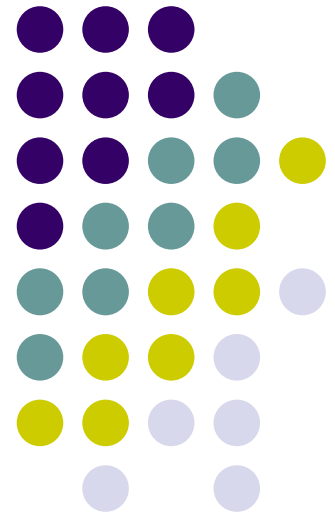


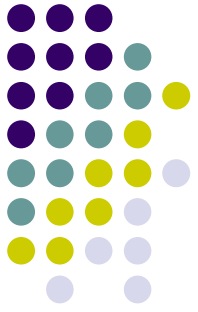
EMPLOYMENT AND WAGES IN HIGH TECHNOLOGY INDUSTRIES IN THE US: THE INFLUENCE OF RACE AND ETHNICITY

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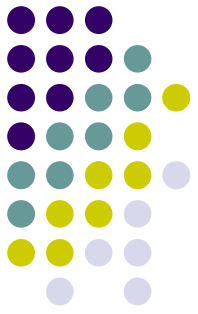


Overview



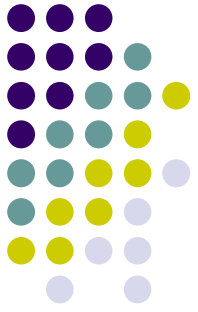
- This study:
 - Examines the influence of education and experience on employment and wages in four industry/occupational groups for the period 1992 to 2002
 - Compares racial and ethnic differences
 - Uses regression analyses including non-parametric estimations and trend analyses

Importance of Study and Contributions



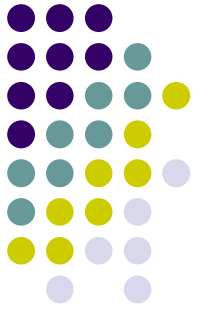
- Updates earlier studies with focus on the intersection of high technology industries and S & E occupations
- Evaluates the distributional consequences of a high technology growth strategy
- Examines the issue of whether the demand for skill outweighs long-standing practices that lead to disparities
- Contributes to the debate on returns to education and the extent of the racial wage gap

Background



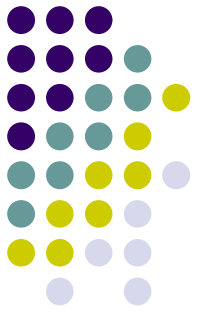
- Technology based strategies used to promote economic growth and well-being
 - Encourage growth of high technology industries
 - Employment growth rates greater than the rest of the economy in the 1980s but slower in the 1990s
 - Provide higher than average wage jobs

Background cont'd



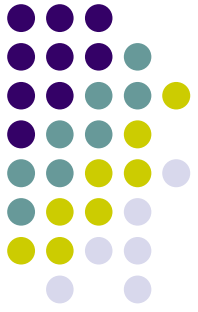
- High technology industries:
 - Require highly educated and skilled workforce in particular scientists and engineers
- Blacks/Hispanics on average lag behind whites/ Asians in educational attainment, especially in the S&E fields
 - Representation in science and engineering occupations lower than representation in the population

Definition of high technology industry

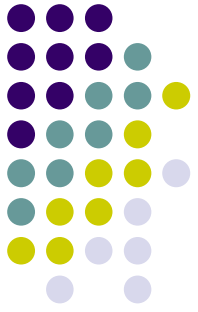


- Considerable debate on definition
- Study uses BLS definition of 1999 (Hecker, 1999)
- Industries with employment in R & D and technology oriented occupations that are a least twice the average for all industries in the OES Survey
 - SIC 281; 282; 283; 284; 285; 286; 287; 289; 291; 348; 351; 353; 355; 356; 361; 362; 366; 367; 371; 372; 376; 381; 382; 384; 386; 737; 871; 873; 874;

S & E Occupation



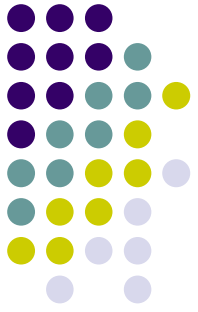
- Adapted from Chapple et al 2004 - science and engineering occupations together with managers with S & E backgrounds and certain groups of computer professionals
- 1980 SOC codes used for science and technology occupations 1622-8; 1632-7; 1639; 164; 171; 1732-3; 1739; 1842-3; 1845-7; 1849; 1852-5; 3971-2; 3974



Industry/Occupation Groups

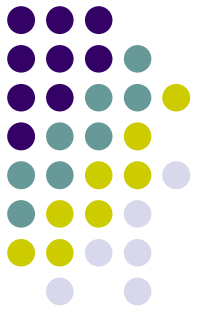
Occupation	Industry	
	High Technology	Non-High technology
Science and Engineering	HTSE	NHT_SE
Non- Science and engineering	HT_NSE	NHT_NSE

Racial/Ethnic Groups



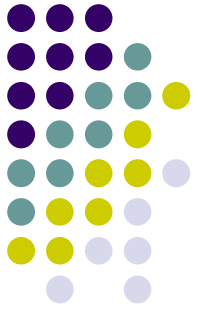
- Classification used by US Federal government
 - Non-Hispanic whites (whites)
 - Non-Hispanic blacks (blacks)
 - Asians
 - Hispanics
 - Native Americans and Alaskan Natives are omitted

Explaining Employment and Wage Disparities



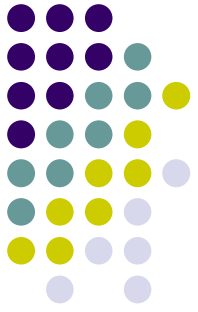
- Structural
 - Industry; occupations; job activities etc,
 - Macroeconomic conditions - wage rates, unemployment rates – business cycle effects
 - Geographic e.g. regional differences which depend on history, institutions, politics that shape economy
 - Economic instabilities - benefit technology industries which extract higher monopoly rents because of innovation – higher profits passed to workers in form of higher wages (Galbraith, 1998)
 - Spatial mismatch

Explaining Employment and Wage Disparities



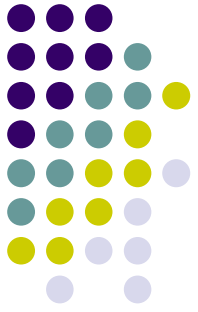
- Human capital – measured as education and experience; in addition to unmeasured skills
 - Increased returns due to higher levels of education/skills
 - Skill biased technology change - \uparrow demand for higher skilled workers; and/or \downarrow demand for lower skilled workers change wage structure
 - Knowledge economy workers (symbolic analysts – Reich, 1991; creative class, Florida, 2002) earn more

Explaining Inequality Cont'd



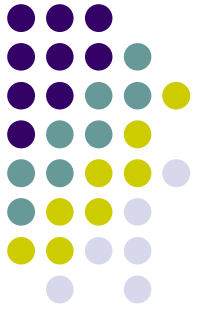
- Race and Ethnicity
 - Closure
 - Union membership, credentialing, etc.
 - Race based social closure
 - Sorting/ Segregation
 - Minorities concentrated into lower paying jobs
 - Lower wages in jobs with high concentration of minorities

Main arguments



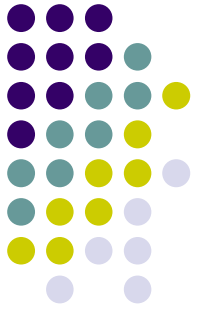
- The success of high tech industries/innovation driven by the creation and use of knowledge
- Require high levels of education and skills
- Black/Hispanics on average have lower levels of educational attainment (amount and quality) compared to whites/Asians
- Human capital differences along with structural effects combine to place blacks/Hispanics at a disadvantage

Research Questions



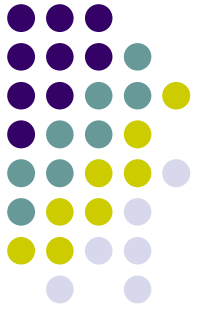
- Are education and experience the primary determinants of employment and wage disparities?
 - How important are race and ethnicity compared to education and experience?
 - Have rising levels of educational attainment changed employment and wage disparities between racial and ethnic groups over the period 1992 to 2002?

Data



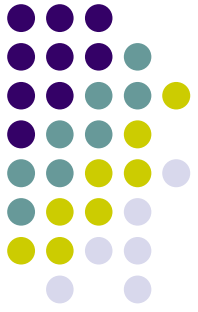
- Pooled cross-section of March Annual Demographic Survey (Bureau of Labor Statistics) 1992 to 2002
- Sample includes self-employed, part-time and full year workers
- Restricted to 16-65 years old
- Analyses run separately for men and women

Methodology



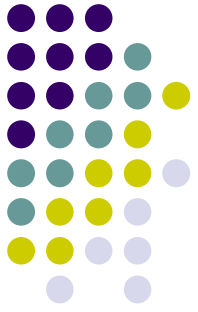
- Employment
 - Trend analyses
 - Multinomial Logit
 - Dependent variable: probability of working in HTSE; HT-NSE; NHT-SE; NHT-NSE
- Wages /Wage gap
 - Trend Analyses
 - 2-Level HLM with comparisons to OLS; IV estimates and non-parametric estimations

Dependent and Independent Variables



- Probability of employment &
- Wages -Individual -Level 1
 - Industry/ occupation
 - Education
 - Experience
 - Race
 - Race./HTSE
 - Foreign-born
 - Central City/ urban/ rural
 - Year
 - Full/part-time employment
 - Marital status;
 - Number dependents
 - Home ownership
- Level 2- Region- CMSA
 - Unemployment rate
 - Proportion black/Hispanic/Asian

Models



Multinomial Logit

$$\text{indocc} = \alpha_0 + \alpha_1 \text{black} + \alpha_2 \text{asian} + \alpha_3 \text{hispanic} + \alpha_4 \text{educ} + \alpha_5 \text{exp} \\ + \alpha_6 \text{exp}^2 + \alpha_j X_j + \alpha_k T_k + \alpha_l \text{region}_l + \varepsilon$$

HLM - Level 1 Model

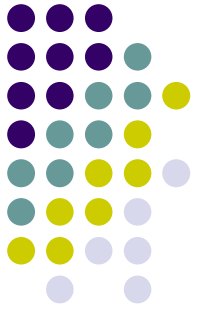
$$\text{Inwage}_{ij} = \beta_{0j} + \beta_{1j} \text{black} + \beta_{2j} \text{asian} + \beta_{3j} \text{hispanic} + \\ \beta_{4j} \text{htse} + \beta_{5j} \text{ht_nse} + \beta_{6j} \text{nht_se} + \beta_{7j} \text{blackhtse} + \\ \beta_{8j} \text{asianhtse} + \beta_{9j} \text{hisphhtse} + \beta_{10j} \text{educ} + \beta_{11j} \text{exp} + \\ \beta_{12j} \text{exp}^2 + \beta_{ij} X_{ij} + \beta_k T_k + r_{ij}$$

Limitations



- Data
 - Earnings data are self-reported so are subject to measurement error (usually considered non-systematic)
 - Top coding – (99,999 to 1995; 150,000 to 2002)
- Model specification
 - Functional form
 - Omitted variables- ability, family background, firm level effects
- Selection – only observe wages for those who work
 - Excluding the unemployed and incarcerated bias estimates (Chandra, 2004)
- Conclusions may not apply outside the study period

Policy Implications



- Education
 - S&E including quality, quantity and entrants
 - Workforce training and development
- Race and ethnicity
 - Increase employment opportunities through minority business development
 - Retain affirmative action policies and mechanisms that help to identify racial differences

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