The Changing Occupational Distribution by College Major

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Preview

- We propose two indexes to characterize the distribution of occupations by college major
- We examine data from the National Survey of College Graduates for 1993, 2003 and 2010
- We show that the occupational distribution within college major has generally become more diverse
- We explore the role of the distribution of occupations plays in relative earnings across majors

Two dimensions of the occupational distribution by college major:

- Distinctiveness: How different is the occupational distribution of individuals who hold a particular college major when compared with all others?
- Variety: How varied is the distribution of occupations among those who hold a particular college major?

Occupational Distinctiveness

$$D_{jk} = \frac{1}{2} \sum_{i=1}^{N} \left| s_{ij} - s_{ik} \right|$$

Properties of D:

1. 0< D < 1

2. D is the share of those holding a degree from major j that would have to change occupations in order for those with that Major to have the same occupational distribution of those who Do not have that major.

Occupational Variety

$$O_v = \left[\sum_{i=1}^{N} s_i^2 \right]^{-1}$$

Properties of O_v

1. Ov >1

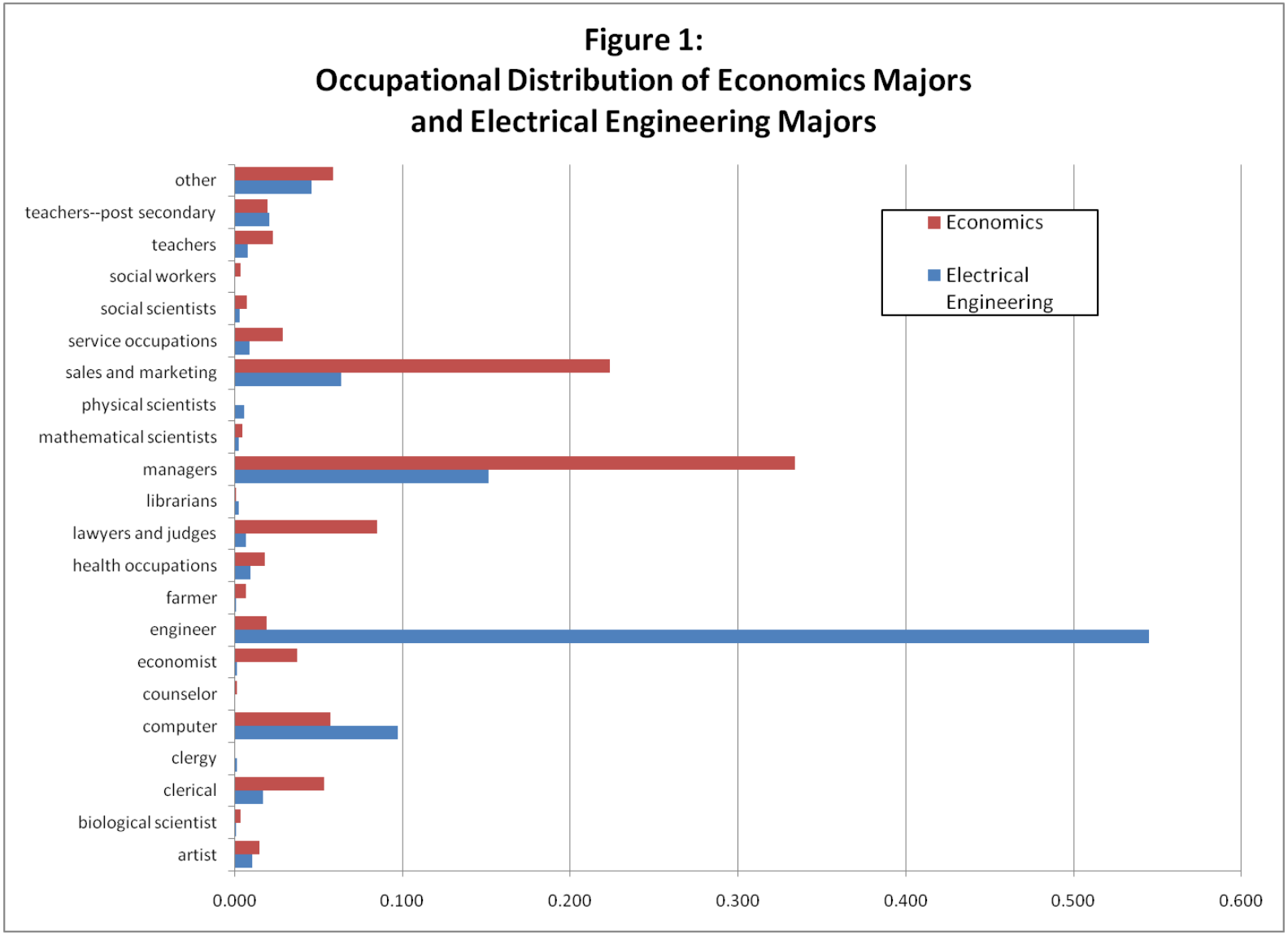
2. Ov = 1 indicates that everyone holding a particular majors has has the same occupation.

3. This index measure the number of equal-sized occupations that would be necessary to achieve the observed value of the Herfindahl index calculated from the occupational shares of those holding the particular major

Data: National Survey of College Graduates

- Survey years 1993, 2003 and 2010
- Collected for US National Science Foundation
- Representative sample of all in the United States who hold a bachelor's degree or higher, regardless of where earned
- Based on individuals who reported college degree in 1990 Census, 2000 Census or 2009 ACS

Figure 1:
Occupational Distribution of Economics Majors and Electrical Engineering Majors



Examples of Distinctiveness

Least Distinctive	1993	2003	2010
Liberal Arts and General Studies	0.256499	0.26751	0.26695
History, OTHER	0.317527	0.346492	0.385287
General Psychology	0.332707	0.371029	0.404292
Other Foreign Languages & Literature	0.342159	0.399328	0.411287
Moderately Distinctive			
Physics	0.525742	0.511758	0.416262
Mathematics Teacher Education	0.530476	0.572403	0.66294
Chemistry, except Biochemistry	0.534606	0.532872	0.504124
Biology, General	0.539378	0.539618	0.413591
Zoology, General	0.55976	0.510063	0.400302
Highly Distinctive			
Civil Engineering	0.701838	0.710681	0.661087
Computer and Information Sciences	0.707502	0.66301	0.526048
Health/Medical Technologies	0.709765	0.656089	0.573127
Pharmacy	0.724438	0.757659	0.601152
Computer and Systems Engineering	0.736381	0.690583	0.55117
Computer Science	0.76747	0.698716	0.575743
Nursing	0.780456	0.764544	0.712157

Examples of Occupational Variety

High Variety	1993	2003	2010
Anthropology and Archeology	31.30	27.36	26.25
Liberal Arts and General Studies	28.79	34.05	29.53
History, OTHER	24.40	26.37	23.69
OTHER Foreign Languages & Literature	22.44	18.33	27.20
English Language, Literature, and Letter	22.00	21.97	23.66
Physics	19.67	20.75	22.35
General Psychology	19.25	19.07	24.94
Mathematics, General	19.19	17.94	16.52
Medium Variety			
Business, General	17.93	22.76	20.19
Economics	16.88	21.34	14.77
Secondary Teacher Education	15.72	15.05	17.86
Sociology	13.82	26.05	24.75
Political Science and Government	13.27	14.27	12.66
Business Administration and Management	12.97	18.31	15.12
Biology, General	11.11	12.53	24.47
Low Variety			
Accounting	3.69	4.86	7.67
Social Work	3.51	4.90	6.21
Architecture/Environmental Design	2.74	4.27	7.37
Civil Engineering	2.72	2.60	3.42
Health/Medical Technologies	2.43	3.59	6.12
Pharmacy	2.32	1.91	3.38
Nursing	1.87	2.01	2.33

Ov and D Highly Correlated

- But the concepts are theoretically distinct
- Possible to have low variety—all econ major have same occupation
- But if that occupation is common among other majors, such as “management,” then the distinctiveness will be relatively lower
- Both Ov and D depend on the rather ad hoc choice of occupational groupings!

Figure 2: Relationship between D and Ov (2003)

Changes in Ov for 40 Large Majors

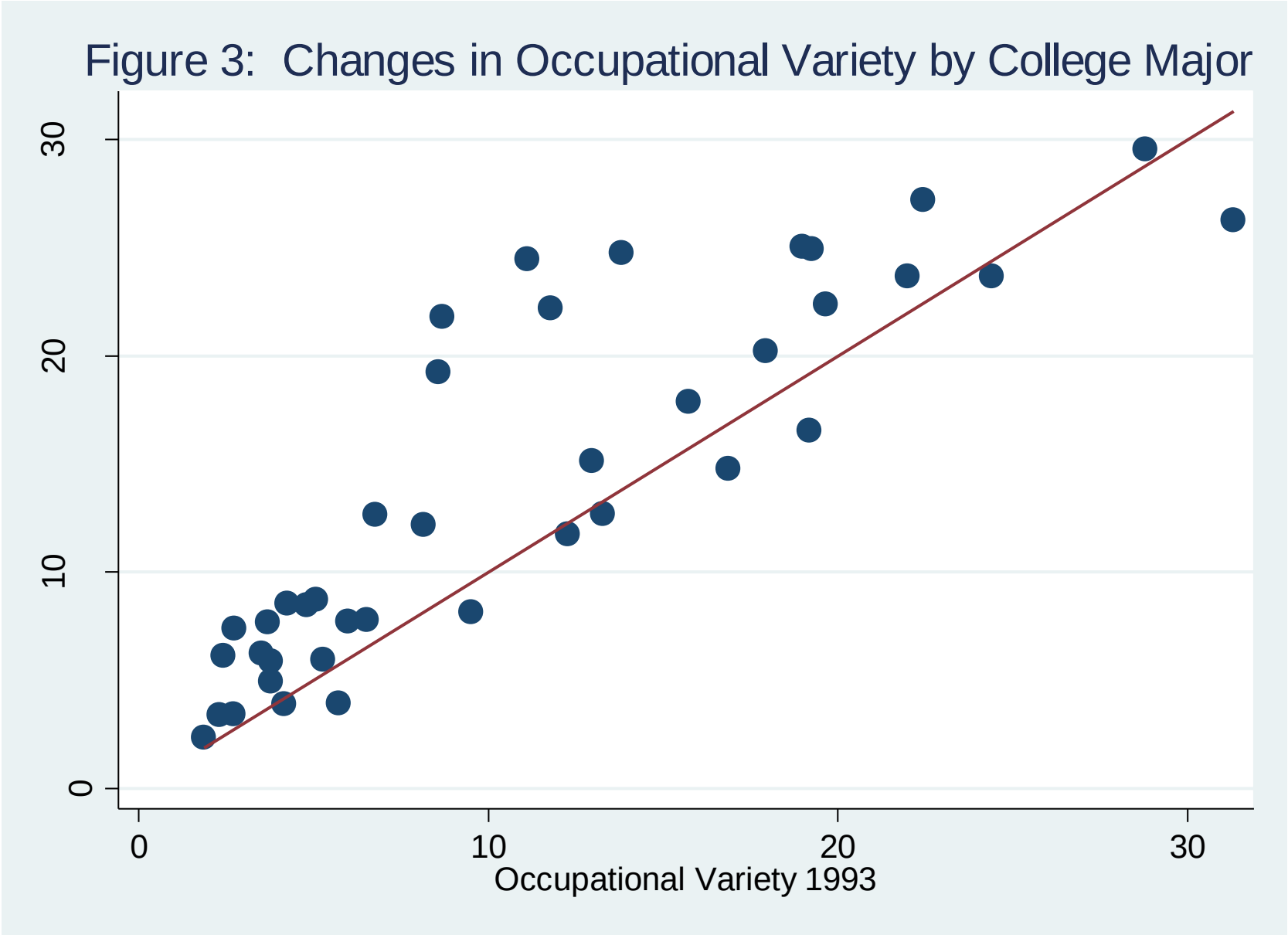


Figure 4: Changes in Occupational Distinctiveness of Majors

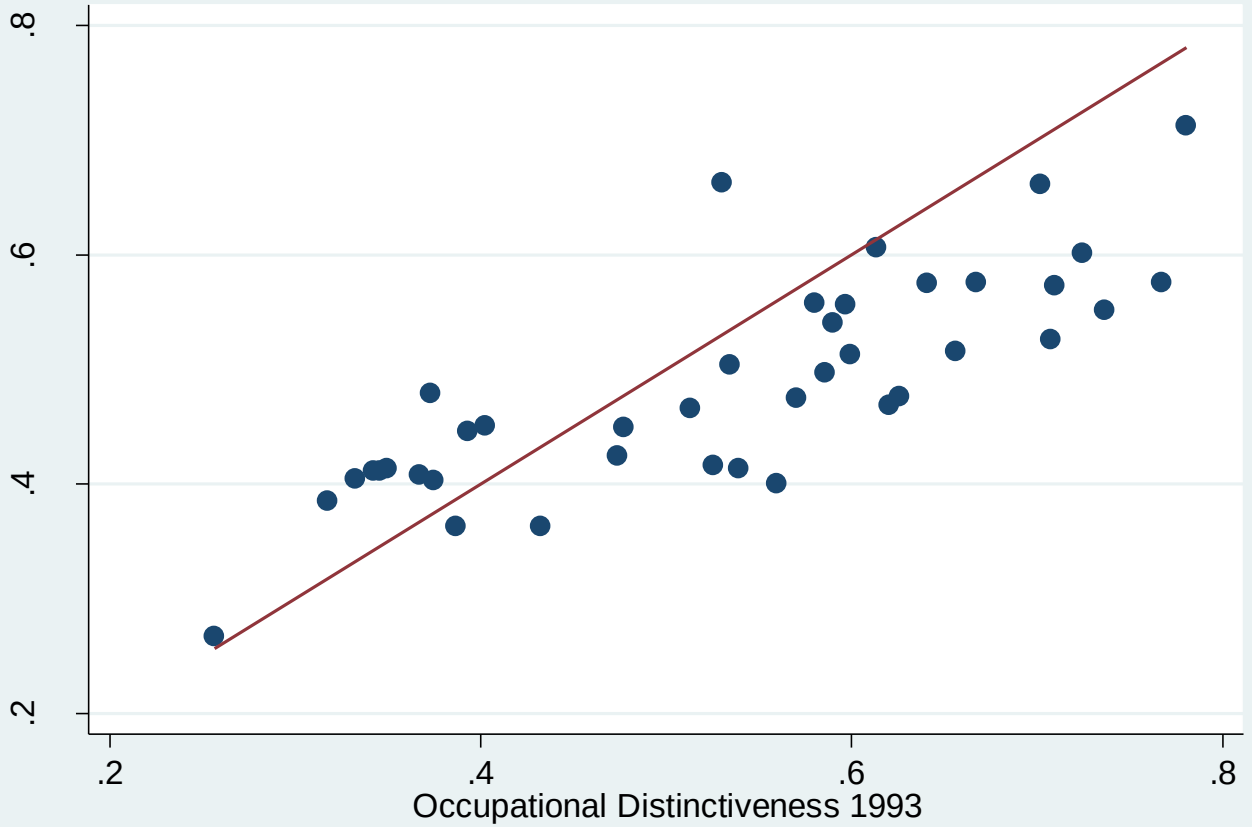
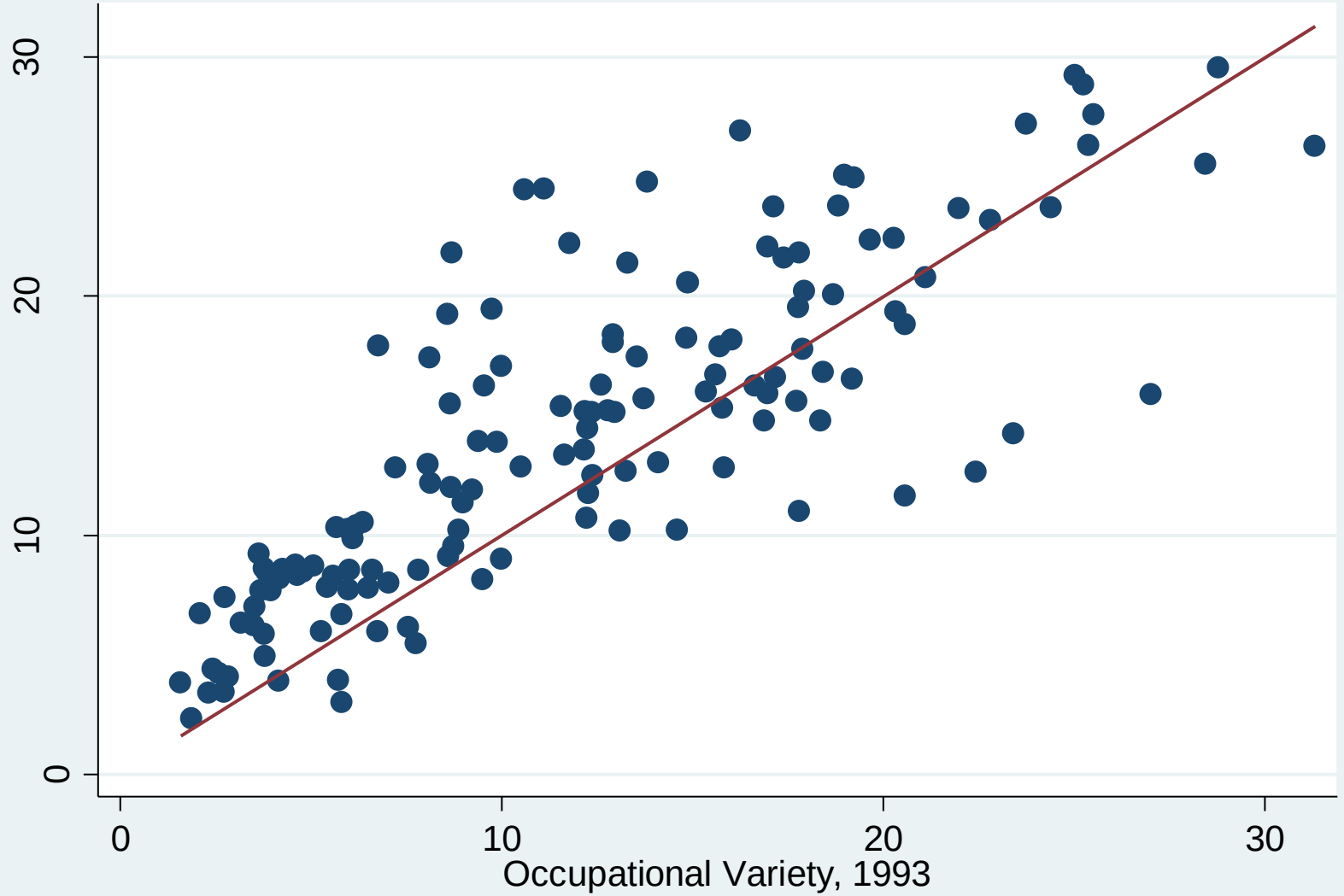


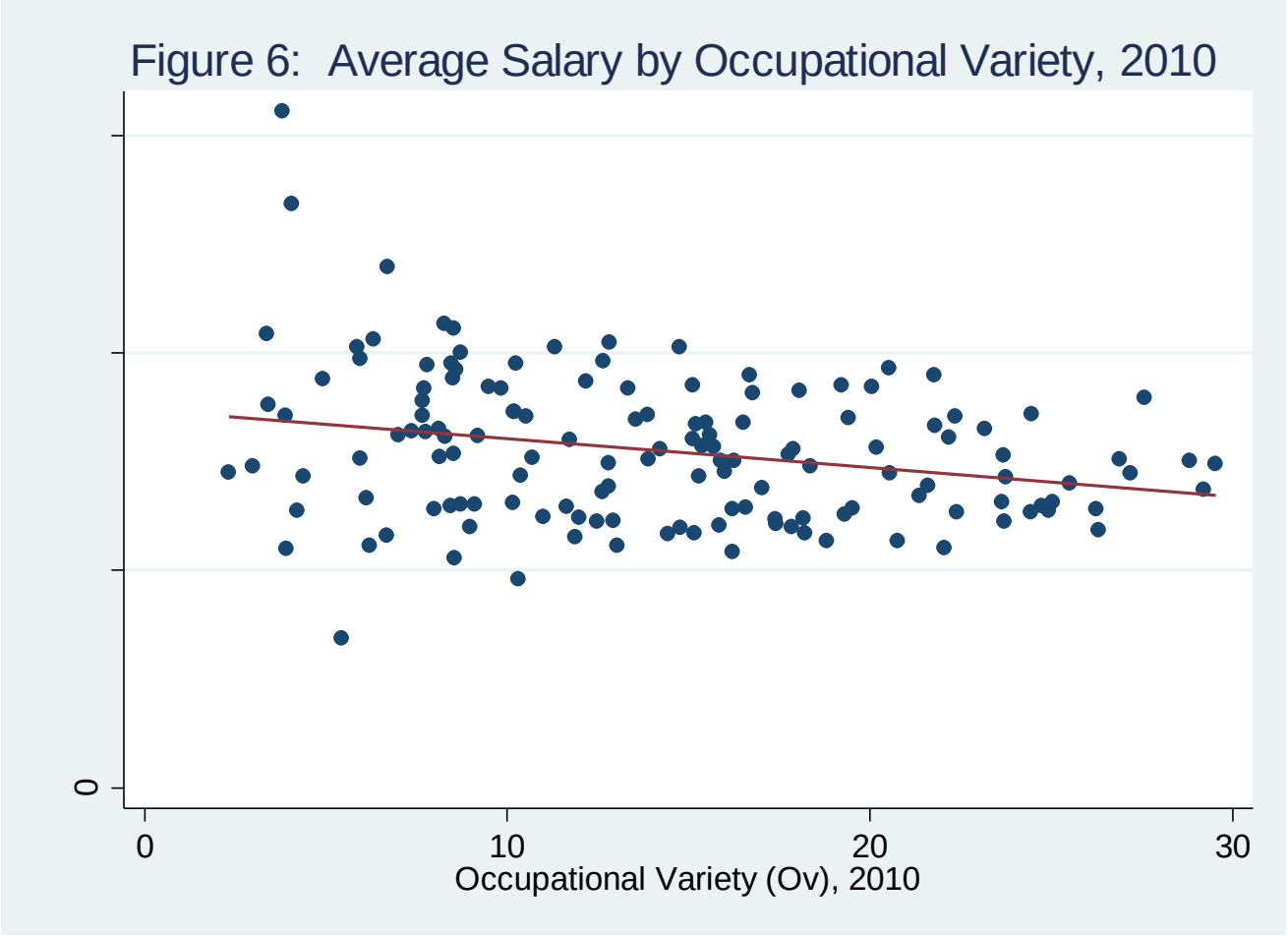
Figure 5: Changes in Occupational Variety, 1993-2010 (All majors)



Salary and Occupation

Some Observations

Majors with low Variety tend to pay more



How much of a major's salary "bonus" is due to occupations varies greatly

Table 6b
Decomposition of Salary Premium for Highest Paid Undergraduate Majors*
2003 Sample Year

Undergraduate Major	Average Salary	Salary Premium (%)	Explained by Model (%)		Unexplained (%)	Fraction Explained by All	Fraction Explained by Occupation
			All Variables	Occupation Variables Alone			
Pre-medicine, Dental, Etc.	141,488	62.3	47.5	40.1	14.8	0.762	0.643
Medicine, dental & etc.	99,028	25.5	37.4	32.8	-12.0	1.470	1.289
Zoology	97,085	25.0	19.9	17.2	5.0	0.798	0.691
Biochemistry	94,359	30.2	12.7	15.8	17.5	0.420	0.522
Computer & Systems Engineering	87,236	35.2	29.2	20.0	6.1	0.828	0.568
Economics	86,833	21.4	13.0	9.9	8.4	0.608	0.461
Physics	86,399	33.5	18.7	15.5	14.8	0.559	0.463
Electrical & Electronics Engineering	86,200	38.5	26.9	20.4	11.6	0.699	0.530
Biology (general)	84,165	12.7	11.2	13.0	1.5	0.883	1.024
Chemistry	83,784	21.6	14.9	13.6	6.7	0.690	0.632

*Only majors represented by at least 250 individuals in the sample are included here. Variables used in the decomposition are age, work experience, square of work experience, sex, race and advanced degrees held, along with twenty broad occupational categories. Dependent variable is logarithm of salary. For each major, the coefficients used to explain differences are estimated from the "all other majors" group.

Source: Author's calculations from the National Survey of College Graduates, 2003.

Concerns

- Indexes change a lot between cohorts relative to the very small sample variance