The Occupational Relevance of a College Education: An Examination of Education-Job Match among Bachelor's Degree Recipients

Research Brief
May 2014

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The economic value of a bachelor's degree is readily evident when comparing the employment status and salary of high school graduates and college graduates. As the nation slowly recovered from the Great Recession, the annual average unemployment rate in 2010-11 ranged from 9.4 to 10.3 percent for individuals with just a high school diploma (Bureau of Labor Statistics, 2012). Conversely, unemployment rates were much lower among experienced college graduates in most major fields: 2.6 percent for healthcare; 3.4 - 4.8 percent for agriculture, computers and mathematics, education, engineering, public policy, sciences, and recreation; 5.2 - 6.3 percent for business, journalism, humanities, and the social sciences; and 6.6 - 9.3 percent for architecture, arts, and psychology (Carnevale, Cheah, & Strohl, 2013). The attainment of a college degree also confers a significant earnings advantage. In his review of research on the returns of a college education, Hout (2012) reported that college graduates earn significantly more than their high school counterparts over the course of 40 years: $1.1 million and $636,000 for men and women, respectively. After taking into account the cost of a college education, the earnings premium of a four-year college degree yields a 12 percent rate of return (Pascarella & Terenzini, 2005). Indubitably, the completion of a college degree remains a shrewd investment.

Whether college graduates are gainfully employed, however, does not fully reflect the degree to which an undergraduate education is instrumental to effective work. Some college graduates may attain employment in fields vastly different from their academic majors, thereby failing to fully utilize their field-specific skills. Others may attain major-relevant employment but find that the skills and knowledge acquired through education are insufficient, outdated, or irrelevant for their occupation. As wage levels partly depend upon the applicability of one's skills, a mismatch between education and a job can depress earnings (Melguizo & Wolniak, 2012; Robst, 2007; Staklis & Skomsvold, 2014). The annual earnings difference between graduates in matched and mismatched jobs is particularly acute for technical and applied majors that provide specific, non-transferable skills (Robst, 2007). For example, among 2007-08 bachelor's degree recipients, the median salary differential for respondents in matched and mismatched jobs one year after graduation was $6,300 for those with a major in the humanities but $14,000 for those with a major in engineering (Staklis & Skomsvold, 2014). Education-job match may also be consequential for personal well-being (Allen & van der Velden, 2001; Hersch, 1991; Wolniak & Pascarella, 2005; Xu, 2013). Among graduates of 30 public and private liberal arts

colleges, perceived major-job congruence predicted job satisfaction with personal fulfillment, including intellectual challenge, sense of accomplishment, and social recognition (Wolniak & Pascarella, 2005).

This research brief further examines the nature, prevalence, and corollaries of the match between education and work among bachelor's degree recipients. Specifically, five research questions are addressed:

- What was the employment status of 2007-08 bachelor's degree recipients one year after graduation?
- What proportion of alumni attained major-congruent employment one year after graduation?
- Why did some college graduates work outside of their major field?
- What proportion of recent college graduates were satisfied with opportunities to use their undergraduate education in their current work?
- Are there differences in job satisfaction of recent college graduates by major-job congruence?

Principal Findings

- 74 percent of college graduates were either employed full-time or enrolled in a post-baccalaureate program.
- The unemployment rate was highest among alumni with a major in the humanities (10 percent) and lowest among alumni with a major in engineering (3.5 percent).
- 78 percent of alumni who were employed full-time but not enrolled reported that their job was closely or somewhat related to their undergraduate major.
- The prevalence of severe major-job mismatch among recent college graduates changed little between 1994 (22 percent) and 2009 (23 percent).
- Among bachelor's degree recipients with full-time employment, a job closely related to one's major (i.e., high congruence) was obtained by more than 50 percent of students in computer and information sciences, engineering, healthcare fields, business, and education.
- 37 percent of college graduates with major-incongruent jobs accepted work outside of their major primarily due to the unavailability of relevant jobs. Other primary reasons included working conditions, job location, and family (17 percent); pay and promotion (16 percent); change in career interests (9 percent); and other factors (21 percent).

- 10 percent of all bachelor's degree recipients who were employed in some capacity but not enrolled reported that their job was not related to their major primarily due to the unavailability of relevant jobs.
- 88 percent of college graduates with jobs closely related to their major were satisfied with opportunities to use their education in their current job.
- Approximately 85 percent of college graduates with jobs closely related to their major reported overall satisfaction with their jobs, compared to 50 percent of alumni with jobs unrelated to their major.

Data Source and Analysis

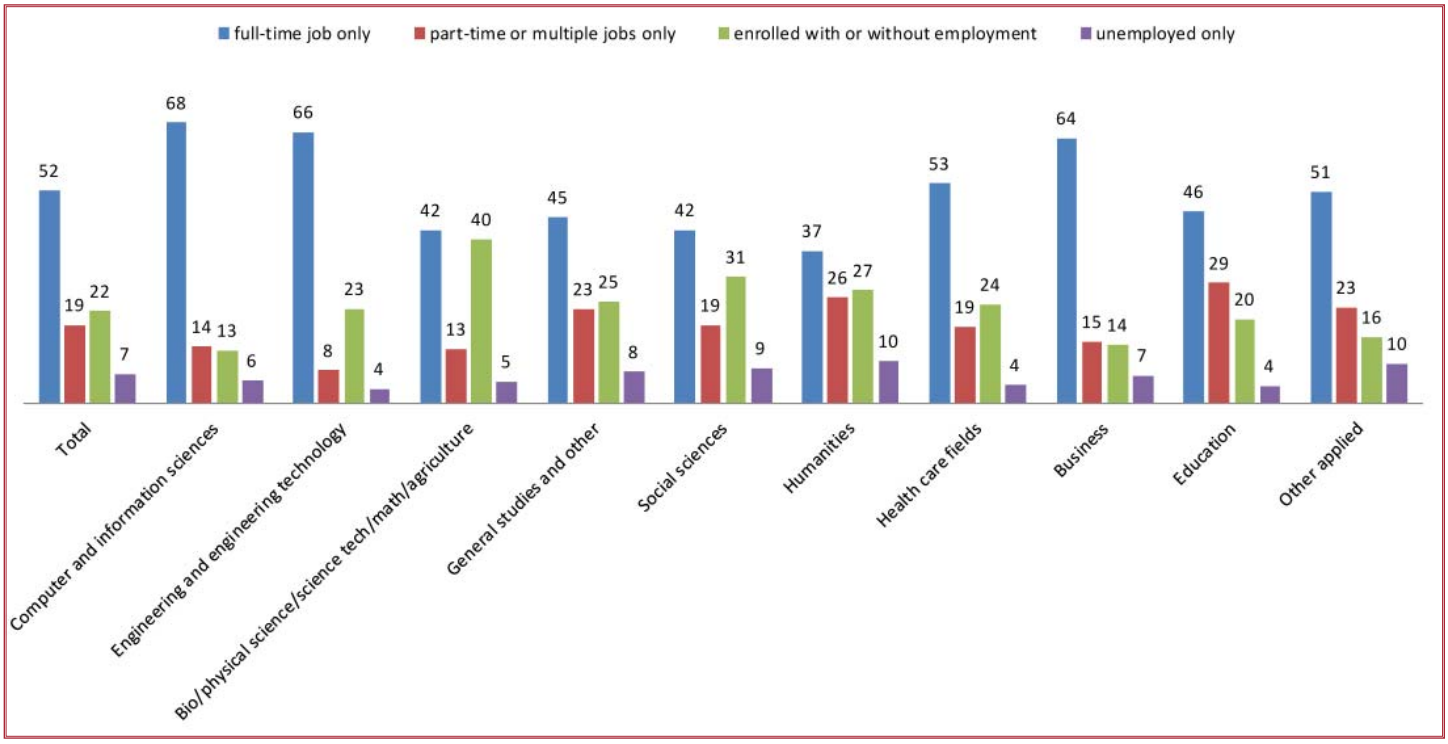
The data are derived from the Baccalaureate and Beyond Longitudinal Study (B&B) of 1992-1993, 1999-2000, and 2007-2008 bachelor's degree recipients who responded to a follow-up questionnaire one year after graduation (see Charleston et al., 2003; Wine et al., 2005, 2013). The B&B samples are drawn from a nationally representative sample of students who participated in the National Postsecondary Student Aid Study (NPSAS) and were identified as likely bachelor's degree recipients. For example, as Wine et al. (2013) documented, approximately 15,000 students from 1,730 institutions participated in the 2008 NPSAS, completed bachelor's degree requirements during the 2007-08 academic year, and subsequently completed B&B interviews during the 2008-09 academic year (i.e., July 2008 – June 2009). Students in the B&B samples represent public, non-profit, and for-profit institutions as well as multiple institutional types (e.g., research, master's, bachelor's).

The analyses in this brief are confined to descriptive statistics and t-tests with selected contrasts ($\alpha = .05$). Accordingly, the analyses do not control for potentially confounding variables, which may alter the magnitude of any differences attributed to education-job match. The standard errors of the estimates are reported in the Addendum. Estimates with relative standard errors of 30 percent or more were suppressed.

What was the employment status of 2007-08 bachelor's degree recipients one year after graduation?

Upon graduating from college, most students pursue either employment or post-baccalaureate enrollment. Figure 1 indicates that in the midst of the Great Recession, approximately 52 percent of 2007-08 college alumni held a full-time job only one year after graduation; 19 percent held a part-time job or multiple jobs only; 22 percent were enrolled with or without employment; and 7 percent were unemployed and not enrolled. There is some variation by academic major.[1] The unemployment rate was highest among alumni who had majored in the humanities and lowest among alumni who had majored in engineering (10 percent vs. 3.5 percent; $p < .05$).

Figure 1. Employment status in 2009 among Bachelor's Degree Recipients (one year after graduation)



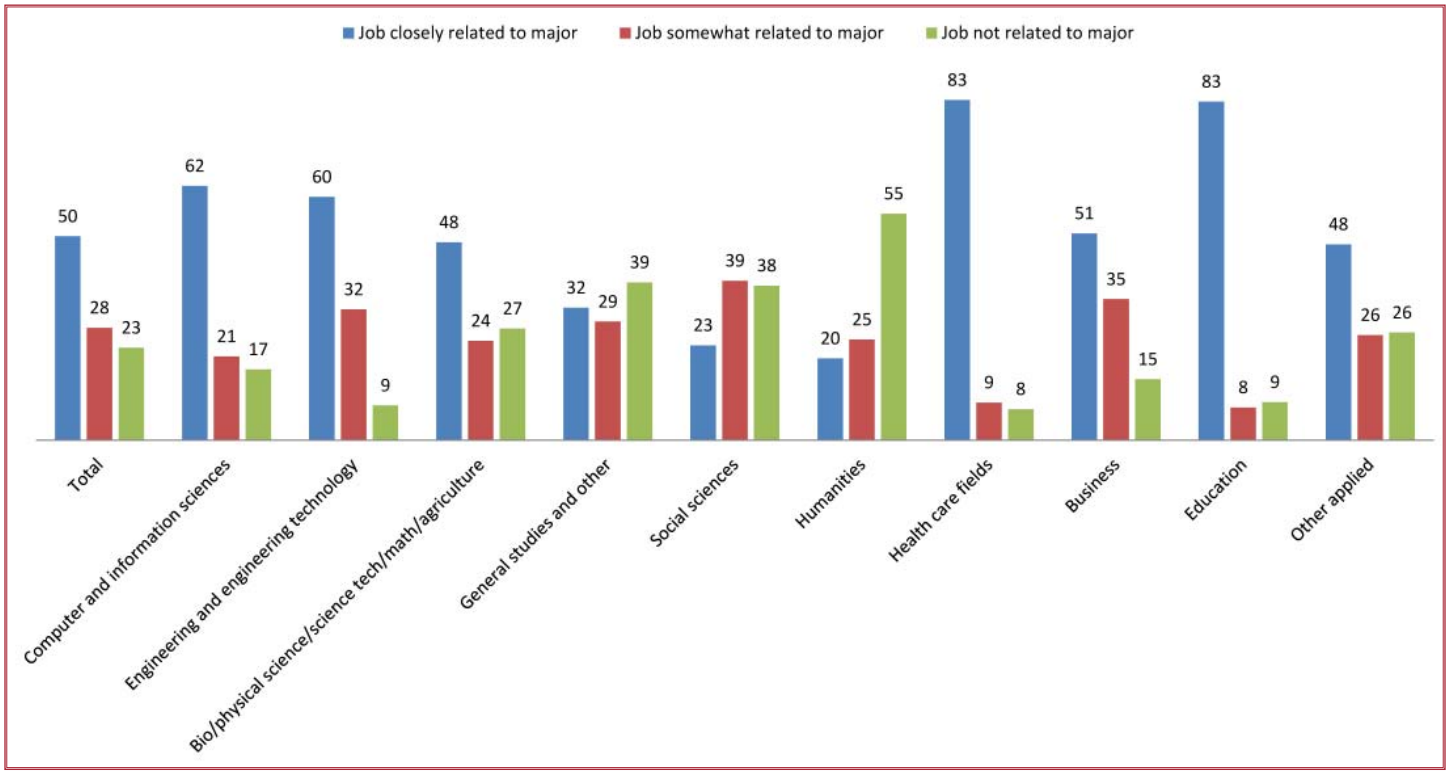
Source: Author's analysis of B&B:08/09 using NCES PowerStats. Variables: B1LFP09, MAJORS4Y.

[1] See the Addendum for the proportion of bachelor's degree recipients by major.

What proportion of alumni attained major-congruent employment one year after graduation?

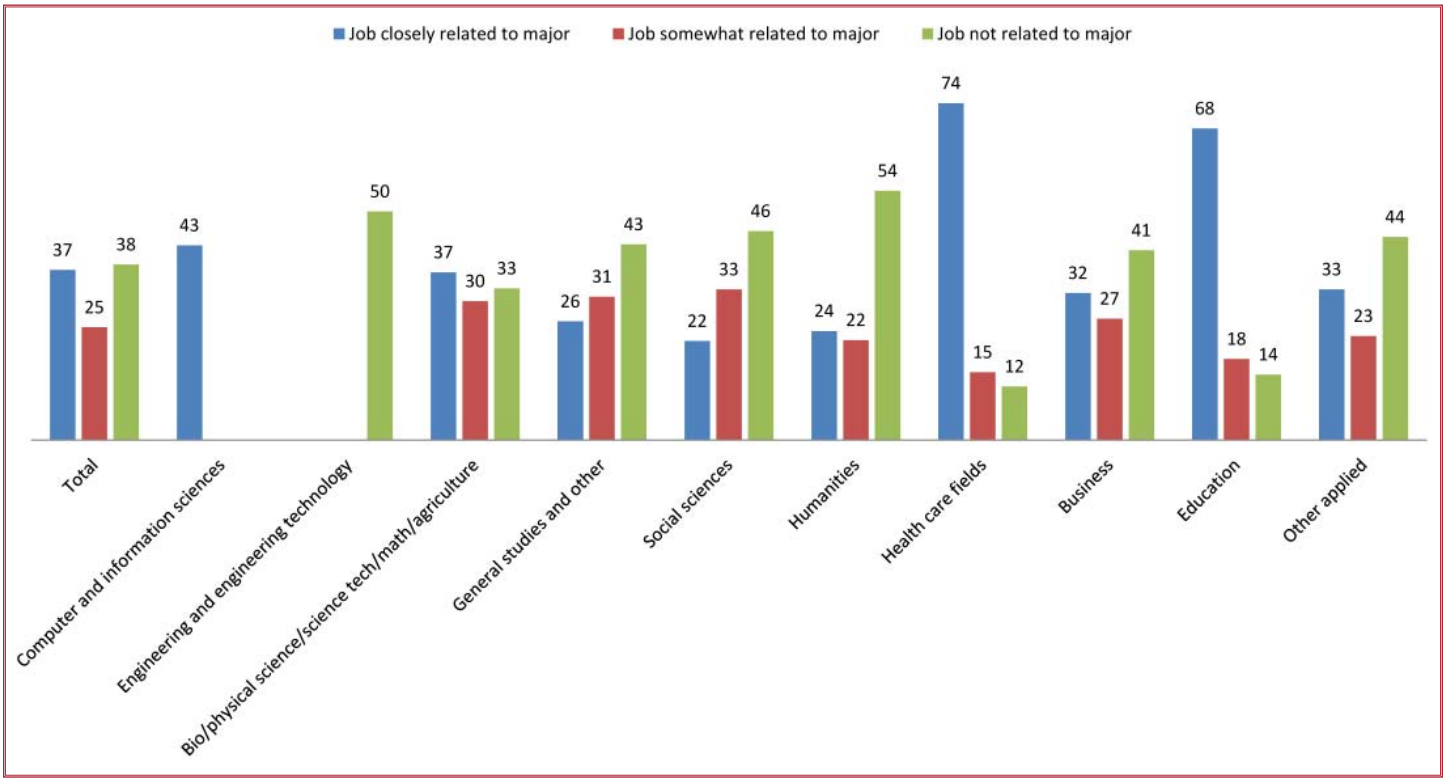
Approximately 78 percent of alumni who were employed full-time but not enrolled reported that their job was closely or somewhat related to their undergraduate major (see Figure 2a). Employment in a full-time job closely related to one's major (i.e., high congruence) was achieved by more than 50 percent of students in computer and information sciences, engineering, healthcare fields, business, and education. As depicted in Figure 2b, the majority of respondents with a part-time job or multiple jobs also stated that their job was somewhat or closely related to their major (62 percent). In fact, a lack of major-job congruence characterized the majority of graduates only among those who had majored in the humanities (54-55 percent). Of particular concern, Table 1 reveals that 66 percent of alumni who had majored in History but did not enroll in graduate school and were employed in any capacity held jobs that were incongruent with their major. Finally, Figure 2c presents a historical parallel to Figure 2a by examining the major-job congruence of 1992-93 bachelor's degree recipients. Approximately 23 percent of respondents with full-time employment in 2009 reported that their job was unrelated to their major, compared to 22 percent of respondents in 1994.

Figure 2a. Employment in 2009 Related to Bachelor's Degree Major Among Bachelor's Degree Recipients with a Full-time Job (one year after graduation)



Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: one full-time job, not enrolled. Variables: B1LFP09, MAJORS4Y, B1NSF19B.

Figure 2b. Employment in 2009 Related to Bachelor's Degree Major Among Bachelor's Degree Recipients with a Part-time Job or Multiple Jobs (one year after graduation)



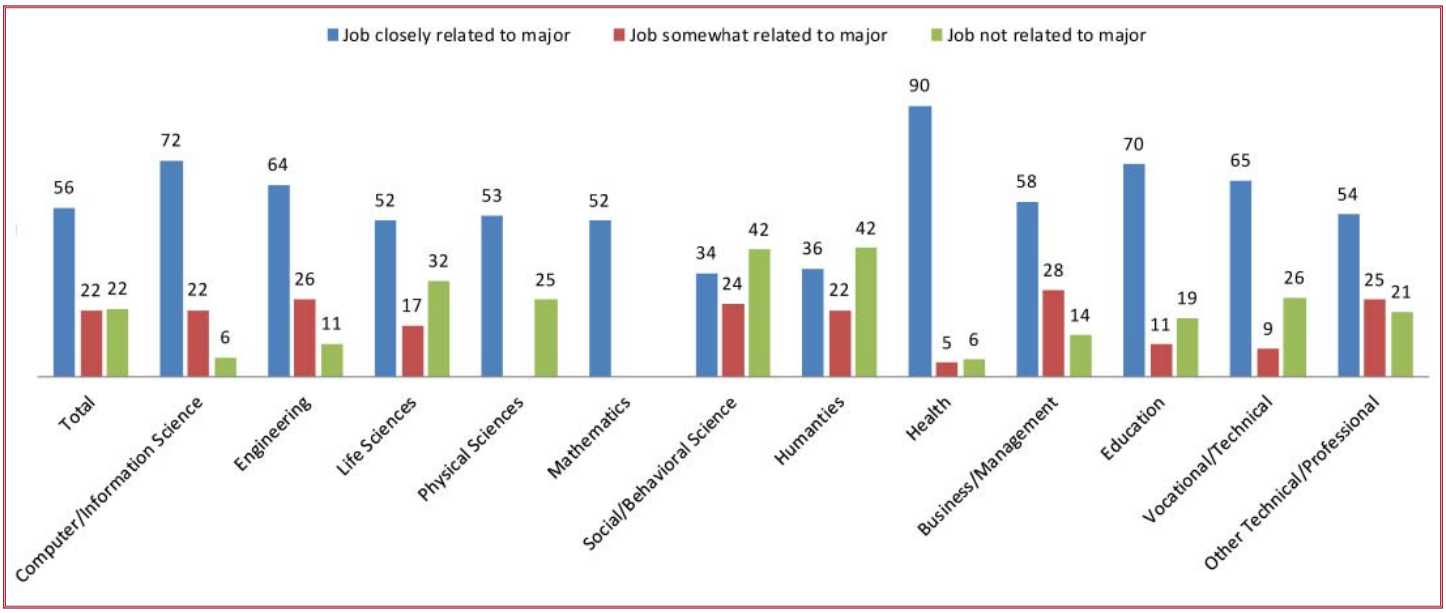
Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: part-time or multiple jobs, not enrolled. Variables: B1LFP09, MAJORS4Y, B1NSF19B.

Table 1. Employment in 2009 Related to Bachelor's Degree Major Among Bachelor's Degree Recipients Employed in Any Capacity without Enrollment (one year after graduation)

	Job closely related to major	Job somewhat related to major	Job not related to major
Total	46	27	27
Computer and information sciences	59	24	17
Engineering and engineering technology	56	31	13
Biological or physical science, science technology	43	25	32
Mathematics	54	–	–
Agriculture and natural resources	49	29	22
General studies and other	30	30	40
Social sciences	21	38	41
Psychology	26	36	39
Humanities	23	24	53
History	15	19	66
Manufacturing/construction/repair/transportation	81	–	–
Military technology and protective services	41	19	40
Health care fields	81	11	9
Business	47	33	20
Education	77	12	11
Architecture	72	–	–
Communications	33	32	35
Public administration and human services	55	19	26
Design and applied arts	43	28	29
Law and legal studies	–	–	–
Library sciences	–	–	–
Theology and religious vocations	–	–	46

Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: full-time job, not enrolled; part-time job, not enrolled; multiple jobs, not enrolled. Variables: B1LFP09, MAJORS23, B1NSF19B.

Figure 2c. Employment in 1994 Related to Bachelor's Degree Major Among Bachelor's Degree Recipients with a Full-time Job (one year after graduation)



Source: Author's analysis of B&B:93/94 using NCES PowerStats. Sub-sample: full-time, one job, not enrolled. Variables: B2EN9404, MAJORS3, AJOBRELT, B1LFP94.

Why did some college graduates work outside of their major field?

Among bachelor's degree recipients who were working in any capacity but not enrolled, 27 percent reported that their job was unrelated to their major (see Table 1). Alumni with major-incongruent jobs were asked to cite reasons for working outside of their major field. Table 2 shows that 37 percent of college graduates with major-incongruent jobs accepted work outside of their major primarily due to the unavailability of relevant jobs. Other primary reasons included working conditions, job location, and family (17 percent); pay and promotion (16 percent); change in career interests (9 percent); and other factors (21 percent).

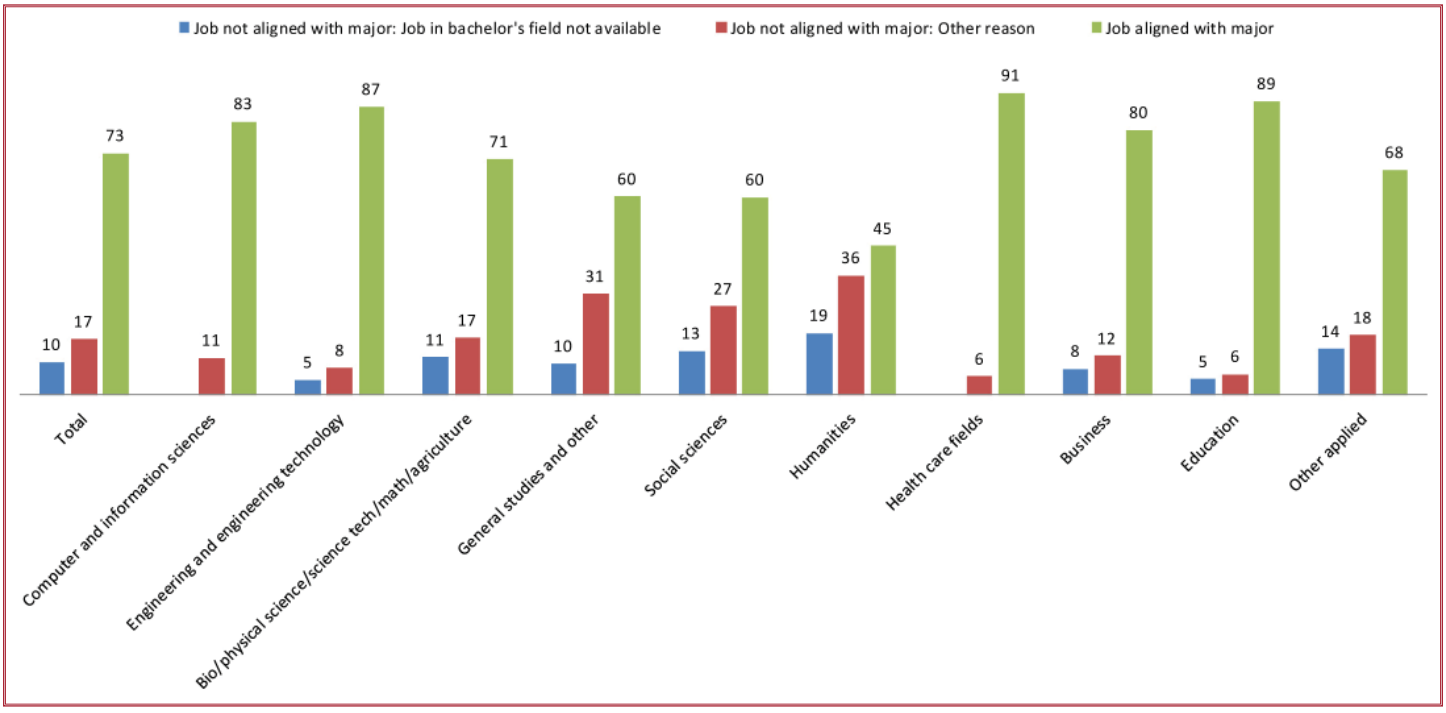
The reason of "job unavailability" for accepting major-incongruent work provides some sense of the prevalence of incongruence on a much larger scale, that is, a lack of equilibrium between the production or supply of graduates and labor market demand (Robst, 2007). However, this phenomenon must be examined in the context of all employed bachelor's degree recipients. As demonstrated in Figure 3, only 10 percent of all bachelor's degree recipients who were employed in some capacity but not enrolled reported that their job was not related to their major primarily due to the unavailability of relevant jobs. Whereas major-job mismatch previously appeared relatively high among alumni who had majored in the humanities, Figure 3 indicates that only 19 percent of employed alumni with a humanities major accepted work unrelated to their major due to job unavailability. Overall, the prevalence of poor articulation between postsecondary and labor market systems appears to be quite limited (Robst, 2008).

Table 2. Primary Reason for Working Outside of Bachelor's Major Field Among Alumni with a Job Not Related to their Major in 2009 (one year after graduation)

	Percentage of Total
Pay, promotion opportunities	16
Working conditions, location, family	17
Change in career/professional interests	9
Job in bachelor's field not available	37
Other factors not listed	21

Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: full-time, one job, not enrolled; part-time job, not enrolled; multiple jobs, not enrolled; job not related to bachelor's degree. Variables: B1LFP09, B1OUTFLD, B1NSF19B.

Figure 3. Percentage of Alumni Working Outside of Bachelor's Degree Field Due to Job Unavailability or Other Reasons vs. Percentage of Alumni who Attained a Major-Congruent Job in 2009 (one year after graduation)



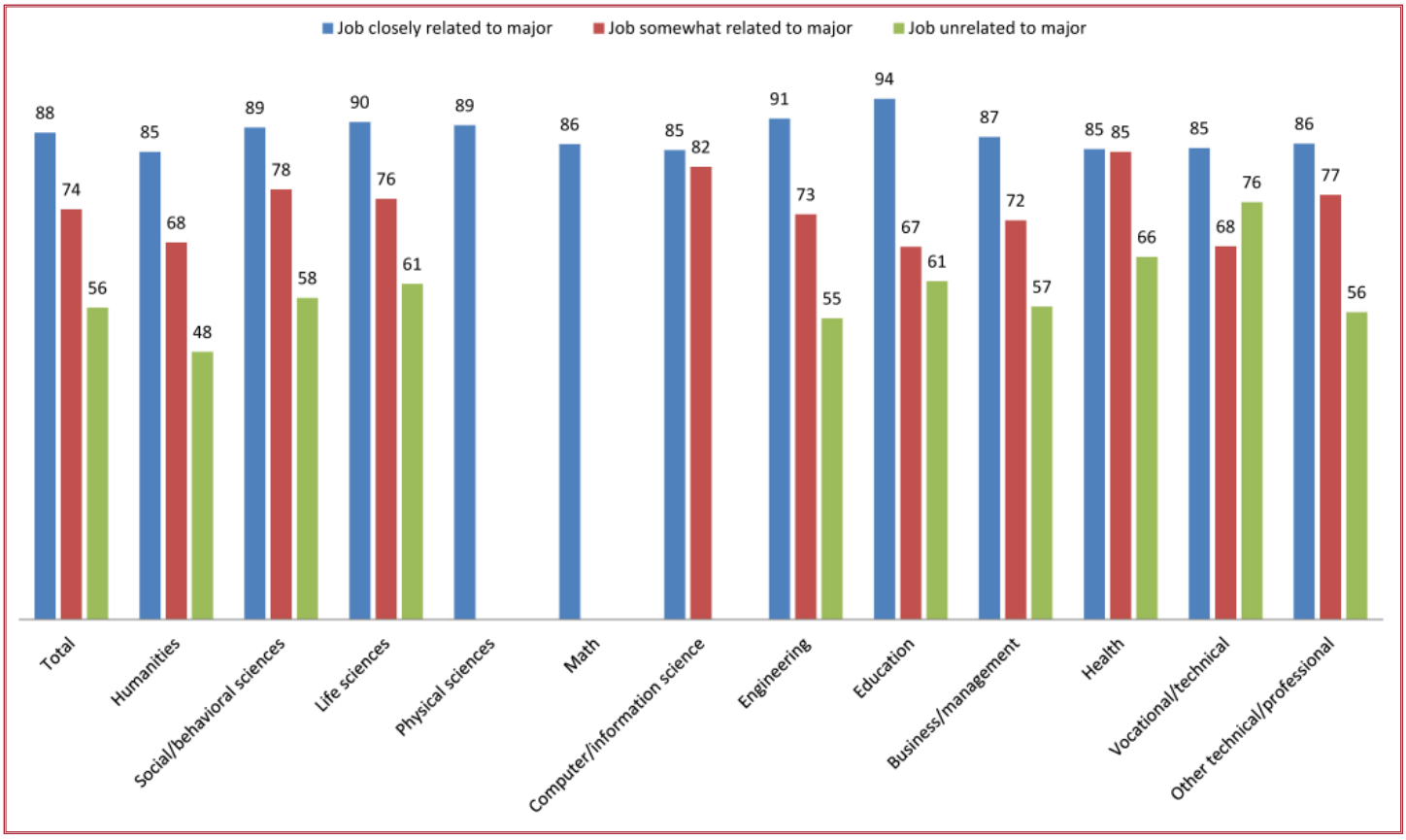
Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: full-time, one job, not enrolled; part-time job, not enrolled; multiple jobs, not enrolled; responded to or skipped question about job related to major. Variables: B1LFP09, MAJORS4Y, B1OUTFLD, B1NSF19B.

What proportion of recent college graduates were satisfied with opportunities to use their undergraduate education in their current work?

The congruence between a college graduate's job and major field is but one method of measuring education-job match. Another indicator is defined by the individual's satisfaction with opportunities to use the skills and knowledge gleaned through the collegiate experience. This indicator helps determine the overall utility of technical and general education for effective job performance. Of particular interest is variation in the relevance of education by major-job congruence. This analysis is conducted for 1999-2000 bachelor's degree recipients who were employed in some capacity but not enrolled one year after graduation (data for 2007-08 graduates were unavailable).

As indicated in Figure 4, a large majority of 1999-2000 bachelor's degree recipients with major-congruent jobs were reportedly satisfied with opportunities to use their training and education in their current job (74-88 percent). A smaller proportion of alumni with major-incongruent jobs, who could presumably draw only upon general skills and knowledge, were satisfied with the utility of their education. But even here satisfied alumni outnumbered their dissatisfied counterparts in nearly every major field. Taken together, these levels of satisfaction suggest that a college education provides most graduates with many field-specific or at least general (transferable) skills relevant to effective employment.

Figure 4. Percent of College Graduates Employed but not Enrolled who are Satisfied with Opportunities to Use Training and Education in Current Job in 2001 (one year after graduation)

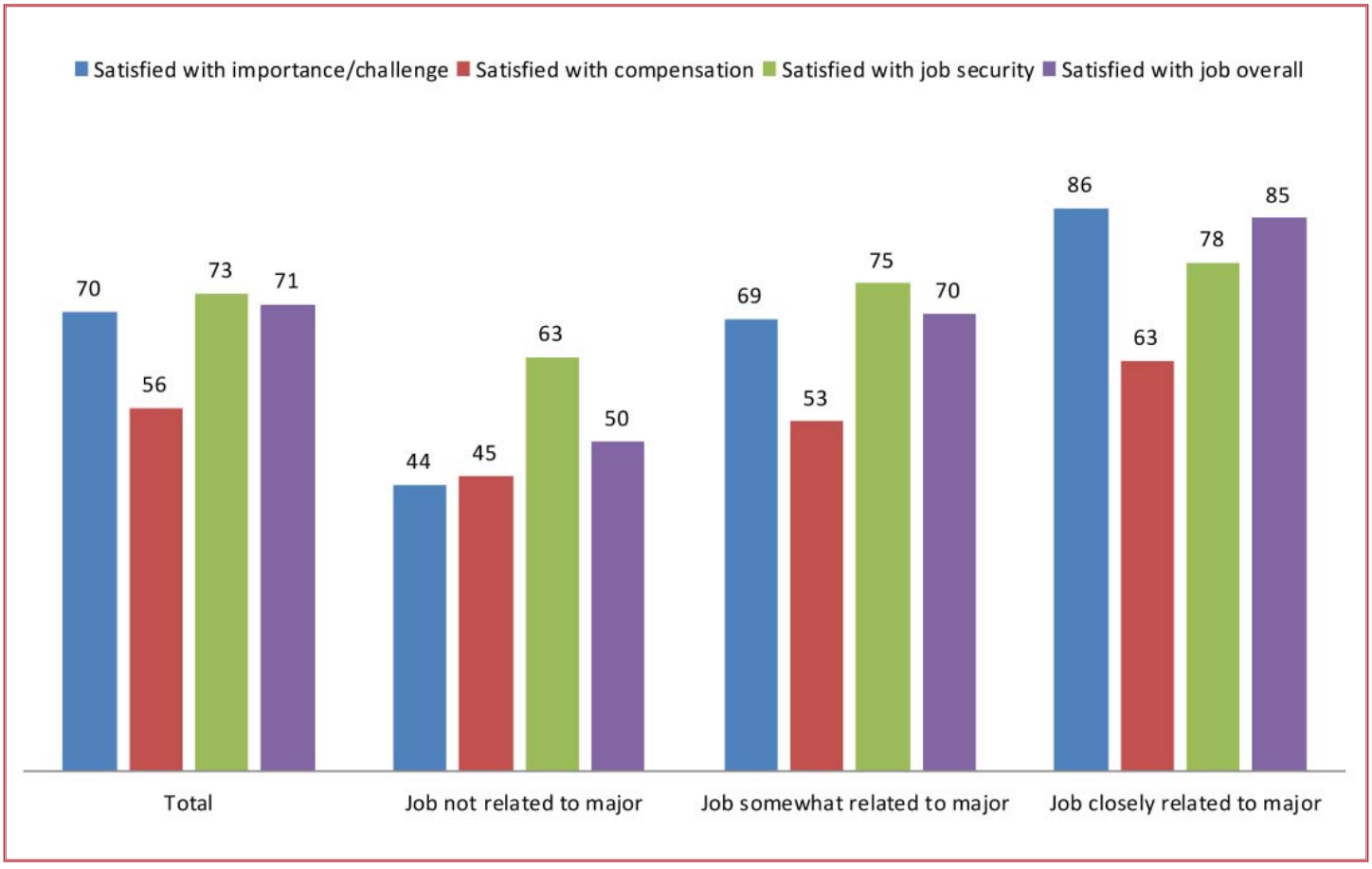


Source: Author's analysis of B&B:00/01 using NCES PowerStats. Sub-sample: full-time, part-time, or multiple jobs; not enrolled. Variables: CDCUGR1, CERELMAJ, LFP2001, BMAJORS3, CEUSEED.

Are there differences in the job satisfaction of recent college graduates by degree of major-job congruence?

Past research has indicated that major-job congruence is a moderately strong predictor of job satisfaction while controlling for major field, institutional variables, work characteristics, and demographic characteristics (Wolniak & Pascarella, 2005). Indeed, Figure 5 demonstrates that job satisfaction is much lower among alumni with major-incongruent jobs than among alumni whose jobs are somewhat or closely related to their majors ($p < .05$). Approximately 85 percent of college graduates with jobs closely related to their major reported overall satisfaction with their jobs, compared to 50 percent of alumni with jobs unrelated to their major. Moreover, 86 percent of college graduates with jobs closely related to their major reported that they were satisfied with the importance and challenge of their work; 63 percent were satisfied with compensation; and 78 percent were satisfied with job security.

Figure 5. Job Satisfaction by Degree of Major-Job Match in 2009 (one year after graduation)



Source: Author's analysis of B&B:08/09 using NCES PowerStats. Sub-sample: full-time, part-time, or multiple jobs; not enrolled. Variables: B1LFP09, B1JBPAY, B1JBSECR, B1JBOVER, B1JBIMPO, B1NSF19B.

Final Remarks

Indicators of gainful employment can be used to evaluate the rate of return on a college degree, which in turn can inform discussions of college affordability. Whether alumni attain a lucrative career, however, does not capture the total value of a college education, which ideally furnishes students with knowledge and skills - both technical and general - that facilitate effective employment. Accordingly, this brief examined two complementary measures that move beyond wage effects to assess the occupational relevance of a college education for recent graduates of four-year institutions, namely perceived major-job congruence and satisfaction with opportunities to use one's education. Overall, the analysis suggests that moderate to strong major-job congruence is more common than not, even in the aftermath of a recession. In fact, the prevalence of major-job mismatch has remained fairly constant over the past 15 years. This is not to minimize the importance of education-job match, for it is a critical predictor of wages and job satisfaction (Robst, 2007; Wolniak & Pascarella, 2005). The present analysis revealed significant disparities in job satisfaction between alumni with and without major-job congruence, though the majority of alumni with jobs unrelated to their major were nonetheless satisfied with opportunities to use their education and were generally satisfied with their jobs. This latter finding supports the notion that a four-year college education fosters general skills and knowledge that can enhance occupational mobility.

Readers should be mindful that in some cases education-job congruence may be an inappropriate or equivocal indicator of the occupational relevance of a college education. First, while major-job mismatch is generally undesirable, some degree of incongruence is arguably inevitable (see Hersch, 1991), and some college graduates may eventually find employment that allows them to better utilize their education. Second, the prevalence of major-congruent employment may be more defensibly examined at the graduate level in fields that are actual or *de facto* pre-professional programs, including some majors in the humanities (e.g., history, philosophy) and social sciences (e.g., psychology, sociology). Third, it is conceivable that some students with major-incongruent jobs are content with using general skills attained through college in the context of formal employment and yet find rewarding outlets for utilizing major-specific skills during leisure (e.g., fine arts). In such cases, the perceived relevance of one's education for the effective pursuit of vocational interests rather than major-job congruence per se may better reflect the vocational value of a college degree.

Policy Considerations

The small proportion of respondents who cited job unavailability as a reason for major-job incongruence suggests that efforts to significantly realign the four-year postsecondary and labor market systems are unwarranted. Nonetheless, some modest measures are worth considering to further track and limit the scope of education-job incongruence.

- Develop education-job match indicators that reflect the relevance of a college education for formal employment and the effective pursuit of vocational interests more generally. The estimates in this brief could be used as national benchmarks for state performance indicators.
- Implement "Tuning" programs for academic majors with high levels of education-job mismatch (see MHEC, 2013).
- Raise admissions standards for majors with projected market saturation.
- Increase student intentionality and foresight in the major selection process, such as (a) promoting awareness among students of projected employment prospects; (b) requiring the completion of a future plan for employment in fields with projected market saturation; and (c) encouraging students to reflect on factors that may lead to major-job incongruence, including lack of employment opportunities, sub-optimal working conditions and job location, familial matters, lower-than-expected compensation, and the pursuit of careers that are incompatible with enduring interests.

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Addendum

Proportion of Bachelor's Degree Recipients by Major (supra-categories)

	Percent of Total
Computer and information sciences	3
Engineering and engineering technology	6
Bio/physical science/science tech/math/agriculture	7
General studies and other	3
Social sciences	15
Humanities	12
Health care fields	8
Business	23
Education	8
Other applied	15

Proportion of Bachelor's Degree Recipients by Major (sub-categories)

	Percent of Total
Computer and information sciences	3
Engineering and engineering technology	6
Biological or physical science, science technology	5
Mathematics	1
Agriculture and natural resources	1
General studies and other	3
Social sciences	8
Psychology	7
Humanities	10
History	2
Personal and consumer services	1
Manufacturing/construction/repair/transportation	1
Military technology and protective services	3
Health care fields	8
Business	23
Education	8
Architecture	1
Communications	5
Public administration and human services	2
Design and applied arts	2
Law and legal studies	1
Library sciences	–
Theology and religious vocations	0.3

Standard Errors (BRR)

Standard Errors for Figure 1.

	Enrolled	Unemployed, not enrolled	Part-time multiple	One full-tme job, not enrolled
Total	0.48	0.31	0.5	0.63
Computer and information sciences	2.39	1.58	2.61	3.22
Engineering and engineering technology	1.99	1.01	1.54	2.22
Bio/physical science/science tech/ math/agriculture	2.16	0.92	1.34	2.21
General studies and other	2.97	1.85	2.46	3.22
Social sciences	1.31	0.96	1.22	1.45
Humanities	1.46	1.21	1.72	2
Health care fields	1.94	0.92	1.59	2.14
Business	1.02	0.68	1.14	1.4
Education	1.4	0.71	1.92	1.89
Other applied	1.25	0.78	1.26	1.41

Standard Errors for Figure 2a.

	Job not related to major	Job closely related to major	Job somewhat related to major
Total	0.79	0.87	0.73
Computer and information sciences	4.1	4.28	3.8
Engineering and engineering technology	1.85	3.18	2.97
Bio/physical science/science tech/ math/agriculture	2.94	3.41	2.51
General studies and other	5.46	5.46	4.88
Social sciences	2.76	2.37	2.18
Humanities	2.85	2.54	2.56
Health care fields	1.72	2.27	1.75
Business	1.45	1.93	1.63
Education	1.57	2.13	1.71
Other applied	1.85	2.28	2.01

Standard Errors for Figure 2b.

	Job not related to major	Job closely related to major	Job somewhat related to major
Total	1.46	1.61	1.23
Computer and information sciences	7.57	12.47	12.18
Engineering and engineering technology	10.88	9.79	9.06
Bio/physical science/science tech/math/agriculture	5.56	5.47	5.45
General studies and other	6.42	6.48	7.43
Social sciences	3.72	2.94	3.43
Humanities	4.01	3.13	2.7
Health care fields	2.55	3.96	3.38
Business	4.14	3.54	3.23
Education	2.12	3.48	2.98
Other applied	3.32	3.34	3.02

Standard Errors for Table 1.

	Job closely related to major	Job somewhat related to major	Job not related to major
Total	0.78	0.63	0.72
Computer and information sciences	4.18	3.7	3.66
Engineering and engineering technology	3.09	2.94	2.35
Biological or physical science, science technology	3.27	2.56	3.14
Mathematics	8.03	7.49	6.7
Agriculture and natural resources	7.57	7.25	5.72
General studies and other	4.63	4.21	4.11
Social sciences	2.34	2.68	2.89
Psychology	2.79	2.86	3.09
Humanities	2.11	2.09	2.56
History	3.99	4.65	5.14
Personal and consumer services	6.15	5.26	4.66
Manufacturing/construction/repair/transportation	7.82	1.55	7.75
Military technology and protective services	4.51	3.29	4.35
Health care fields	1.94	1.52	1.42
Business	1.64	1.43	1.46
Education	1.92	1.57	1.28
Architecture	7.76	5.33	6.53
Communications	2.93	3.04	2.96
Public administration and human services	5.18	3.67	4.74
Design and applied arts	5.64	5.4	4.67
Law and legal studies	14.32	12.59	11.12
Library sciences	–	–	–
Theology and religious vocations	12.54	8.69	12.65

Standard Errors for Figure 2c.

	Closely	Somewhat related	Not at all
Total	1.07	0.78	0.75
Uncodable	8.75	5.84	7.84
Humanities	2.5	2.07	2.14
Social/Behavioral Science	1.92	1.9	1.89
Life Sciences	2.67	2.01	2.52
Physical Sciences	8.51	7.02	7.26
Mathematics	6.76	8.98	6.68
Computer/Information Science	5.15	5.27	1.51
Engineering	3.36	3.09	1.61
Education	2.1	1.05	1.88
Business/Management	2.13	1.74	1.42
Health	1.75	1.06	1.46
Vocational/Technical	4.17	2.42	3.58
Other Technical/Professional	3.64	3.89	2.23

Standard Errors for Table 2.

	Pay, promotion opportunities	Working conditions, location, family	Change in career/ professional interests	Job in bachelor's field not available	Other factors not listed
Total	1.05	1.08	0.79	1.41	1.12

Standard Errors for Figure 3.

	Job in bachelor's field not available	Other	Job aligned with major
Total	0.45	0.61	0.72
Computer and information sciences	2.17	3	3.66
Engineering and engineering technology	1.24	1.89	2.35
Bio/physical science/science tech/math/agriculture	1.76	2.14	2.72
General studies and other	1.97	3.77	4.11
Social sciences	1.37	2.02	2.29
Humanities	1.97	2.36	2.28
Health care fields	0.96	1.14	1.42
Business	0.97	1.06	1.46
Education	1	0.88	1.28
Other applied	1.18	1.34	1.68

Standard Errors for Figure 4.

	Job closely related to major	Job somewhat related to major	Job unrelated to major
Total	0.73	1.27	1.76
Humanities	2.73	4.28	3
Social/behavioral sciences	2.37	2.27	3.65
Life Sciences	2.63	4.83	5.41
Physical sciences	6.63	–	–
Math	10	–	–
Computer/information science	3.55	6.97	–
Engineering	2.2	5.54	11.01
Education	1.18	9.57	7.94
Business/management	1.83	3.12	5.17
Health	2.02	5.06	6.62
Vocational/technical	4.1	8.26	8.92
Other technical/professional	2.31	3.05	5.06

Standard Errors for Figure 5.

	Satisfied with importance/ challenge	Satisfied with compensation	Satisfied with job security	Satisfied with job overall
Total	0.64	0.74	0.7	0.64
Job not related to major	1.39	1.61	1.48	1.51
Job closely related to major	0.8	0.96	0.93	0.81
Job somewhat related to major	1.32	1.54	1.38	1.41

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