

**MORE THAN A SIGNATURE:
HOW ADVISOR CHOICE AND ADVISOR BEHAVIOR
AFFECT DOCTORAL STUDENT SATISFACTION**

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"It is impossible to overestimate the significance of the student-advisor relationship. One cannot be too careful about choosing an advisor. This is both a personal and professional relationship that rivals marriage and parenthood in its complexity, variety and ramifications for the rest of one's life."

– Doctoral student in ecology, the Survey of Doctoral Education and Career Preparation

The advisor-student relationship is one of the most important aspects of doctoral education. The best advisor-student relationships approach the platonic ideal of mentor and protégé. That is the kind of relationship most students and faculty members aim for, rare though it might be. On the other end of the spectrum, graduate student folklore is replete with stories of egregiously bad advisors. For example, the collapse of the advisor-student relationship has been directly implicated in several high-profile murders and suicides may (Burd, 1996; Hall, 1998; Leatherman, 1996; "Wayne State U. Professor Gunned Down in Class," 1999). Most relationships, of course, fall between these extremes: good in some ways, fair or poor in others.

Good or bad, the quality of the relationship between doctoral student and advisor directly influences the quality of the doctoral education experience, as research has shown. A positive relationship has positive outcomes for students, including a positive departmental environment (Hartnett, 1976), successful socialization into the department and discipline (Gerholm, 1990; Weiss, 1981), and timely completion of the degree (Girves & Wemmerus, 1988; Long, 1987; Lovitts, 2001). An unsatisfactory advising relationship is strongly implicated in many students' decisions to leave doctoral study (Golde, 1996; Jacks, Chubin, Porter, & Connolly, 1983; Lovitts, 2001).

Advanced doctoral students, like the one quoted above, recognize the importance of this relationship and repeatedly describe it as the most important aspect of their education (see also, Heiss, 1970). The relationship not only affects the quality of the doctoral experience, there are material implications. In many disciplines, funding for doctoral study and for dissertation

research often comes directly from advisors and their grants. And the impact of the advising relationship can last far beyond the years of doctoral study. For example, the strength of an advisor's letter of recommendation can affect the career options open to a student. When asked for advice by new graduate students, savvy students focus on advisor attributes and strategies for selecting an advisor.

What makes for good advisor? The qualities of a good advisor include supportiveness (Long, 1987), high levels of interaction (accessibility, frequent informal interactions, and connections with many faculty members) (Gerholm, 1990; Girves & Wemmerus, 1988; Hartnett, 1976; Weiss, 1981), purposefully helping the student progress in a timely manner (Heiss, 1970; Lovitts, 2001; Rudd, 1986), providing regular reviews of progress (Hartnett, 1976; Heiss, 1970), and treating the student as a junior colleague (Girves & Wemmerus, 1988). Yet little is known about how advisor behaviors are related to satisfaction with the advising relationship, and if this relationship differs by discipline.

The process by which students and advisors come together is also an essential step to understand and explore, as the graduate student advice literature emphasizes (Bloom, Karp, & Cohen, 1998; Peters, 1992). There is considerable variation in how departments pair students with advisors, which often follows a predictable pattern by discipline. Some departments (often humanities) assign all students to an initial advisor, and expect that over the course of the first few terms each student will form a relationship with someone else, who will then become the primary advisor. In other departments (commonly in science), students and advisors decide to work together as part of the admissions process; indeed, in some departments a faculty member selects the applicants with whom they wish to work and this becomes the admissions decision. In still other departments the student is advised by a committee for the first year, while systematically searching for an advisor (prevalent in life sciences). Regardless of when and how

students and advisors come to work together, we do not know what criteria students use when assessing prospective advisors, whether or how this varies by field, and whether or how differences in these strategies are related to subsequent satisfaction with the advising relationship. The linkage between students' advisor selection strategies and satisfaction with advising is relatively unexplored.

So far we have suggested two different and potentially important influences on student satisfaction with the student-advisor relationship. Selecting the right advisor might be the most important act, or satisfaction with the relationship might depend more on specific advisor behaviors once the relationship is undertaken.

Implicit in our discussion is the assumption that some critical aspects of doctoral education vary systematically by discipline, or at least by disciplinary area (by which we mean the humanities, the physical sciences, and the like). Disciplinary communities can be seen as cultures, in which norms and habits of interaction are taken for granted and invisible to insiders. And yet these disciplinary cultures can vary enormously, even on the same campus. Several authors, notably Tony Becher (Becher, 1989; Becher & Trowler, 2001) and Janet Donald (Donald, 2002), have outlined some of the differences in disciplinary cultures. These cultural differences manifest themselves in the policies and practices of doctoral education, for example, how research is funded, and what the dissertation looks like, how a dissertation topic is selected, and how students and faculty interact.

This brief overview establishes our two research questions:

1. After controlling for student characteristics, do patterns of advisor choice and advisor behavior differ by disciplinary area?
2. After controlling for student characteristics and disciplinary area, how do advisor choice and advisor behavior relate to satisfaction with the advising relationship?

A visual model of the relationship of the interrelationship of our four key concepts— advisor selection, advisor behavior, satisfaction with the advisor, and disciplinary area — would be:

Insert figure 1 about here

It is logical to imagine, of course, that advisor selection and advisor behavior are not entirely independent influences on a satisfactory advisor-student relationship. It is reasonable to assume that the two are related, in that a student's advisor choice may incorporate expectations of subsequent behavior based on a faculty member's reputation. Reputations, of course, develop from behavior. But advisor choice may involve other considerations, such as the availability of funding and compatibility of intellectual interests, that may have little bearing on the conduct of the advising relationship. For the purposes of this paper, we are less interested in establishing causal relationships between behavior and choice, and more interested in exploring the relative influence of behavior and choice on satisfaction.

Data and Methods

This study uses data collected as part of the Survey on Doctoral Education and Career Preparation (see www.phd-survey.org for details). The Survey is a national, cross-sectional study of advanced doctoral students in eleven disciplines at 27 universities, plus one cross-institutional program (the Compact for Faculty Diversity). Currently-enrolled doctoral students who began their studies in the fall of 1996 or earlier compose the survey sample. The survey was administered in the summer of 1999, so respondents had spent at least three years in their program. The data are based on 4,114 completed surveys, a 42.3% response rate. After excluding students who did not have an advisor and those who identified their discipline as

“other,” the analysis sample comprised 4,010 students. The vast majority of respondents (94%) were full-time students.

In the interest of parsimony, disciplines represented in the study were collapsed into four broad disciplinary areas: humanities (art history, English, history, and philosophy; 36% of the sample), social sciences (psychology and sociology; 21%), physical sciences (chemistry, geology, and mathematics; 20%), and biological sciences (ecology and molecular biology; 23%).

The survey listed 13 possible reasons for students’ choice of advisor. Respondents were asked, “Rate the extent to which each statement describes why you chose your advisor,” designating each as a major reason, a minor reason, or not a reason.¹ Another section asked respondents to identify the extent to which their advisor displays 24 possible behaviors using a 4-point Likert scale (scaled from Strongly Disagree to Strongly Agree): “Advisors engage in many different behaviors. For each of these statements, indicate the extent that it describes the behavior of your advisor.” (See descriptors in appendix table A1.)

Four survey items were used to assess students’ satisfaction with the advising relationship: “I currently have the advisor I want,” “I’m satisfied with the process by which I came to have my current advisor,” “I’m satisfied with the amount and quality of time spent with my advisor,” (each on a 4-point Likert scale) and “If did it over, I would select a different advisor” (No/Maybe/Yes). After reverse-coding the last item, responses were standardized and summed to create a simple satisfaction index. We then standardized the resulting index for use as the dependent variable in the analysis of doctoral student satisfaction.

¹ Respondents who indicated that their advisor was assigned were asked to skip items related to advisor choice.

Appendix table A1 presents means and standard deviations for all survey items used in this analysis, reported separately by disciplinary area: student background characteristics as well as each of the advisor choice, advisor behavior, and advisor satisfaction items.

We used principal components factor analysis to distill the advisor choice and advisor behavior items into three dimensions of advisor choice and four dimensions of advisor behavior. Standardized and summated factor scores were then computed for use as independent variables in the analysis of students' satisfaction with the advising relationship.

After examining the relationships among the factors, we used ordinary least-squares regression to test for disciplinary differences in choice strategies and advisor behaviors, controlling for student background characteristics (gender, marital status, and presence of children as dichotomous variables; age; and parents' education using a 5-category scale ranging from no college to doctorate). Next, we used regression to examine the impact of disciplinary area, advisor choice factors, and advisor behavior factors on students' satisfaction with the advising relationship, controlling for student background characteristics .

Findings

Factor analysis results for advisor choice and advisor behavior are presented in table 1. The analysis of advisor choice reveals three major dimensions underlying students' advisor selection: a generalized reputation dimension, reflecting an advisor's reputation as a good teacher, researcher, and advisor; an intellectual compatibility dimension, capturing the alignment of the advisor's intellectual interests and methodological expertise with the student's interests, as well as expectations of ensuring high-quality work; and a dimension emphasizing pragmatic benefits of the advising relationship, such as financial support and a favorable work environment.

The analysis of advisor behaviors identifies four factors: academic advising, based on items related to training and progress; personal touch, reflecting advisor interest and support beyond purely academic concerns; career development, reflecting collegial support, sponsorship, and mentorship; and cheap labor, a factor based on two items capturing negative and exploitative aspects of the advisor-student relationship.

Insert table 1 about here

Reliabilities (Cronbach's alpha) for four of the seven factors were high (.73 to .90), and more modest for the other three (.43 to .68). Of the four advisor behavior factors, three had reliabilities of .85 or higher. The lowest reliability was observed for the "pragmatic benefit" factor of advisor choice, which is based on only three items of which two (funding availability and research groups) are more relevant to certain disciplines than others.

Descriptive statistics for the standardized factor scores and satisfaction index by disciplinary area appear in table 2. Disciplinary differences emerge quite strongly in the advisor choice, advisor behavior, and satisfaction items. Turning first to the advisor choice ratings, these are also depicted in figure 2. Here the physical and biological sciences pattern quite similarly, and the humanities are the mirror image. The scientists are much more likely to rely on pragmatic benefit as a reason for selecting their advisor than are either the social scientists or the humanities students. Conversely, scientists are less likely to emphasize intellectual compatibility than their colleagues in the humanities. Social science students are in the middle. Advisor reputation is also more likely to be used by humanists.

Insert table 2 and figure 2 about here

Advisor behavior also varies by discipline, again in ways that may be predictable. As shown in figure 3, the biological and physical scientists responded nearly identically, the humanities students responded in opposite ways, and the social scientists were much closer to the mean on all four scales. The science students were much more likely it to feel that they were exploited as cheap labor. Of course, relatively few humanities students work for faculty members in positions where they might be asked to put in large number of hours to advance the faculty members' research. When humanities students feel overworked and exploited it is usually a reference to the number of hours spent teaching or grading papers. Social science and humanities students also seem to report more academic advising and personal touch behaviors from their advisors. On the positive side, students in the physical, biological, and social sciences are more likely to report advisor behaviors to develop the careers of their protégés, than their counterparts in the humanities.

Insert figure 3 about here

Figure 4 shows the mean standardized scores on the satisfaction scale by disciplinary area. The humanities students are the most satisfied, and the biological science students are the least satisfied with their relationship with their advisor. While the social scientists and physical scientists are slightly dissatisfied, their responses are much closer to the mean.

Insert figure 4 about here

Intercorrelations among the advisor choice and advisor behavior factor scores are presented in table 3. Of the advisor choice and behavior factors other than cheap labor, all are positively correlated, though few show a strong correlation. Students who took pragmatic

considerations into account when selecting their advisor also tended to report the exploitative behaviors captured by the cheap labor factor, but the correlation is modest (.28).

The three desirable advisor behavior factors – academic advising, personal touch, and career development – are positively and relatively strongly correlated with each other, suggesting that students whose advisors exhibit behaviors on one dimension tend to report that they do so on the other two, as well. Cheap labor is negatively correlated with two of the three positive behaviors, academic advising and personal touch, but the relationship is not nearly as strong as it is among the positive behaviors. Career development and cheap labor behaviors appear not to be correlated for the overall sample.

Satisfaction with the advising relationship is positively correlated with advisor choice factors, with correlations on the order of .2 to .4. But the more interesting findings are between the advisor behavior factors and the satisfaction index. The strongest correlation in the table is between the academic advising behaviors and satisfaction: each explains about 46 percent of variation in the other. The other two positive behaviors are also fairly strongly related to satisfaction. While satisfaction is negatively related to cheap labor, the rather modest correlation suggests that many students may simply accept this as part of the doctoral experience, or they may judge the available alternatives in their department as not offering an improvement.

Insert table 3 about here

After controlling for student characteristics, do patterns of advisor choice and advisor behavior differ by disciplinary area?

Our first research question explores the extent to which advisor choice and advisor behavior factors vary by disciplinary area, rather than by gender, age and the other personal characteristics that might arguably play a role. Multivariate analysis doesn't change our overall

understanding; the strong disciplinary effects seen earlier continue to hold. Table 4 presents the regression results for the three advisor choice factors and the four advisor behavior factors. For two of the three advisor choice factors and three of the four advisor behavior factors, student characteristics and disciplinary areas account for a very small proportion of the variance in advisor choice and advisor behavior (explaining from 1 to 6 percent). Personal characteristic variables account for an appreciable share of the “pragmatic benefit” choice factor as well as the “cheap labor” behavior factor (24 and 16 percent of the variance, respectively).

In general, student background characteristics have limited roles in predicting advisor choice or advisor behavior. Except for student age, most of the background characteristics play a role in only one or two of the seven factors analyzed, and marital status shows no independent effect. Age, however, shows significant coefficients for five of the seven factors. Older students less often choose their advisor based on reputation or pragmatic considerations, and older students report that their advisors are less likely to manifest academic advising or career development and mentorship behaviors. Advisors to older students are also less likely to engage in exploitative advising behaviors.

While student background characteristics do not play a major role in advisor choice and behavior, there are pronounced and systematic differences with respect to disciplinary area. Relative to students in the humanities, those in the other fields are less likely to take reputational factors or intellectual compatibility into account when choosing an advisor, and are more likely to consider pragmatic factors – especially students in the physical and biological sciences, who are about a standard deviation higher than humanities students on this factor.

Now, consider advisor behavior. The academic advising factor is slightly higher in the social sciences and slightly lower in the biological and physical sciences, compared to the humanities. Personal touch is as common in the social sciences as in the humanities, but lower

in the science fields. Career development behaviors are least commonly reported in the humanities, with the largest difference between the humanities and the biological sciences. Particularly noteworthy is the finding for the “cheap labor” factor: doctoral students in the physical and biological sciences report considerably higher levels of exploitative advisor behavior relative to their counterparts in the humanities. Exploitative behavior is also higher in the social sciences than in the humanities. These differences are probably attributable, at least in part, to the increased reliance on grant funding in the sciences and social sciences.

Insert table 4 about here

After controlling for student characteristics and disciplinary area, how do advisor choice and advisor behavior relate to satisfaction with the advising relationship?

Table 5 presents findings for doctoral students’ satisfaction with the advising relationship. The analysis is presented in three stages: first considering only background characteristics and disciplinary area, then adding advisor choice factors, and then advisor behaviors. Each refinement substantially improves the model’s explanatory power, from less than one percent of variance explained by the baseline model, to 21 percent in the intermediate model, to just over half in the final model. Not surprisingly, advisor behavior has a strong influence on students’ satisfaction with the advising relationship. Discussion here focuses on the full model.

Insert table 5 about here

With the exception of gender and parents’ education, student background characteristics do not appear to play a role in satisfaction with the advising relationship after taking discipline, advisor choice, and advisor behavior into account. Women doctoral students are less satisfied

with their advising than their male counterparts, and students with more highly educated parents are more satisfied. The latter may reflect the influence of parental advising among students with parents who trained at the doctoral level.

Both advisor selection strategies and advisor behaviors affect doctoral students' satisfaction with the advising relationship. Only one advisor choice factor, advisor reputation, appears unrelated to satisfaction. This can mean one of two things: one possibility is that advising relationships that lead to a good reputation do not reflect general advising skills and commitment, but simply the serendipitous matching of individuals who develop an effective relationship; alternatively, reputation is simply a proxy for effective advising behavior, and thus it drops out as a predictor after including behavior. The fact that advisor reputation is significant in the intermediate model before behavior enters the model offers some support for the latter account.

Not surprisingly, the cheap labor behavior factor is the only one that shows a negative relationship with satisfaction. The single most powerful influence on students' satisfaction with the advising relationship is the academic advising dimension of advisor behavior, with each standard deviation increase on this factor netting a .38 standard deviation increment in satisfaction. This is twice as strong as the next strongest factor, the personal touch advising behaviors.

It is interesting to note that even controlling for advisor choice strategies and advisor behaviors, disciplinary area continues to have an independent effect (though generally smaller than advisor choice and behavior). After controlling for these aspects of the advising relationship and student background characteristics, doctoral students in the social and biological sciences are less satisfied with their advising relationship than their peers in the humanities. Interestingly, students in the physical sciences are as satisfied as those in the

humanities after taking advisor choice and behavior into account—a departure from the descriptive findings reported in table 2 and figure 4. This suggests that the uncontrolled difference between the two disciplinary areas shown in table 2 and figure 4 reflects the effect on satisfaction of systematic differences in advisor choice and advisor behavior.

Implications

These findings answer both research questions affirmatively. There are pronounced disciplinary differences in the way doctoral students approach the choice of an advisor, and also in the way the advising relationship is conducted. Moreover, both the strategies doctoral students use in selecting their advisor and actual advisor behaviors influence their satisfaction with the advising relationship. Even after taking these into account, however, disciplinary differences in satisfaction remain.

There is both promise and caution to be found in these results, but both can be used to improve doctoral education. One caution pertains to the findings regarding “cheap labor.” Some doctoral students—especially in the biological and physical sciences—feel their relationship with their advisor is based in part on exploitation. Another caution is the systematic lower satisfaction evidenced by female doctoral students, even after controlling for background and personal circumstances, discipline, and advisor choice and behavior. This disturbing finding clearly demands further investigation.

Now the promise. Most importantly, advisor behaviors promoted in the literature clearly make a difference for students, especially those captured by the academic advising factor. Apart from the academic advising factor, the remaining behaviors make relatively small (though statistically significant) contributions to satisfaction with the advising relationship. On their own, improvements of a standard deviation on each of these factors results in an

incremental .12 to .19 standard deviation increase in satisfaction. Consider, though, the *combined* impact of such increases in each of the positive factors (academic advising, personal touch, and career development) with an equivalent decrease in the negative cheap labor factor: this would yield a payoff in doctoral student satisfaction of about four-fifths of a standard deviation. Add to this an equivalent improvement of advisor selection strategies emphasizing intellectual compatibility and pragmatic benefits, and the increment in satisfaction would just exceed a standard deviation. This, in turn, could yield payoffs in doctoral student retention and completion, and perhaps even quality of preparation and time to degree. And it might increase the rewards to faculty members associated with their important role as sponsors and mentors.

Some simple interventions for both students and faculty could improve the doctoral experience, and it is clear that there is room for improvement. Students could be explicitly informed of important factors to consider when choosing their advisor. Faculty can be reminded of their role in ensuring a satisfactory doctoral experience, and of the particular ways they can be more effective as advisors and mentors, with special attention to the “academic advising” behaviors listed in table 1. And departments can systematically assess and seek to improve their students’ advising experiences.

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Insert appendix table A1 about here

Figure 1: Model of relationship among key concepts

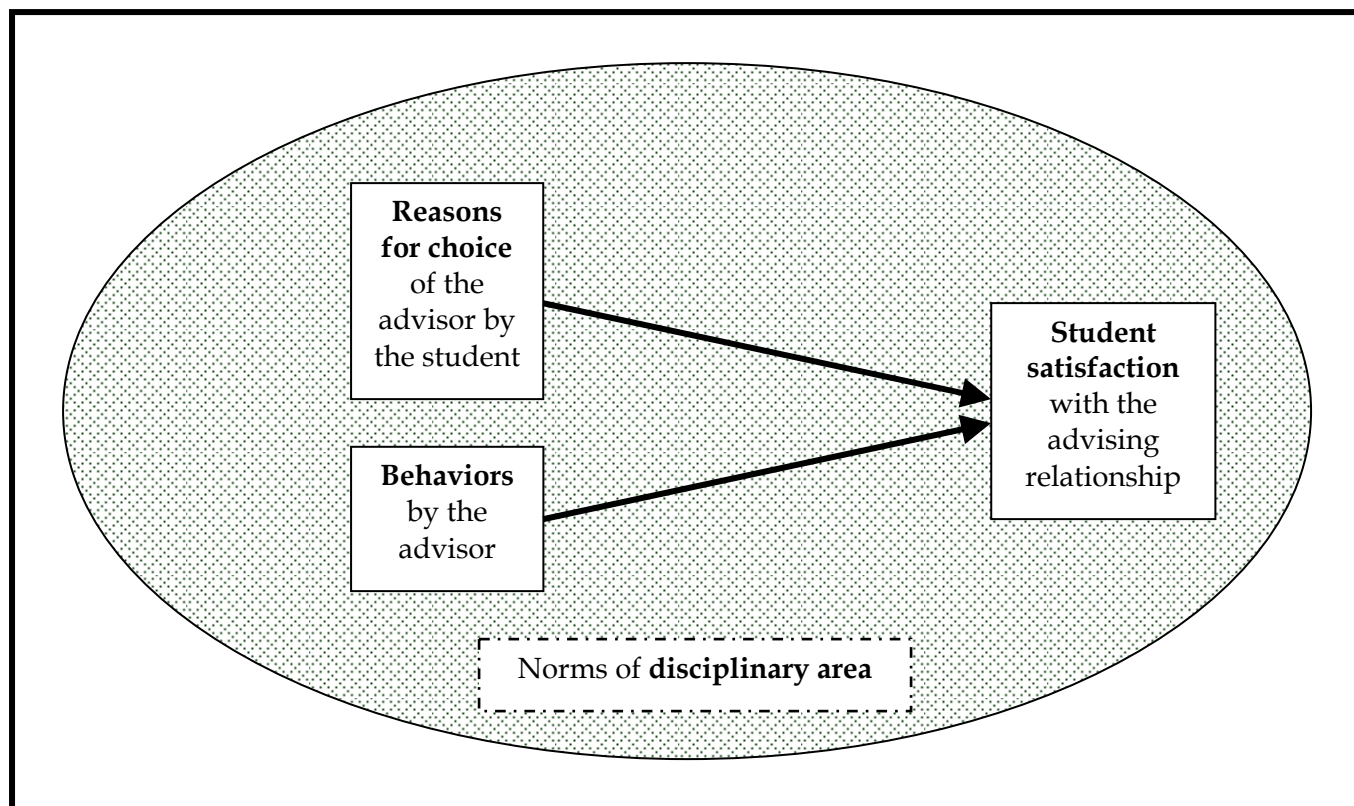


Figure 2:
Advisor Choice by Disciplinary Area

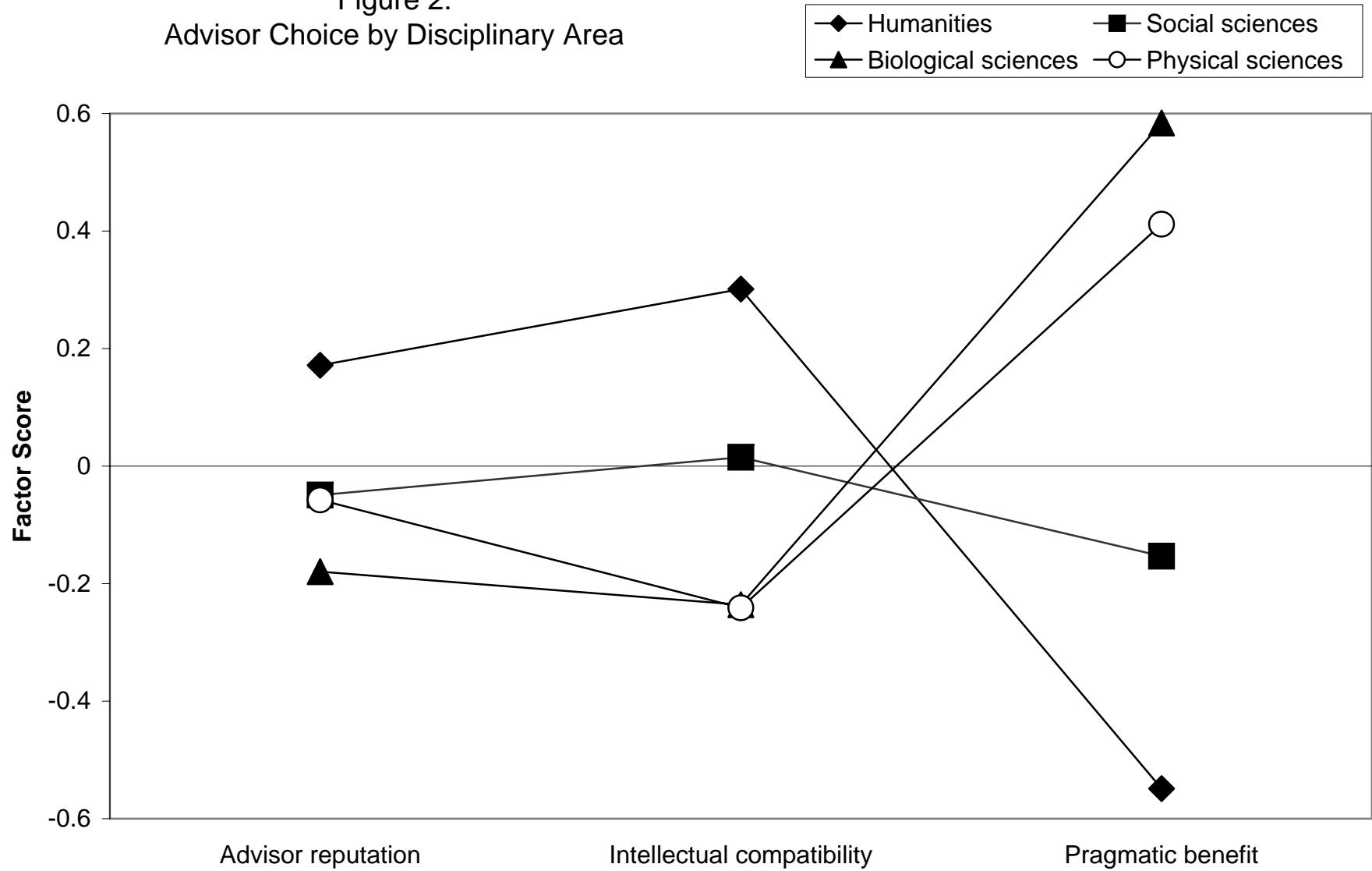


Figure 3:
Advisor Behavior by Disciplinary Area

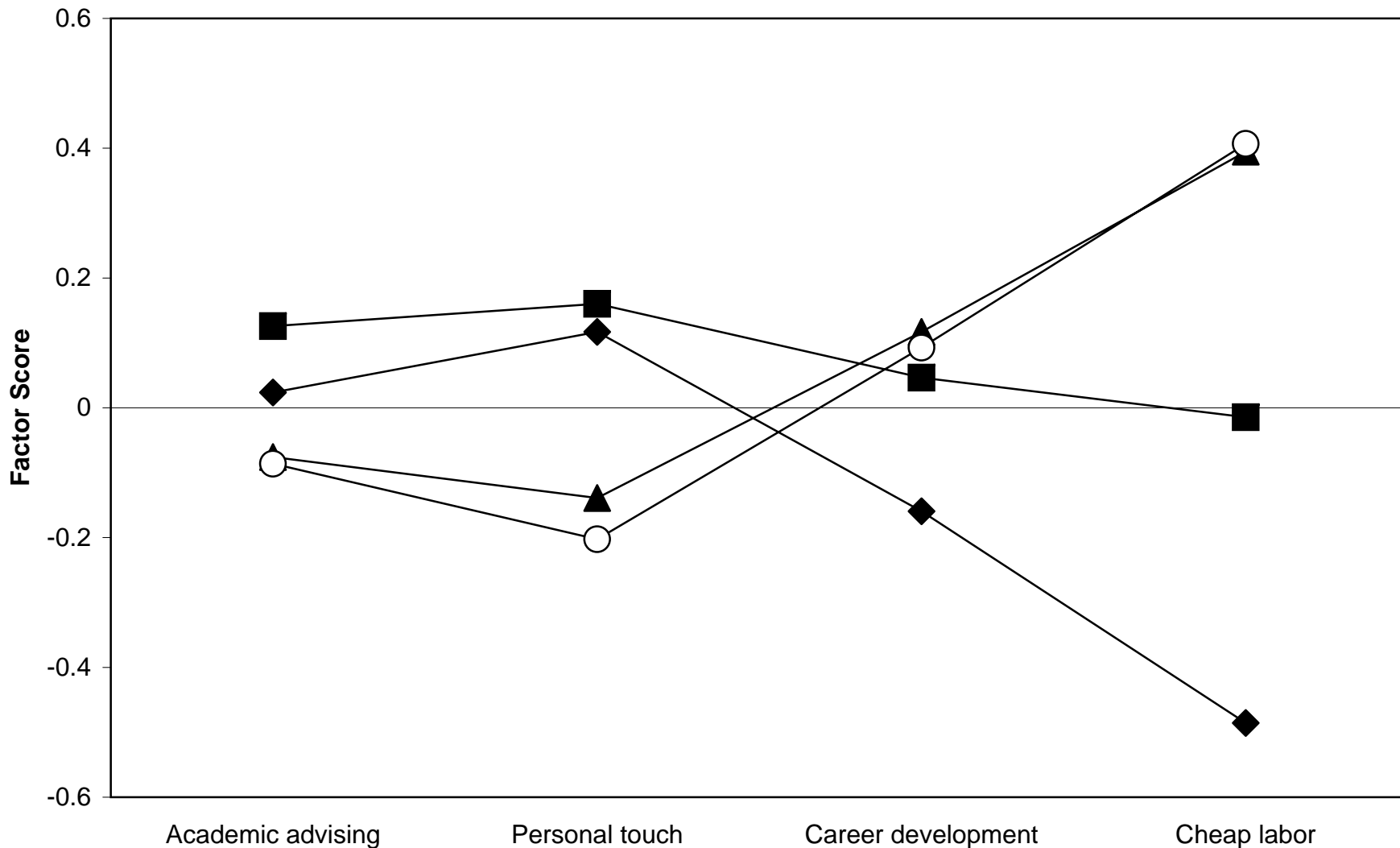
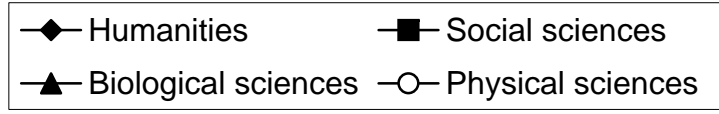


Figure 4:
Satisfaction by Disciplinary Area

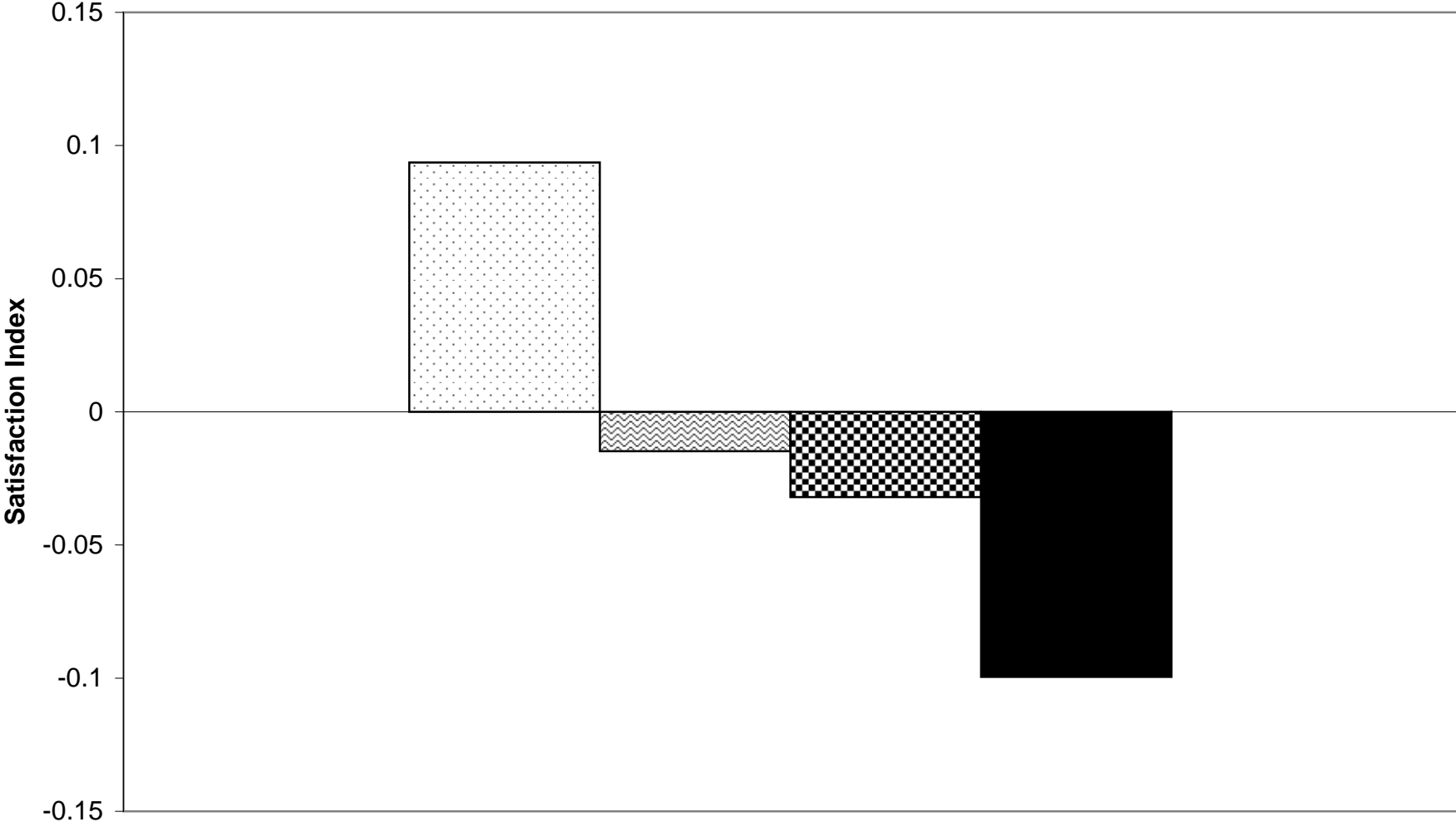


Table 1: Factor analysis results for advisor choice and advisor behaviors

Advisor Choice¹	Loading
<i>Factor 1: Advisor reputation (alpha=.73)</i>	
Reputation as a good advisor	0.79
Reputation for getting students through in a timely manner	0.67
Reputation as a good teacher	0.67
Recommended by other people	0.63
Reputation as a good researcher	0.48
Can write a good recommendation letter to carry my career a long way	0.48
<i>Factor 2: Intellectual compatibility (alpha=.52)</i>	
Intellectual interests match mine	0.71
Knows the techniques and methods I will employ	0.68
Will make sure I do a rigorous dissertation	0.54
<i>Factor 3: Pragmatic benefit (alpha=.43)</i>	
Has money to support me	0.76
Is doing interesting research	0.71
Fosters a working environment I like in his/her research group	0.42
Advisor Behavior²	Loading
<i>Factor 1: Academic advising (alpha=.89)</i>	
Gives me regular and constructive feedback on my research	0.79
Available when I need help with my research	0.76
Gives me regular and constructive feedback on my progress toward degree completion	0.71
Available when I need to talk about my program and progress	0.71
Provides direct assessments of my progress	0.69
Teaches me the details of good research practice	0.66
Provides information about ongoing relevant research	0.58
<i>Factor 2: Personal touch (alpha=.90)</i>	
Takes an interest in my personal life	0.82
Cares about me as a whole person, not just as a scholar	0.82
Provides emotional support when I need it	0.77
Is sensitive to my needs	0.73
Has my best interests at heart	0.62
Would support me in any career path I might choose	0.59
<i>Factor 3: Career development (alpha=.85)</i>	
Helps me secure funding for my graduate studies	0.77
Teaches me to write grant and contract proposals	0.72
Helps me develop professional relationships with others in the field	0.7
Assists me in writing presentations or publications	0.56
Teaches me survival skills for this field	0.52
Advocates for me with others when necessary	0.5
Solicits my input on matters of teaching and research	0.47
Provides information about career paths open to me	0.46
<i>Factor 4: Cheap labor (alpha=.68)</i>	
Sees me as a source of labor to advance his/her research	-0.81
Expects me to work so many hours that it's difficult to have a life outside of school	-0.79

¹ "Was willing to take me on" was excluded due to low factor loading.

² "Treats my ideas with respect" was excluded due to low factor loading.

Table 2: Descriptive statistics for factor scores and satisfaction index

	Humanities		Social sciences		Biological sciences		Physical sciences	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Advisor choice								
Advisor reputation	0.172	0.990	-0.049	0.983	-0.180	0.991	-0.058	1.001
Intellectual compatibility	0.301	0.898	0.015	0.973	-0.236	0.997	-0.241	1.040
Pragmatic benefit	-0.549	0.839	-0.153	0.992	0.584	0.852	0.412	0.864
Advisor behavior								
Academic advising	0.024	0.995	0.126	0.985	-0.076	1.001	-0.086	1.006
Personal touch	0.117	0.958	0.160	0.991	-0.139	1.003	-0.203	1.011
Career development	-0.159	1.020	0.047	1.043	0.117	0.967	0.093	0.924
Cheap labor	-0.486	0.696	-0.015	0.963	0.395	1.019	0.407	1.079
Satisfaction index	0.094	0.943	-0.015	1.005	-0.100	1.045	-0.032	1.025
N of cases (range)	1,300-1,407		764-816		778-805		882-914	

Table 3: Correlations among advisor choice factors, advisor behavior factors, and satisfaction index

		Choice			Behavior				
		Advisor reputation	Intellectual compatibility	Pragmatic benefit	Academic advising	Personal touch	Career development	Cheap labor	Satisfaction
Choice	Advisor reputation	1							
	Intellectual compatibility	0.417	1						
	Pragmatic benefit	0.251	0.127	1					
Behavior	Academic advising	0.365	0.401	0.190	1				
	Personal touch	0.310	0.285	0.110	0.631	1			
	Career development	0.358	0.313	0.399	0.675	0.584	1		
	Cheap labor	-0.103	-0.127	0.283	-0.167	-0.365	-0.013 (NS)	1	
Satisfaction		0.336	0.396	0.212	0.681	0.598	0.576	-0.266	1

NOTE: Except as indicated, all correlations significant at the .01 or .001 level.

N of cases: 3,568 to 3,942.

Table 4: OLS regression results for advisor choice and advisor behavior

	Dependent Variables						
	Advisor Choice			Advisor Behavior			
	Advisor reputation	Intellectual compatibility	Pragmatic benefit	Academic advising	Personal touch	Career development	Cheap labor
(Constant)	0.388 **	0.198	0.056	0.376 **	0.199	0.574 ***	-0.110
Female	0.070	0.047	0.074 *	-0.029	0.043	-0.049	-0.009
Single	0.014	0.052	-0.020	0.010	-0.039	-0.054	0.058
Nonwhite	0.113 *	0.088	0.051	0.047	0.003	-0.032	-0.054
Has children	0.027	-0.021	-0.029	0.043	0.165 **	-0.012	-0.033
Parents' highest degree	0.007	-0.020	-0.027 *	-0.024	-0.017	-0.016	-0.034 **
Age	-0.009 **	0.004	-0.017 ***	-0.009 **	-0.002	-0.019 ***	-0.008 **
Social sciences	-0.257 ***	-0.300 ***	0.374 ***	0.115 *	0.057	0.225 ***	0.489 ***
Biological sciences	-0.387 ***	-0.531 ***	1.089 ***	-0.138 **	-0.237 ***	0.260 ***	0.855 ***
Physical sciences	-0.294 ***	-0.530 ***	0.937 ***	-0.159 **	-0.298 ***	0.194 ***	0.853 ***
F	9.538 ***	22.679 ***	108.788 ***	4.557 ***	10.721 ***	10.651 ***	69.818 ***
Adjusted R ²	2.4%	5.8%	23.7%	1.0%	2.7%	2.7%	16.0%

*p<.05, **p<.01, ***p<.001.

Notes: Columns correspond to seven separate regression models. Dependent variables are standardized factor scores. Reference categories are male, married/partnered, white, no children, humanities. Regression coefficients are unstandardized.

Table 5: OLS regression results for satisfaction with the advising relationship

	Baseline model	Advisor Choice factors added	Advisor Behavior factors added
(Constant)	0.385 **	0.264 *	0.080
Female	-0.086 *	-0.116 ***	-0.088 ***
Single	-0.012	-0.023	0.010
Nonwhite	0.001	-0.042	-0.022
Has children	0.034	0.040	-0.018
Parents' highest degree	0.015	0.014	0.023 *
Age	-0.009 **	-0.004	-0.002
Social sciences	-0.086	-0.047	-0.116 **
Biological sciences	-0.201 ***	-0.204 ***	-0.087 *
Physical sciences	-0.154 **	-0.141 **	0.019
Advisor reputation		0.159 ***	0.001
Intellectual compatibility		0.283 ***	0.109 ***
Pragmatic benefit		0.175 ***	0.108 ***
Academic advising			0.383 ***
Personal touch			0.186 ***
Career development			0.116 ***
Cheap labor			-0.134 ***
F	3.488 ***	67.989 ***	208.739 ***
Adjusted R ²	0.7%	20.9%	54.3%

*p<.05, **p<.01, ***p<.001.

Notes: Columns correspond to three separate regression models. Dependent variables are standardized factor scores. Reference categories are male, married/partnered, white, no children, humanities. Regression coefficients are unstandardized.

Appendix Table A1: Descriptive statistics for variables included in the analysis

	Humanities		Social sciences		Biological sciences		Physical sciences		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Background characteristics										
Female	0.56	0.50	0.67	0.47	0.51	0.50	0.39	0.49	0.53	0.50
Single	0.39	0.49	0.45	0.50	0.48	0.50	0.51	0.50	0.45	0.50
Nonwhite	0.15	0.35	0.21	0.41	0.20	0.40	0.15	0.35	0.17	0.38
Has children	0.18	0.38	0.21	0.40	0.14	0.35	0.11	0.32	0.16	0.37
Parents' highest degree ¹	3.47	1.28	3.30	1.31	3.39	1.26	3.35	1.31	3.39	1.29
Age	33.25	6.81	32.04	6.36	30.24	5.08	29.34	4.75	31.50	6.17
Advisor Choice (1=Not a reason / 2=Minor reason / 3=Major reason)										
Is doing interesting research	2.33	0.71	2.46	0.70	2.77	0.49	2.81	0.43	2.56	0.64
Reputation for getting students through in a timely manner	1.72	0.77	1.67	0.79	1.50	0.70	1.67	0.78	1.65	0.77
Has money to support me	1.21	0.55	1.48	0.77	1.97	0.83	1.86	0.82	1.58	0.79
Intellectual interests match mine	2.72	0.50	2.65	0.55	2.54	0.62	2.45	0.65	2.60	0.58
Will make sure I do a rigorous dissertation	2.42	0.70	2.13	0.80	2.03	0.78	1.92	0.79	2.16	0.79
Recommended by other people	2.02	0.83	1.82	0.81	1.86	0.82	1.91	0.81	1.92	0.82
Reputation as a good researcher	2.34	0.75	2.45	0.73	2.46	0.71	2.45	0.73	2.41	0.73
Reputation as a good teacher	2.16	0.80	1.86	0.81	1.83	0.83	1.82	0.81	1.95	0.83
Reputation as a good advisor	2.17	0.81	2.03	0.83	1.92	0.84	2.01	0.83	2.05	0.83
Knows the techniques and methods I will employ	2.47	0.68	2.39	0.74	2.22	0.75	2.42	0.72	2.39	0.72
Fosters a working environment I like in his/her research group	1.69	0.83	1.91	0.84	2.28	0.80	2.07	0.83	1.95	0.86
Can write a good recommendation letter to carry my career a long way	2.12	0.79	2.01	0.78	1.87	0.78	1.94	0.80	2.00	0.79
Willing to take me on	2.39	0.70	2.48	0.68	2.42	0.70	2.33	0.72	2.40	0.70
Advisor Behavior (1=Strongly disagree / 2=Disagree / 3=Agree / 4=Strongly agree)										
Available when I need help with my research	3.23	0.74	3.32	0.73	3.28	0.78	3.25	0.77	3.26	0.76
Available when I need to talk about my program and progress	3.24	0.73	3.29	0.75	3.22	0.78	3.15	0.79	3.22	0.76
Gives me regular and constructive feedback on my research	3.03	0.87	3.01	0.90	2.83	0.93	2.84	0.94	2.94	0.91
Teaches me the details of good research practice	2.71	0.92	3.08	0.86	2.74	0.95	2.82	0.90	2.82	0.92
Provides information about ongoing relevant research	2.79	0.92	2.89	0.94	2.89	0.86	2.93	0.89	2.86	0.91
Teaches me survival skills for this field	2.69	0.94	2.77	0.96	2.56	0.93	2.60	0.91	2.66	0.94
Helps me secure funding for my graduate studies	2.59	1.07	2.70	1.09	3.01	0.95	3.05	0.98	2.80	1.05
Helps me develop professional relationships with others in the field	2.62	0.97	2.59	0.99	2.60	0.95	2.64	0.92	2.62	0.96

Appendix Table A1: Descriptive statistics for variables included in the analysis (continued)

	Humanities		Social sciences		Biological sciences		Physical sciences		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Assists me in writing presentations or publications	2.51	0.96	2.86	1.02	3.12	0.89	3.08	0.88	2.84	0.98
Teaches me to write grant and contract proposals	2.09	0.97	2.20	1.01	2.54	0.97	2.24	0.96	2.24	0.99
Advocates for me with others when necessary	3.22	0.82	3.28	0.85	3.14	0.84	3.10	0.83	3.19	0.84
Provides emotional support when I need it	2.64	1.02	2.76	1.05	2.46	1.06	2.39	1.01	2.57	1.04
Is sensitive to my needs	2.88	0.89	2.90	0.93	2.63	0.96	2.60	0.94	2.77	0.93
Takes an interest in my personal life	2.58	0.96	2.68	0.97	2.45	0.94	2.36	0.95	2.52	0.96
Has my best interests at heart	3.33	0.71	3.24	0.77	3.00	0.89	2.93	0.87	3.15	0.82
Cares about me as a whole person, not just as a scholar	3.02	0.89	3.01	0.92	2.81	0.93	2.73	0.94	2.91	0.92
Provides direct assessments of my progress	2.94	0.86	2.85	0.88	2.71	0.85	2.68	0.87	2.82	0.87
Would support me in any career path I might choose	2.89	0.88	2.92	0.90	2.84	0.89	2.90	0.88	2.89	0.89
Gives me regular and constructive feedback on my progress toward degree completion	2.76	0.84	2.75	0.86	2.56	0.86	2.55	0.86	2.67	0.86
Provides information about career paths open to me	2.32	0.91	2.44	0.91	2.21	0.86	2.39	0.89	2.34	0.90
Solicits my input on matters of teaching and research	2.41	0.95	2.65	0.97	2.72	0.91	2.68	0.87	2.59	0.94
Treats my ideas with respect	3.59	0.62	3.48	0.69	3.29	0.78	3.27	0.74	3.43	0.71
Sees me as a source of labor to advance his/her research	1.38	0.65	1.94	0.97	2.33	0.98	2.35	1.01	1.92	0.98
Expects me to work so many hours that it's difficult to have a life outside of school	1.51	0.71	1.70	0.81	1.97	0.89	1.97	0.95	1.75	0.85
Satisfaction with Advising Relationship (1=Strongly disagree / 2=Disagree / 3=Agree / 4=Strongly agree)										
Currently have the advisor I want	3.57	0.65	3.47	0.72	3.36	0.77	3.47	0.73	3.48	0.71
Satisfied with how I came to have my current advisor	3.25	0.84	3.18	0.85	3.23	0.82	3.22	0.82	3.23	0.83
Satisfied with amount and quality of time spent with advisor	2.86	0.94	2.89	0.96	2.90	0.94	2.89	0.96	2.88	0.95
If did it over, I would select a different advisor ²	2.61	0.66	2.49	0.75	2.36	0.77	2.43	0.75	2.49	0.73
N of cases (range)	1,287-1,421		761-833		681-812		731-921		3,460-3,984	

¹1=No college / 2=Some college / 3=Bachelor's degree / 4=Master's or professional degree / 5=Doctorate²1=Yes / 2=Maybe / 3=No