

The Composition, Preparation and Aspirations of Agricultural and Resource Economics PhD Students^{1,2}

Jerrod M. Penn³
University of Kentucky
Lexington, KY

H. Mikael Sandberg⁴
University of Florida
Gainesville, FL



Abstract

In the fall of 2012, current students in agricultural and resource economics or affiliated graduate programs were surveyed at 30 U.S. universities. The survey elicited thoughts and opinions of students about their programs, future career goals, and preparation for a graduate degree in the field. The evidence suggests that students are well-aware of the nature of graduate schools and have clear goals about post-graduation careers, with strong attitudes about the importance of quantitative preparation prior to enrollment. The findings indicate that students are pragmatic about applying for, and ultimately choosing, graduate schools, with the greatest emphasis on funding and major professor. Furthermore, there seems to be a structural mismatch between the field of interest among students and the current hiring trends in the profession.

Introduction

Academic departments and their graduate students attain greater prosperity when students are successful in their respective programs and post-graduation careers. To foster this symbiotic relationship, it is important for departments, not only in the field of agricultural and resource economics (ARE) but in other agricultural disciplines as well, to know who their students are, what they want, and their perceptions and opinions. Graduate students have diverse academic backgrounds and goals. These characteristics are not trivial, as graduate committees often make admittance and funding decisions based on backgrounds and goals of prospective graduate students. This paper analyzes the backgrounds, motivations, and perceptions of a sample

of current PhD students in ARE at major American universities.

Past studies of ARE graduate students focus on measuring program productivity and ranking (Perry, 1994; Tauer and Tauer, 1984), the evolution of graduate programs (Reed, 2010), number of enrolled students, domestic versus international (Kinnucan, 2012), and research areas (Boland and Crespi, 2010; Marchant and Zepeda, 1995). Another vein of works study post-graduation outcomes such as job placement and salaries (Marchant and Zepeda, 1995; Stock and Siegfried, 2006). However, few studies have examined ARE graduate students' perception of their program of study and long-term career goals.

Mark et al. (2004) and Perry (1995) focus on student preferences for quantitative and qualitative characteristics of their graduate programs, such as course instruction and availability, research opportunities, financial support or other amenities, and program culture. Such perceptions are important and indicative of graduate student success. Cooke et al. (1995) show that the students' attitude towards their programs is linked to the probability of dropping out of the program. Similarly, Goodboy et al. (2015) also find a relationship between attitude and attrition rates, and further establish that attitude affects positive organizational behaviors such as general departmental courtesy/helpfulness. In addition, better understanding graduate students should also help departmental recruitment efforts. Malaney (1987) study graduate students' motivations, how they gathered information, and why they applied for certain schools while Kallio (1995) show that applicants had a

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³Corresponding author, Doctoral Student, 312 CE Barnhart Bldg., Department of Agricultural Economics, Lexington, KY 40546, jerrod.penn@uky.edu

⁴Lecturer and Undergraduate Coordinator, 1177 McCarty A, Food and Resource Economics Department, Gainesville, FL 32611, Sandberg@ufl.edu

wide variety of considerations which affected their school choice beyond just academic reputation and funding. Similarly, Bersola et al. (2014) echo the importance of non-monetary considerations.

Given the above context, the purpose of this study is to assess and analyze the backgrounds, goals, and perceptions of current ARE doctoral students. We uncover the background and reasons why PhD students decide to enter graduate school in the first place; what skills and experiences they find most valuable to succeed academically; their opinions on preparing for a PhD program; desired career choice, and declared field of specialization. Even though international students are an important part of many US graduate programs (Kinncan, 2012), comparisons of domestic and international students at the graduate level remain relatively limited (Zhao et al., 2005; Curtin et al., 2013). Our analysis can shed light on other potential differences and similarities between the two groups of students. While this analysis is specific to the field of ARE, its findings should be of great interest to graduate programs across agricultural disciplines in the land-grant system and beyond.

Methods and Survey Instrument

With limited knowledge of graduate students' attitudes toward program satisfaction and program selection, we explore students' perceptions via a survey. We reviewed previous literature of general graduate program selection and assessment such as Malaney (1987) and Kallio (1995) as well as ARE-specific literature (Perry, 1995; Mark et al., 2004) to inform the content, structure, and wording of the survey instrument. The survey instrument begins with undergraduate backgrounds such as major and minor. Next, students provided feedback on preparation and selection of a graduate program including the number of applications submitted, the importance of various criteria for program selection, and the value of various skills for program preparation. Subsequently, the survey queries why students entered graduate school, their intended area of focus, and their desired career goals. The survey concludes with basic questions on publication and presentation productivity, work experience, and regional affiliation.

Out of the 56 questions asked of current PhD students, 16 were objective questions, asking respondents to recall their previous decisions and actions. The remaining 40 were subjective, relying on the opinion and attitude of the student. Twenty-seven of these were presented in Likert-style grid formats. While the answers to the questions are subjective, the content of the questions themselves were still relatively objective in terms of the concept being measured. For example, while it is a student's opinion of how important various aspects are for graduate program selection, the aspects themselves, such as location, funding, graduate program size, etc., are not abstract ideas, minimizing concern for construct validity.

Many steps were taken to assess the credibility of the survey instrument. Prior to its distribution,

we tested the survey using a focus group and pilot responses from recent graduates of ARE programs, including faculty and post-doctorates. All questions were scrutinized to ensure consistent interpretation across respondents. Their feedback both supported and enhanced the validity of the survey. Survey instruments and implementation protocols received approval by a University Institutional Review Board.

We rely on several combinations of subjective questions to establish reliability. For example, respondents' attitudes towards calculus, statistics, and linear algebra as useful skills for PhD preparation should have a high degree of association as quantitative skills. For these three measures, Cronbach's alpha equals 0.786. Removing any of the three areas reduces Cronbach's alpha to between 0.662 and 0.769. On the other hand, if we include writing skills, which was also generally considered important, with the three previous quantitative skills, Cronbach's alpha falls to 0.687. We would expect similar levels of importance for all three quantitative measures, and indeed we find they are the highest rated skills to have before entering a PhD, evidence of convergent validity.

Data were collected using an online survey instrument via Qualtrics. A graduate program representative was identified and contacted for each school. Each representative used graduate student listservs to distribute the hyperlink to complete the survey. Thirty schools agreed to include their graduate students in the survey, listed in Table 1. Readers should note that some high-ranked programs, such as the University of California, Berkeley and the University of California, Davis opted not to participate. Student and university anonymity was stressed to encourage broad participation but circumvents inference about school differences. Survey distribution occurred during the fall of 2012, including two survey reminders.

Results and Discussion

We received 247 useable responses from those who classified themselves as PhD students, corresponding to a response rate of 33% (748 students received the survey). This response rate is similar to (Mark et al., 2004) or exceeds those of other researchers (House and Sterns, 2003; Stock and Siegfried, 2006)

Table 1: Schools Participating in the Survey

Colorado State University	University of Delaware
Cornell University	University of Florida
Louisiana State University	University of Georgia
Michigan State University	University of Idaho
Mississippi State University	University of Illinois at Urbana-Champaign
New Mexico State University	University of Kentucky
North Dakota State University	University of Minnesota-Twin Cities
Oklahoma State University	University of Missouri-Columbia
Oregon State University	University of Nebraska-Lincoln
Pennsylvania State University	University of Tennessee
Purdue University	University of Wyoming
Southern Illinois University-Carbondale	Utah State University
Texas A&M University	Virginia Tech
Texas Tech University	Washington State University
University of Arkansas	West Virginia University

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for the same study population. Out of the respondents in our sample, 25% were first year PhD students, 21% were in their second year, 38% were in their third year or fourth year, and 15% have been in their programs for more than four years. In addition, 40% classified themselves as domestic U.S. students, 55% as international students with undergraduate degrees from non-U.S. institutions, and the remaining 5% are international students with a U.S. undergraduate degree. Hereafter, the latter two categories are combined as “international students.” Any statistical evidence comparing domestic and international students relies on difference of proportions and difference of means t-tests. About 52% of the respondents completed an MS degree in ARE prior to beginning their PhD program and roughly 55% had work experience prior to the PhD. About 42% of students attended three different universities for the various academic degrees pursued, 53.7% attended two universities, and 4.5% of students only attended one university for all degrees pursued.

Figure 1 presents the undergraduate majors (including some double-majors) and minors of the respondents. The evidence suggests that traditional economics is the most common academic preparation of ARE graduate students, followed by agricultural economics. Other majors cited, but less frequently, include mathematics, statistics, political science, business administration, agricultural operations management, and soil science/agronomy. The sample’s academic background shares similarities to Perry (1994), with many economics students, but a large group of students with other training as well, including undergraduates from departments usually housed within colleges of agriculture. Out of the 128 respondents with a minor, minors in mathematics, statistics, or business administration are most common. Certainly, minors can be indicative of student interest and preparation.

Understanding students begins with understanding their motivations for entering graduate school in the first place and the factors influencing that decision. Students ranked their three most important reasons for pursuing a PhD, see Table 2 which lists the percentage of students

Table 2: Percentage Frequency of Top Three Reasons for Beginning PhD Program

	All Students, n= 242	Domestic, n= 98	International, n=144	P-value for equality ^z
Better job	83.5	80.6	85.4	0.323
Passion for Research	76.4	71.4	79.9	0.127
ARE's culture	39.3	33.7	43.1	0.143
Encouraged by Advisor	28.9	27.6	29.9	0.698
Other	23.6	34.7	16.0	0.001
Difficult Job Market	22.7	22.4	22.9	0.927
Unsure what to do	13.6	15.3	12.5	0.502

^z Based on difference of proportions t-test

Table 3: Important Factors in Choosing a Graduate Program

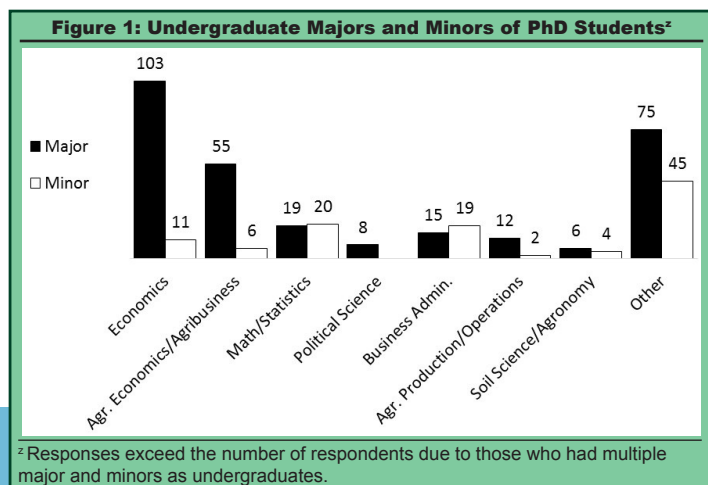
Reason ^z	All, n=247	Domestic, n=98	International, n=148	P-value for equality ^y
Funding	4.62	4.60	4.64	0.705
Major Professor	3.88	3.80	3.96	0.256
Prospective Job placement	3.70	3.49	3.91	0.004
Department/University Prestige	3.61	3.31	3.91	<0.001
Location	2.95	3.19	2.71	0.004
Graduate Program Size	2.87	2.64	3.09	0.002
Convenience of same School	2.17	2.07	2.28	0.225

^z Scale: 1=Not at all important, 5=Extremely Important
^y Based on difference of means t-test

who listed a particular motivation among their top three reasons. Improving future job prospects appeared most often, followed by a passion for research, and were the only two reasons to appear in a majority of students’ top three reasons. Reassuringly, the results suggest that students start PhD programs for “good reasons” (i.e., due to research and employment opportunities) rather than “bad reasons” (i.e., due to a tough job market or career indecisiveness). Interestingly, many students also listed the culture of ARE departments as a major influence. It seems that students are receptive to the inclusive and encouraging environments of ARE departments.

Once the decision to attend graduate school in ARE is made, how do students decide on particular departments? Table 3 outlines how students rate the importance of multiple elements for program choice. Not surprisingly, funding is the most important determinant among students for program selection. Students also value, although to a somewhat lesser extent, prospects of future job placement, the opportunity to work with specific professors, and the prestige of the department. Geographic location and the convenience of remaining at the same school were, overall, less important factors. Comparing international students and domestic students, international students are more likely to consider university and department prestige, graduate program size, and the prospective job placement as more important factors, while location is more important to domestic students. The importance of factors for school selection seem to corroborate Mark et al. (2004), in that funding, the single most important factor, can overcome school reputation.

Preparation is key to a successful experience in ARE PhD programs. Respondents were queried on advice to give to prospective doctoral students by ranking the importance of eight recommendations, seen in Table 4. Students unequivocally valued quantitative skills highly, such as calculus, statistics, and linear algebra, echoing the



rigorous quantitative coursework requirements for admission to most doctoral programs. However, it appears that students also value the importance of written communication skills. Significant differences exist in the average importance of some skills between domestic and international PhD students. Domestic students weigh calculus as more important for preparation, while international students place higher importance on experience with statistical software, undergraduate research, and exposure to academic conferences.

Table 4: Recommendations to Prospective PhD Students in Agricultural Economics

Skill ^z	All Students, n=247	Domestic, n=98	International, n=149	P-value for equality ^y
Calculus	4.47	4.59	4.35	0.007
Statistics	4.38	4.42	4.34	0.359
Linear Algebra	4.19	4.15	4.23	0.459
Writing	3.99	3.94	4.03	0.409
Statistical Software Experience	3.50	3.37	3.64	0.036
Complete Master's Degree First	3.17	3.10	3.23	0.374
Research Experience in BS	3.03	2.92	3.14	0.069
Undergraduate Conference in BS	2.40	2.21	2.58	0.002

^z 1= Not all important, 5=Extremely Important
^y Based on difference of means t-test

Beyond motivation, selection criteria, and preparation for graduate school, students make decisions on fields of specialization and future career goals. Students ranked the three most desirable areas for potential post-graduate employment, as summarized in Table 5. Students are overwhelmingly attracted to academic employment in the United States/Canada (78.9%), disproportionately more than the 40.7% (Reed, 2010) and 56.3% (Stock and Siegfried, 2014) of doctoral recipients who are actually employed in academia. Government employment, ranked below both NGO and industry employment. A caveat here is that government employment in the US often requires US citizenship, which would preclude most international students from this particular segment of the job market. US employment laws and visa requirements also make it difficult for non-US individual to secure private industry employment. Subsequently, international students more frequently desire an academic job outside of the United States/Canada (perhaps in their home country) or work with non-governmental organizations, while domestic students more frequently list government or private industry employment.

Table 5: Percent Frequency of Top 3 Jobs After Graduation

	All Students, n= 241	Domestic, n= 98	International, n= 143	P-value for equality ^z
Academia- US	78.9	79.6	79.0	0.910
NGO	71.9	56.1	83.2	<0.001
Industry	46.3	54.1	41.3	<0.001
Academia- Outside US	45.9	25.5	60.1	<0.001
Government	44.2	68.4	28.0	0.052
Other	5.8	8.2	4.2	0.192

^z Based on difference of proportions t-test.

Students provide their primary field of specialization, see Table 6. The most common PhD field is environmental and natural resource economics with economic development being nearly as popular. Our results seem similar to Perry's (2010) recent analysis of ARE departments' offered PhD fields and dissimilar to Marchant and Zapeda (1995), who found a larger (smaller) proportion of students interested in international trade, finance and production economics (development). Only the areas of international trade and agribusiness showed significant differences between domestic and international students' choice of field.

Table 6: Primary Field of Interest for PhD Students

Primary Field	Percent All, n=246	Percent Domestic, n=98	Percent International, n=148	P-value for equality ^z
Environmental/Resource Development	23.2	26.5	20.9	0.310
Economic Development	21.5	19.4	23.0	0.503
Econometrics	17.9	19.4	16.9	0.612
International Trade	7.7	3.1	10.8	0.029
Production	7.3	7.1	7.4	0.930
Marketing	5.3	7.1	4.1	0.306
Agribusiness	5.3	2.0	7.4	0.066
Finance	3.3	3.1	3.4	0.897
Extension	1.2	2.0	0.7	0.365
Other	7.3	10.2	5.4	0.160

^z Based on difference of proportions t-test

However, only 8.6% of sample respondents specialize in these areas. Thus, students entering their PhD program studying environmental economics and economic development, but available faculty positions are in other fields. That said, economic development as a frequently cited specialization may not be that surprising given the high percentage of foreign enrollment in U.S. graduate programs and the sizeable foreign-born contingency in the sample. Perhaps foreign students specialize in economic development with the goal to return and apply their knowledge in their home countries.

Summary

The current survey produced useful insight into the thoughts, opinions, and backgrounds of current ARE PhD students, knowledge useful to improving success for the student and their department. The sample of students is diverse, coming to U.S. graduate schools from a variety of backgrounds, both in terms of national origin and previous academic experience. Most students have degrees in economics, agricultural economics, and business administration; other fields are also well represented.

The findings suggest that graduate students are highly pragmatic in their school selection, since funding ranks the most important factor of school selection,

Interestingly, there may be a future structural mismatch in the profession between departments' needs and job candidates' skills, where students want to specialize in environmental economics and development, but universities want to hire in agribusiness. House and Sterns (2003) show that approximately 41% of open tenure-track positions posted in 2001 issues of *The Exchange* were in agribusiness management and finance. A similar inspection of 2012 issues show 50% of available tenure-track positions in the same area.

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with prospects for job placement and major professor following. Students appear to be open to going to any school, pending funding and future career prospects, since the location and the convenience of staying at the same program for school selection ranked much lower. These results depend on whether the student is domestic or international. Reassuringly, students seem to pursue a PhD for appropriate reasons, to gain advanced training to become the next generations of academics and researchers. Finally, students feel that strong quantitative skills are crucial to a successful completion of a graduate program.

Our results reveal two disparities in the discipline. First, students primarily desire an academic position within the United States, but previous studies show a much smaller proportion receive such employment. Given this reality, graduate faculty advisors have a responsibility to inform their students of such trends, which gives students an opportunity to adjust expectations and prepare for auxiliary employment areas. Secondly, environmental and resource economics and economic development were cited as the most prevalent fields of interest, conforming to previous studies. However, numerous openings in academia involve agribusiness, which ranks relatively low as the primary field of choice. It seems that, at least anecdotally, graduate programs would be well served by better marketing and recruiting qualified graduate students in the agribusiness area.

Comparing international and domestic students, they have some differences in reasons for applying or selecting a certain school, but their career aspirations and areas of specialty seem largely similar. Consequently, recruitment and marketing activities may be different for international and domestic students, but the same efforts can help both groups achieve their long-term goals once enrolled.

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