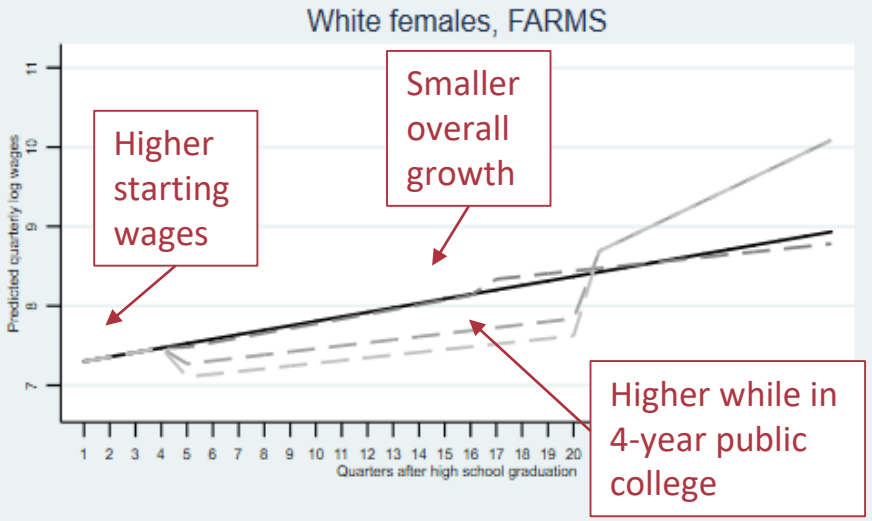
- Starting wages are 15% lower and overall quarterly growth is slightly smaller.
- Growth rates during college are slightly higher.
- A bachelors degree provides a 15% greater boost but an 8% flatter subsequent growth rate.



Model includes county and sector.

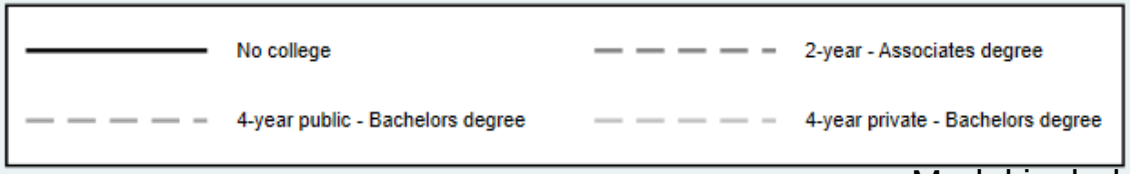
Prototypical predicted log wage trajectories for the poverty study cohort females





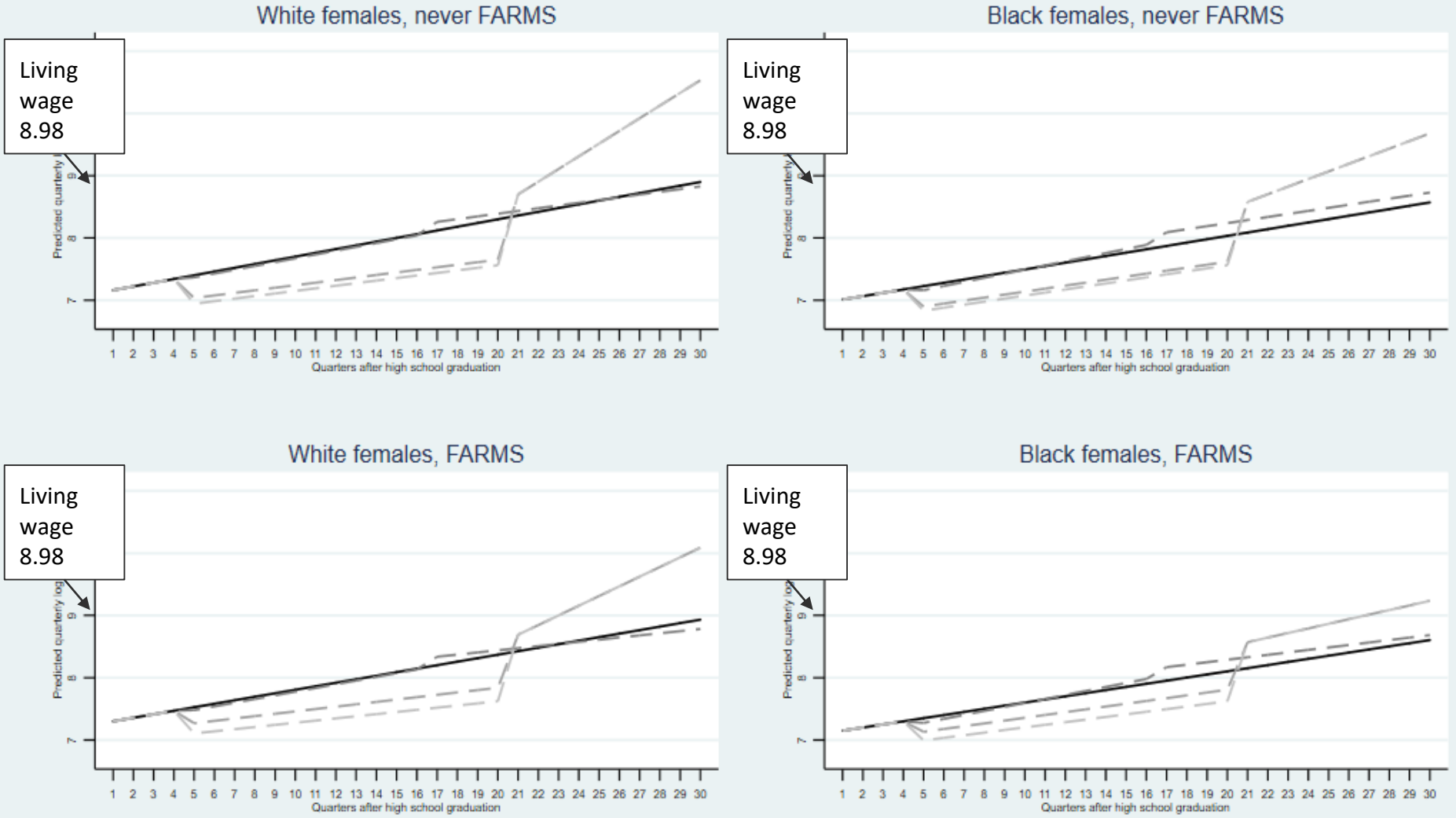
For people who experienced poverty:

- Starting wages are 14% higher and overall quarterly growth is slightly smaller.
- Earnings while enrolled in 4-year public college are 11% higher.
- No difference in impact of associates or bachelors degrees.



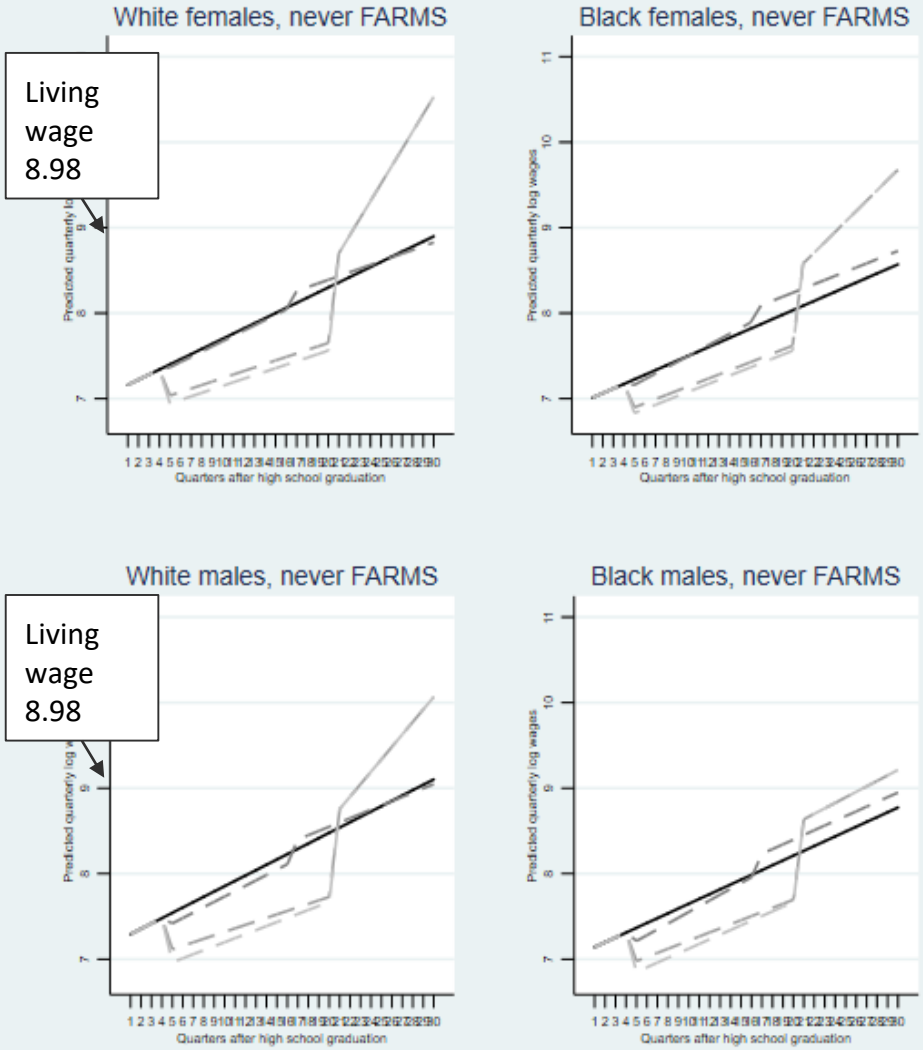
Model includes county and sector.

Prototypical predicted log wage trajectories for the poverty study cohort females



Model includes county and sector.

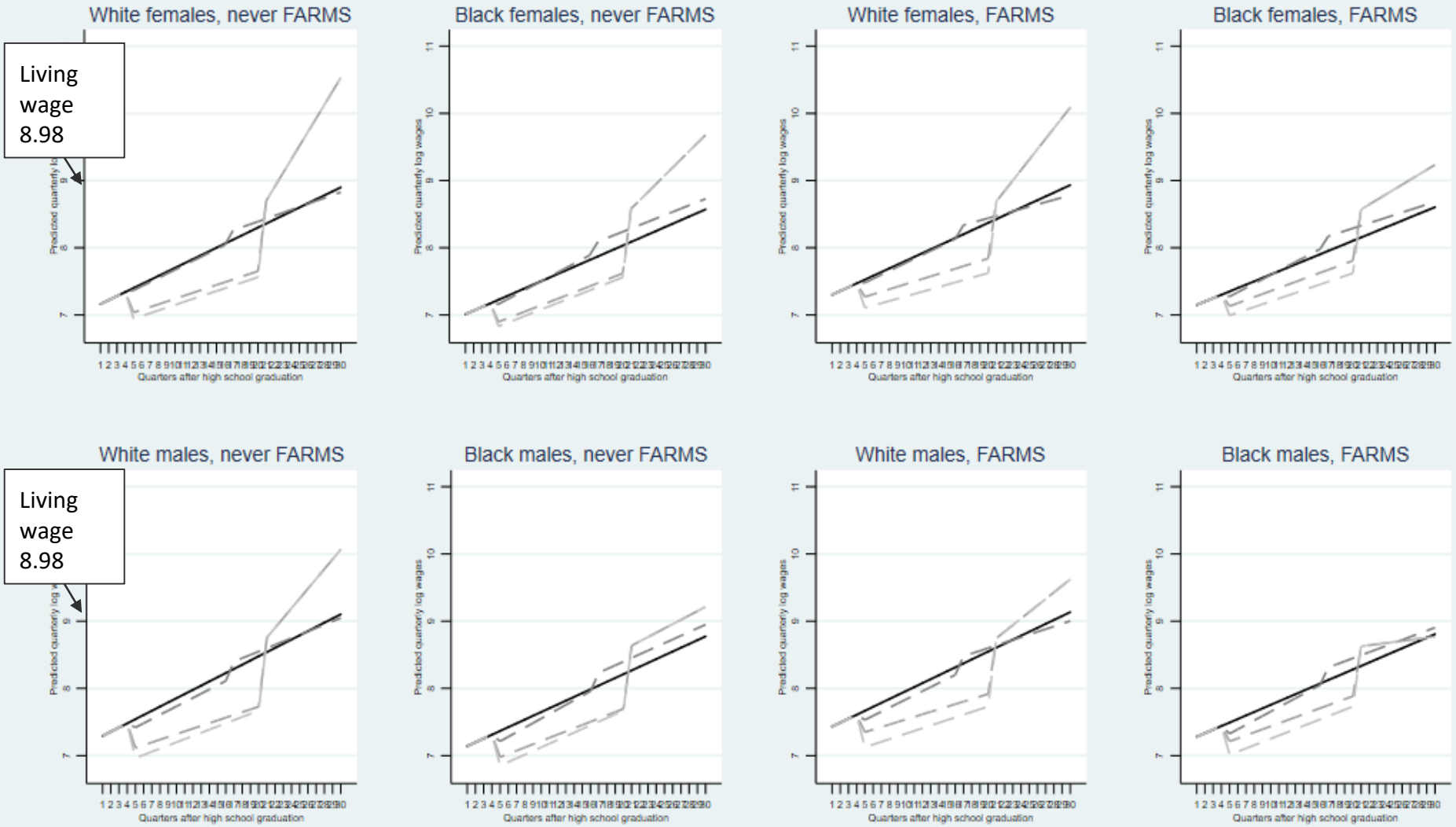
Prototypical predicted log wage trajectories for the poverty study cohort



Overall, men have higher starting wages and slightly larger growth over time compared to similar women, but earn less while in college, and benefit less from a bachelors degree.

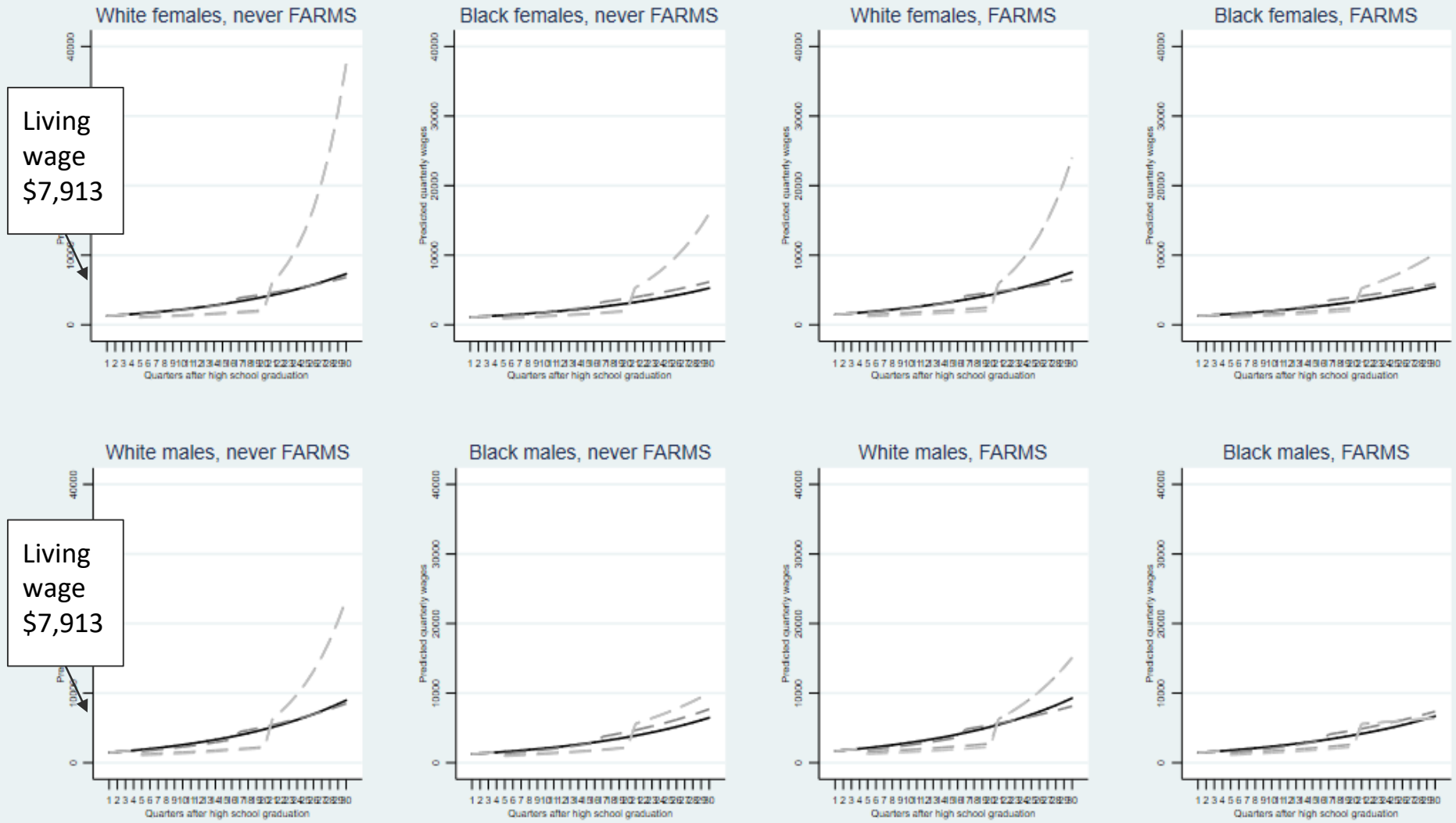
Model includes county and sector.

Prototypical predicted log wage trajectories for the poverty study cohort



Model includes county and sector.

Prototypical predicted wage trajectories for the poverty study cohort



Model includes county and sector.

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Summary

- Bachelors degrees are associated with significant immediate boosts to wages and higher quarterly growth over time
- Associates degrees are associated with immediate boosts to wages but smaller subsequent growth compared to high school graduates who never enroll in college
- Race, gender, and poverty account for substantial variation in wage patterns and the impact of college degrees

Discussion

- Multilevel growth modeling has several unique advantages:
  - Takes advantage of full information about everyone and their characteristics and wages
  - More accurately reflects reality
- However, it requires:
  - Theory on how to code time, what is important about time, how outcome might change over time
  - Initial time and effort for setting up data
  - Computing resources needed to run models

Contact information

Poverty study reports:

mldscenter.maryland.gov/ResearchReports.html

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