Toward Greater (In)Equality? Gender and Race Segregation in Green Fields of Study in American Higher Education

Extended Abstract

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Introduction/Theoretical Background

The last few decades have witness an unprecedented demand for "greener," more sustainable products and technologies. As public and governmental concern for environmental degradation and climate change become more pressing, demand for high skilled labor with applied green knowledge increased dramatically. Jones (2008), perhaps the most prolific thought leader on the topic, foresaw the growth of a "green collar economy" as a potential solution to America's "two biggest problems," namely, rising income inequality and degradation of the physical environment. However, sociologists have given little thought to how the growth of such a green economy may affect socioeconomic inequality. One possible way to begin assessing the influence of the green economy on inequality is to focus on pre-labor market sorting mechanisms, especially higher education.

Though green skills can be acquired from many sources, ranging from on-the-job apprenticeships to training offered through professional associations, higher education is one of the principal sources of the skills that "green jobs" – and, particularly, the most lucrative positions in STEM fields – require (Strietska-Ilina, Hofmann, Haro, and Jeon 2011). Yet, there is substantial variation within the constellation of green academic programs. Writing of environmental studies and environmental sciences, Clark et al note:

> Unfortunately, the record of the EPM [environmental program movement] in actually integrating knowledge across disciplines and producing graduates with the requisite skills to solve complex environmental problems is not particularly impressive. Over the years, many analysts have documented broad concerns about the EPM, both retrospectively and prospectively… The record of the EPM in addressing these concerns is weak… (Clark et al 2011, 707-708).

Thus, there may be a stark qualitative difference between the new fields of study emerging out of the environmental program movement and those of a more disciplinary character. In their critique of the environmental program movement, Clark et al blast programs of a primarily humanistic character that may not be providing effective technical training for the green labor market.

Indeed, though the presence of environmental-themed degrees seems to be a constant in higher education, it is difficult to gauge the extent of the "greening" of the American higher education curriculum. And, understanding who is going into these programs that provide preparation for the green economy may be a starting point for gauging the character of the emerging green workforce. Are the individuals gaining the credentials needed to enter Jones' "green collar workforce" upwardly mobile, or are green credentials claimed by individuals likely to succeed in other sectors of the economy?

The emergence of green topics in the American higher education curriculum could potentially be an avenue through which the sciences could diversify and attract students who might not otherwise consider majoring in a STEM field. By linking academe to a powerful social movement, students who might otherwise dismiss preparation for a scientific career could be motivated to pursue training in degrees that equip them with valuable technical skills. The environmental movement may tap into the caring orientation that has been posited to account for women's' preferences for humanistic caring occupations and fields of study. According to Barone, "we could anticipate a female preference also for fields like psychology or medicine that give access quite often to jobs characterized by their symbolic affinity with traditional caring roles, given their specific orientation toward the well-being and personal development of customers" (2011: 159). Though "caring" for the environment may entail a different set of skills and dispositions relative to caring in a social services context, it is a starting point for exploring the ways in which women may be attracted to green fields of study. And, within STEM, women tend to cluster in bioscience fields that might be closer to the study of many green topics than other "hard" sciences (Drew 2011). Additionally,

as an emerging phenomenon within higher education, "green" fields do not yet have strong gender or ethnic norms or stereotypes attached to them, which may make them more friendly to women and underrepresented minorities.

Yet, there is a persistent association between high socioeconomic status and green lifestyle choices that, if applicable to field of study selection, may predict inequality in green fields of study. Though early research on the topic generally did not find a strong class bias to environmental concern (for a review, see Van Liere and Dunlop 1980), research on environmental *action* has suggested a socioeconomic bias with respect to making lifestyle choices that benefit the environment. For example, individuals of higher SES tend to be more likely to recycle (Berger 1997), though some of this propensity may be explained by differentials in geographic access to recycling programs. Other research has suggested a positive relationship between income and environmentally conscious behaviors without controlling for a link between SES and access to infrastructure that facilitate such behavior (Heins et al 1986). However, the literature on SES and class differences in environmental behaviors is not well developed and it is not clear whether one can generalize from research on mundane, everyday lifestyle choices like energy conservation to such life-altering choices as field of study selection. Given that STEM majors tend to be pursued by members of demographic groups already advantaged in the labor market, the greening of the STEM curriculum may further deter some individuals from pursuing such fields of study.

Research Questions

1. *How did higher education respond to the green economy with respect to undergraduate degree program offerings?*

   Hypotheses: Green fields of study proliferated with the increase in environmental awareness and demand for "green jobs" in the late 20th and early 21st centuries. In addition to the creation of new fields of study, we expect green fields of study to constitute a greater share of bachelor's degrees awarded in the United States.

2. *Who goes to green fields of study? Are they more or less equal than non-green fields of study in terms of gender and race?*

   Hypotheses: Green fields of study should be more equal than other disciplines. As a powerful social movement, environmentalism should attract underrepresented minorities into fields of study that may provide preparation for green careers.

3. *Who goes to STEM green fields and who goes to non-STEM green fields?*

   Hypotheses: Given the persistent problem of a lack of diversity in the sciences, women and underrepresented racial minorities (URM's) will be more concentrated in non-STEM green fields of study.

Data

Data on green fields of study come from the Integrated Post-Secondary Data System (IPEDS) completion files. We merged together IPEDS data on field-of-study level completions across institutions to get a clear picture of the overall distribution of majors (classified by CIP code) in American undergraduate education. From this, we calculated proportion of women and URM's earning bachelor's degrees in green fields of study nationwide.

Despite extensive searches of the scholarly literature, we could not locate a commonly accepted definition of what makes a field of study "green." Consequently, we were forced to exercise some independent judgment; we tended to err on the side of inclusion wherever possible, recognizing that some fields of study will be closer to the center of the "environmental program movement" identified by Clark et al. than others. As a rough guideline, we use the broad categories defined by the U.S. Economics and Statistics Administration's 2010 report on green jobs, "Measuring the Green Economy." ESA identified five major types of economic activity that could be considered green (pp. 8):

- Pollution control
- Renewable and alternate sources of energy
- Energy conservation

- Resource conservation, including recreation
- Environmental assessment, including nonprofit environmental advocacy

Using the descriptions of fields of study provided in IPEDS, we determined if each IPEDS field of study would be directly relevant to work in one of these five economic areas, and, if so, whether the field would best be characterized as STEM or non-STEM.

While many individuals working in green occupations undoubtedly were trained in traditional disciplines, this study focuses on credentials that appear to be designed specifically to prepare individuals to perform tasks related to one of these broad categories. One of the advantages of the IPEDS database is that it is regularly revised to ensure that it gathers data on all programs of study offered by Pell Grant - eligible higher education institutions; therefore, it quickly picks up data on new and emerging disciplines and majors. Additionally, the fields of study classification used has been standardized across the years 1998-2010 with the retroactive recoding of prior years into the 2010 fields of study typology, ensuring an accurate picture of the prevalence and size of green degree programs.

Methods

This study presents descriptive data to chart the emergence and growth of green fields of study. Compiling data on the size of the green phenomenon in higher education is a starting point for answering our first research question, whether and how the environmental movement is shaping higher education. However, our questions on the implications of green fields for inequality require the computation of indices to measure segregation. Indices of dissimilarity measure the proportion of students who would have to switch their major in order for there to be an equal distribution across majors of students of given demographic characteristics (in our case, race and gender).

Preliminary Findings

There has been an explosion in the number of different green fields of study, though the rate of growth in green fields of study has closely mirrored the overall growth in college enrollment in the United States. Thus, there is no support for the supposition that green fields of study are growing faster than other disciplines. Both STEM and non-STEM green fields of study have grown in number and in size, though the STEM side of the green sector is characterized by a larger number of discrete fields of study.

Green fields of study are, on balance, more gender-balanced and less gender-segregated than other fields of study. Whereas women receive about 60% of all bachelors' degrees in the United States, women consistently earn roughly 45-50% of degrees awarded in green fields of study. And, gender segregation seems to be declining in green fields of study: the index of dissimilarly for green fields of study has declined consistently over the last decade (Figure 1), while the index of association for green fields of study has been consistently lower than the index for all fields of study.

However, URM's are even less represented in green fields of study than in higher education as a whole by a striking margin – only 9% of green undergraduate degrees go to URM's, relative to 18% of all bachelors' degrees in 2009. The index of dissimilarity for racial segregation in green undergraduate completions is far higher than for non-green degrees (varying between .20 and .26 over the course of our dataset for green fields, relative to .07 to .10 for all fields of study; Figure 2), suggesting that minorities are disproportionately segregated in a few green fields. (Indices of association were also calculated for racial segregation, but difficult to interpret due to wide swings from year to year.)

Though we are still in the process of analyzing data on the differences between STEM and non-STEM fields, our preliminary tabulations suggest that the proportion of both women and URM degree recipients in STEM green fields is increasing over time. Remarkably, though only 6% of recipients of green STEM degrees were URM's in 1998, by 2008 approximately 11% of green STEM degree recipients were URM's. However, the proportion of female and URM green non-STEM degree recipients has generally been stable over the course of our dataset.

Discussion/Conclusions: Is "Green" Diversifying the Sciences?

It is difficult to disentangle whether the green movement in higher education is leading to greater gender diversity due to some factor(s) intrinsic to the concept of "green" fields of study, or whether we are seeing more of a general distinction between biology-related fields of study and physical sciences. Many "STEM green" fields of study, such as forestry, natural resource conservation, and ecology, do seem to have more in common with biology than other physical sciences, and even fields of study that seem to be offshoots of the physical sciences (e.g., alternative fuel technology) appear to be closer to the natural sciences than ostensibly similar fields. Though qualitative differences between green fields of study beyond STEM and non-STEM are beyond the scope of this study, the idea that biological sciences are more amenable to demographic diversity than other disciplines merits consideration.

The finding of lower overall minority representation and greater between-field racial segregation within the green sector, though concerning and in contrast to the expectation that green fields would draw in URM's, is consistent with the expectations of research associating "green" choices with higher SES, which is in turn associated with race. Explaining this divergence between race and gender segregation patterns will require further research.

References

Barone, Carlo. 2011. "Some Things Never Change: Gender Segregation in Higher Education Across Eight Nations and Three Decades." *Sociology of Education* 84(2): 157-176.

Berger, Ida. 1997. "The Demographics of Recycling and the Structure of Environmental Behavior." *Environment and Behavior* 29(4): 515-531.

Clark, Susan, Murray Rutherford, Matthew Auer, David Cherney, Richard Wallace, David Mattson, Douglas Clark, Lee Foote, Naomi Krogman, Peter Wilshusen and Toddi Steelman. 2011. "College and University Environmental Programs as a Policy Problem (Part 1): Integrating Knowledge, Education, and Action for a Better World?" *Environmental Management* 47:701-15.

Drew, Christopher. 2011. "Where the Women Are." *The New York Times* http://www.nytimes.com/2011/11/06/education/edlife/where-the-women-are-biology.html

Hines, J. M., Hungerford, H. R., and Tomera, A. N. 1986. "Analysis and Synthesis of Research on Responsible Environmental Behavior." *Journal of Environmental Education*, 18(2), 1-8.

Jones, Van. 2008. *The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems.* New York: HarperCollins.

Liere, Kent D. and Riley E. Dunlap. 1980. "The Social Bases of Environmental Concern: A Review of Hypotheses, Explanations and Empirical Evidence." *Public Opinion Quarterly* 44:181-97.

Strietska-Illina, Olga, Christine Hoffman, Mercedes Duran Haro, and Shinyoung Jeon. 2011. *Skills for Green Jobs: A Global View.* Geneva: International Labour Office.

US Economics and Statistics Administration. 2010. "Measuring the Green Economy." Retrieved from http://www.esa.doc.gov/Reports/measuring-green-economy.

Figure 1.

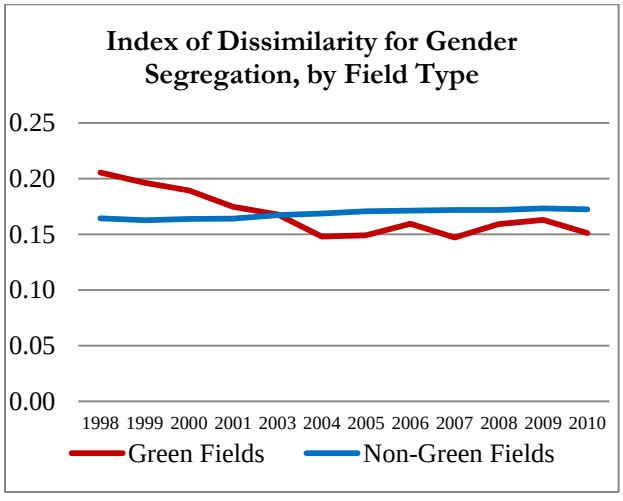

Figure 2.