

**The Impact of Entrepreneurship Education: An Evaluation of the Berger
Entrepreneurship Program at the University of Arizona,
1985-1999**

by

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I. Introduction.

In the past 15 years entrepreneurship education has grown dramatically throughout the United States and other parts of the world. This growth is reflected in the inauguration of numerous international intercollegiate business plans competitions, new entrepreneurship curricula and programs, and endowed professorships in entrepreneurship. Approaches to entrepreneurship education have varied across colleges and universities from offering single courses in new business development or business plans preparation to integrated curricula that include marketing, finance, competitive analysis, and business plan development. In some institutions, majors in entrepreneurship have been adopted and specialized programs for undergraduates, MBA students, as well as for students from engineering, medicine and other technical colleges, have been implemented. Intercollegiate business plans competitions have been established at Arizona, Texas, Nebraska, San Diego, Miami of Ohio, and elsewhere to compare the quality and viability of the plans developed on college campuses.

Entrepreneurship education has become popular for five reasons. First, the development of business plans allows students to integrate accounting, economics, finance, marketing, and other business disciplines. As such, it can be an enriching, integrative educational experience. Second, entrepreneurship education may promote the founding of new businesses by graduates or enhance their employment prospects and the success of graduates in the job market. Third, entrepreneurship education may promote technology transfer from the university to the market through the development of technology-based business plans. Fourth, entrepreneurship education forges links between the business and academic communities. Entrepreneurship education is seen by business leaders as a useful, applied approach to the study of business and the economy, and they have been willing to fund entrepreneurship programs and endow professorships within

them. Finally, because there is no set approach to entrepreneurship education and because entrepreneurship generally is outside traditional discipline boundaries, it has been possible to experiment with curriculums. The learning from these experiments, in turn, has been used to enhance other business school courses. Each of these activities is addressed in the study reported here.

Entrepreneurship programs, however, can be expensive. Students, especially those with little experience, typically require considerable faculty time in the development of their business plans. Viable plans demand more market research and competitive analysis than is necessary for projects in traditional courses. Preparation of plans and their presentation at business plans competitions also are costly activities. Regular faculty in established disciplines can view entrepreneurship programs as peripheral to central business school missions and as a competitor for resources.

Accordingly, an assessment of the impact of entrepreneurship education is in order to determine the degree to which it has accomplished its objectives and justifies the resources committed to it. An assessment also can determine if there are positive spill-over effects from entrepreneurship education on other, more traditional business school activities.

There has been relatively little research conducted on the impacts of entrepreneurship education. The earliest studies were evaluations of Small Business Development Centers conducted in the 1970s and early 1980s and referenced in the 1985 article by Chrisman, et. al (1985). In 1994, Chrisman and Katrishen presented results of their national study of a SBDC program. McMullan, Long and Graham (1986) assessed the economic value added by a university-based venture outreach program at the University of Calgary, and in 1995 Chrisman, Hynes and Fraser examined the impact of the entrepreneurial activities of the faculty of the

University of Calgary. More recently, McMullan and Griffin (1998) evaluated the MEI Entrepreneurship Degree Programme at Swinburne, in Australia. Each of these studies examined the general impact of the program in terms of employment, wages, and firm profits.

A recurring issue in the literature is the measure to be used as a benchmark for assessing the estimated effect. Elstrott (1987) severely criticized Chrisman, et. al. (1995) for comparing estimated performance of SBDCs with the average state economic performance over the same time frame and argued that the performance of SBDC clients should be compared to a matched sample of non-SBDC clients, to control for a variety of factors that might effect performance. McMullan and Griffin (1998) compared the overall business start-up rate of graduates from the Swinburne programme to start-ups of graduates from an unnamed MBA program in Australia, an MBA Concentration in Entrepreneurship at the University of Calgary, and an MBA Hybrid Entrepreneurship Programme at the University of Calgary. In their discussion, they clearly recognized the difficulties involved in making these comparisons due to inherent differences among the students themselves. They concluded that the three different schools for which data were presented Aare middle socio-economic class institutions with student bodies without special advantages and therefore roughly comparable, despite the fact that one is in Canada and two are in Australia.@ They also recognized the need to Apartition out the relative impacts of independent variables such as education level obtained, years developing businesses beyond graduation, pre-program education, and experience and type of venture format chosen (e.g., independent or corporate) upon independent variables at both the individual and economic level.@ Their research design and limited available data, however, prohibited them from examining these potentially important effects.

The study reported here addresses these concerns. This report evaluates the effect of the

Berger Entrepreneurship Program at the University of Arizona on graduates by comparing them with a matched sample of non-entrepreneurship University of Arizona business graduates from 1985 through 1998. The study design allows for the control of the socio-economic characteristics of the individuals involved so that the marginal effect of entrepreneurship education can be observed, holding individual factors constant. The study also evaluates the effect of the Berger Entrepreneurship Program on technology transfer from the university to the private sector, the effect of the program on private giving to the business college, and the pedagogical effect of the entrepreneurship curriculum on other disciplines in the college.

The Berger program is ideally situated for such an analysis. It has been underway for 16 years, providing long-term data on the performance and success of its graduates, technology transfer, contributions, and pedagogical innovations. As described below, the Berger program consists of a dedicated curriculum that has been generally uniform for 16 years. Between 1985 and 2000, 594 students graduated from the program. The Karl Eller Center, which administers the Berger Entrepreneurship Program, maintains a complete, and annually-updated data base on all graduates. Hence, it is possible to survey the entrepreneurship alumni and to compare their responses to a matched sample of general business school alumni. The Eller Center, the Eller College of Business and Public Administration, University of Arizona Office of Technology Transfer, and the University of Arizona Foundation have data on contributions linked to entrepreneurship, as well as general contributions, information on pedagogical changes related to the entrepreneurship program, and more limited information on technology transfers. All of these sources were accessed in the studies reported here.

We surveyed 2,484 individuals, 2,024 non-entrepreneurship and 460 entrepreneurship graduates. 406 non-entrepreneurship alumni responded and 105 entrepreneurship alumni

responded for a total of 511 and a response rate of approximately 21 percent. Our survey included a variety of individual-specific characteristics, such as year of birth, gender, ethnicity, high school graduation year, and educational and employment history. Controlling for these and other characteristics described in the survey allowed us to analyze the marginal effects of entrepreneurship education. In doing so this study goes beyond other analyses of entrepreneurship education that have compared the average performances of entrepreneurship-trained groups with the average performances of control groups. Those studies have not controlled for individual characteristics, making it impossible to separate the effects of individual background from those of the entrepreneurship program. We report the results of our study in two papers. In this paper, we describe the analysis of the surveys of entrepreneurship and non-entrepreneurship graduates. We also describe the effects of the entrepreneurship program on technology transfer. The analysis of technology transfer is based on survey responses, as well as on Berger Entrepreneurship Program business plan data from 1985-1999. In the second paper, we report the effects of the Berger Entrepreneurship Program on private contributions to the Eller College of Business and Public Administration and the pedagogical effects of the program on other disciplines and activities.

II. Summary of Key Results.

Seven key results follow from the analysis of the survey of entrepreneurship and non-entrepreneurship graduates of the Eller College of Business at the University of Arizona and from examination of technology transfer at the University.

- There is strong evidence that entrepreneurship education contributes to risk-taking and the formation of new ventures. On average, entrepreneurship graduates are *three times* more likely than non-entrepreneurship graduates to start new business ventures. Controlling for the personal characteristics of graduates and other environmental factors, entrepreneurship education increased the probability of an individual being

instrumentally involved in a new business venture by 25 percent over non-entrepreneurship graduates.

- Similarly, there is clear evidence that entrepreneurship education increases the propensity of graduates to be self-employed. Once again, entrepreneurship graduates on average are *three times* more likely to be self-employed than are general business graduates. Further, they are less likely to be employed in government or by non-profit organizations. Controlling for personal characteristics and other factors, entrepreneurship education increases the likelihood that a graduate alumnus owns his or her business by 11 percent relative to non-entrepreneurship graduates.
- Entrepreneurship education has a significant impact on the income of graduates. On average entrepreneurship graduates have an average annual income that is 27 percent higher than the average annual income of non-entrepreneurship graduates, and entrepreneurship graduates are more likely to be employed full time. Further, they have 62 percent more assets than do their counterparts. Controlling for personal characteristics, entrepreneurship education increases the income of graduates by \$12,561 beyond that of other business graduates.
- There is weaker evidence that entrepreneurship education increases job satisfaction through greater income. The variance in the ranking of job satisfaction as reported in the survey is quite small. Nevertheless, controlling for other factors, entrepreneurship education increases job satisfaction by approximately 1 percent.
- Entrepreneurship education contributes to the growth of firms, especially small firms. On average, small firms employing entrepreneurship graduates have greater sales and employment growth than do those that employ non-entrepreneurship graduates. For larger firms, the growth effects of a graduate are more difficult to detect. Nevertheless, larger firms pay entrepreneurship graduates substantially more than they do non-entrepreneurship graduates. Firms owned by entrepreneurship graduates also appear to be larger and have more sales than do those owned by non-entrepreneurship graduates. Controlling for individual characteristics, entrepreneurship graduates working for large firms earn approximately \$23,500 more per year than do other graduates. Small firms employing entrepreneurship graduates have substantially greater growth as measured by percent change in sales than do those employing non-entrepreneurship graduates.
- Entrepreneurship education also promotes the transfer of technology from the university to the private sector and promotes technology-based firms and products. On average, entrepreneurship graduates are more likely to be with firms that use licensed technologies and to be with firms that license technologies to others. They also are more likely to be involved with a high-technology firm than are non-entrepreneurship graduates. Among self-employed entrepreneurship graduates, nearly 23 percent own a high-technology firm, compared to less than 15 percent of non-entrepreneurship graduates. Entrepreneurship program graduates also are more

apt to be instrumental in developing new products. Further, entrepreneurship graduates spend more time in R&D, work with products that have shorter life spans, and are more apt to work in high-tech industries. Controlling for other factors, entrepreneurship education increases the graduate's probability of being with a high-tech firm by close to 13 percent and of developing new products by almost 9 percent. Analysis of business plans written in the Berger Entrepreneurship Program since 1985 indicates a growing trend toward more technical products and services, with 50 percent of all 1999 business plans involving innovative technologies.

- Surveys of a total of 34 deans, department heads, and development officers at the University of Arizona strongly indicate that pedagogical innovations in the entrepreneurship program have improved the curriculum in other business disciplines and the MBA program. Moreover, these surveys indicate that the success of the Berger Entrepreneurship Program and its tangible, real-world approach to business education have resulted in greater financial contributions to the college and university from the private sector. Estimates indicate that the Eller College of Business and Administration received 34 percent more outside funding due to the existence of the Berger Entrepreneurship Program. The University of Arizona was estimated to have received an average of \$11.7 million more in private support because of the reputation of program.

III. Overview of the Berger Entrepreneurship Program.

The Berger Entrepreneurship Program in the Karl Eller Center, Eller College of Business and Public Administration, at the University of Arizona is one of the oldest programs in the country. The curriculum was approved by the Arizona Board of Regents in 1983, and the initial class of 30 students graduated in 1985. Between 1985 and 1999, 539 students graduated from the program, 339 undergraduates and 200 MBA students or graduate students from the colleges of engineering, medicine, science, and agriculture. 289 business plans were written, and at least 81 businesses were started from the business plans. Of the 539 graduates, 262 were employed by established firms, 106 graduates had their own businesses, 31 were in non-profit or government activities, 40 went to law, medicine or other post graduate studies, and 100 were in other categories (including 50 from the class of 1999 who were just starting their careers at the time of the survey). The Eller Center maintains an active alumni database that is updated on an on-going basis. Entrepreneurship graduates participate in a variety of activities, including judging

business plans competitions, giving class lectures, mentoring student teams, hiring graduates, and investing in the business plans. This close alumni base provides an ideal study group.

The curriculum includes core courses in competitive advantage, venture finance, market research and business plans development. Additional courses in MIS, management, finance, and marketing are recommended. A combination of regular and business-adjunct faculty staffs the courses. Regular faculty includes those from finance, economics, marketing, and management. Adjunct faculty members have expertise in law, operations, engineering, marketing, and finance. Undergraduates are eligible for a major in entrepreneurship and MBA students can select entrepreneurship as an area of concentration. Most students select joint majors and areas of concentration, such as Entrepreneurship/MIS, Entrepreneurship/Marketing, and Entrepreneurship/Finance. All students receive scholarships, and many are placed in internships with newly started firms or venture capital organizations during the summer prior to their formal entrepreneurship study.

Upper division undergraduates and MBA students apply for entry into the program during their junior year and first year respectively. Study takes place during undergraduate senior year and MBA second year. Application materials include academic transcripts, letters of recommendation, and an essay describing a proposed business plan idea. These materials are examined and the applicants are interviewed. Selection is based on grades, recommendations, and an assessment of the student's entrepreneurship potential. Additionally, undergraduate and graduate students from technical disciplines, such as engineering, science, agriculture, and medicine, participate in the program as associate students. These students are paired with business students in the development of a business plan. Approximately 70 students are accepted annually, 40 undergraduates and 30 graduates. The number of graduates has grown over the

years from 30 in 1985 to 59 in 1999. Students, typically working in two-person teams, begin in the spring and summer with a feasibility study that is evaluated by the faculty in the fall. They develop the plan within the context of their courses during the fall and spring semesters. An internal business plans competition, where students must present and defend their plans, is the capstone for the program. Winning plans receive \$10,000 in prizes. Undergraduates and graduates compete in separate divisions. Students also compete in intercollegiate business plan competitions, including the Arizona Statewide New Venture Competition, organized by the Karl Eller Center, as well as other competitions nationwide.

IV. Research Procedure.

To address the issues of concern to us, we surveyed four groups—i). Entrepreneurship and non-entrepreneurship alumni, ii). Department heads and other college administrators, iii). The college Dean, development officer, and officials in the University of Arizona Foundation, and iv). Those involved in technology transfer, including the staff of the University of Arizona Office of Technology Transfer.

The most critical instrument was the survey document for the alumni. Survey design took place in May and June, 1999 and involved several rounds of questionnaire development to insure that questions essential for the study were included and that the survey read clearly. Samples were faxed to local businesses for reaction regarding clarity and comprehensiveness. There were 11 sections to the survey, each with a series of questions. Section 1 called for personal information, including year of birth, gender, high school graduation date, ethnicity (Caucasian, African-American, Hispanic, Pacific-Rim, other). Section 2 addressed educational history, such as identity and dates of instruction at institutions other than the University of Arizona, post-graduate education, and all degrees obtained. Section 3 asked about seminars and

training programs attended. These and other follow-up questions that asked for written details were designed to “qualify” the information provided throughout the questionnaire.

We believed that by asking the surveyed graduates to describe their seminars and training programs and to elaborate on points provided that they would think carefully about their answers to the basic questions essential for this study. Additionally, answers to these qualifying questions were valuable when coding the survey responses. For example, when we asked about whether or not their firm is considered to be a high-technology firm, we asked those who answered yes to “explain.” In a few instances, individuals incorrectly classified themselves as a high-technology firm simply because they use computers at their place of business. To be classified as a high-technology firm, the business had to be involved in developing new technology as a product or service offering. Section 4 surveyed employment history prior to and during attendance at the University of Arizona. Questions included one that asked whether an individual owned a business at the time of entering a degree program at the University and one that requested the annual income from that business; whether an employer paid for part of the education received and if so, for how much; years of work experience prior to entering the University of Arizona; and descriptions of the two most important positions held. Section 5 examined employment history since leaving the University. Items included total years of work experience and descriptions of the two most important positions held prior to current position. Section 6 focused on the individual’s current situation, including whether or not they were a current student, running a household, working, or other. Additional information was requested for each entry.

Section 7 continued with questions about the individual’s current employment position. Graduates were asked to rank their job satisfaction from 1 to 10; to describe their current

position; to designate whether they owned their own business or were self employed, whether they started the business, number of employees, sales, assets, year business started, whether a private consultant, whether employed in a private business, government, or non-profit. Section 8 asked about changes in the individual's net worth since leaving the University of Arizona. Section 9 posed important questions regarding participation in new ventures and business start-ups. For example, we wanted to know if those surveyed had been instrumentally involved with starting business ventures, and if so, how many. The questionnaire also asked them to describe the "most successful" and "second most successful" business ventures in which they had been involved. Section 10 asked about technology transfer, R&D time, and whether or not the firm was considered to be in a high technology industry. Licensing and patent information were requested. The final Section 11 asked general questions about the individual's experience at the Eller College of Business and Public Administration. Appendix A includes a copy of the questionnaire.

We surveyed all graduates of the Berger Entrepreneurship Program and took a random sample of non-entrepreneurship graduates of the Eller College of Business and Public Administration. The non-entrepreneurship sample was drawn from the alumni records of the University of Arizona Foundation. During the period 1985 to 1998, the Eller College had 16,095 graduates. The University of Arizona Foundation data includes name, year of graduation, colleges, degrees, major, sex, current address, and contribution history. The alumni data were not accessible to the authors of this report. Therefore, we had to rely on the Foundation personnel to select the random sample for us. We expected a high response rate from the entrepreneurship graduates because the program maintains strong ties with its alumni. We were uncertain about the response rate from non-entrepreneurship graduates so we requested a large

sample of 2,700 from the University of Arizona Foundation data. We arrived at 2,700 based on a request of 150 Eller College graduates from 1985-1989; 200 graduates from 1990-1995; and 250 graduating from 1996-1998. The growth in the college sample was to reflect the corresponding growth of the entrepreneurship program. Only 2,024 of the 2,700 were ultimately surveyed due to missing addresses and overlap of some graduates with the entrepreneurship program. All told, the questionnaire was sent to 2,484 alumni, 2,024 non-entrepreneurship (1,730 undergraduates and 294 graduate students) and 460 entrepreneurship graduates (301 undergraduates and 159 graduate students) who graduated between 1985 and 1998. 480 students graduated from the entrepreneurship program during that period, and questionnaires were sent to those for whom we had current addresses. As a result, about 4.5 times as many surveys to non-entrepreneurship as entrepreneurship graduates were mailed. The original survey was sent the last week of July, 1999. The first reminder was sent September 1, and the second reminder went out September 15, 1999

The questionnaire was accompanied by a cover letter that was signed by the Dean of the Eller College of Business and Public Administration at the University of Arizona. This letter appears in Appendix B. The cover letter was general and did not reveal that, in addition to collecting information on business, we would be comparing entrepreneurship graduates' performance with non-entrepreneurship graduates' performance. If the survey instrument had been sent from the Berger Entrepreneurship Program and the cover letter signed by the entrepreneurship program director, it is likely the response rate for the entrepreneurship graduates as a group would have been higher and the response rate for non-entrepreneurship graduates would have been lower. We provided an incentive for graduates to return their surveys promptly by offering to enter their names into a drawing. Prizes were five pairs of tickets to the

then upcoming University of Arizona and Arizona State University football game.

Table 1 describes the response rate of the survey. 1,730 undergraduates and 294 graduate alumni from non-entrepreneurship business programs were sent the questionnaire. Of those, 348 undergraduates and 58 graduates responded and returned the survey instrument for a total of 406 responses, with response rates of approximately 20 percent for each group. 301 undergraduate and 159 graduate student alumni of the entrepreneurship program were sent the questionnaire, and 68 and 37 respectively responded, for a total of 105 responses, with response rates of approximately 22 and 23 percent for the two groups. All in all, approximately 21 percent of the survey questionnaires were returned and, surprisingly, the response rate was generally uniform across levels of degrees and types of programs. The proportion of non-entrepreneurship graduate responses to entrepreneurship graduate responses was approximately 4:1. The original mailing ratio was 4.5:1. Questionnaires were filled out in different levels of detail so throughout the analysis, the number of respondents to each question is reported. Virtually all respondents filled out at least the basic information regarding their educational background (page 1 of the survey).

Table 1
Analysis of Response Rate – By Degree and Type of Program

	Bachelor's Degree	Advanced Degree	TOTALS
Graduates Receiving Questionnaires			
Non-Entrepreneurship Graduates	1,730	294	2,024
Entrepreneurship Graduates	301	159	460
TOTAL	2,031	453	2,484
Graduates Who Responded to Questionnaire			
Non-Entrepreneurship Graduates	348	58	406
Entrepreneurship Graduates	68	37	105
TOTAL	416	95	511
Response Rate			
Non-Entrepreneurship Graduates	20.1%	19.7%	20.1%
Entrepreneurship Graduates	21.6%	23.3%	22.8%
OVERALL	20.5%	21.0%	20.6%

Table 2 provides information on the sample population, and where possible, provides comparative data for those who were sent questionnaires and those who responded. We were limited in this comparison by the type of information held in the University of Arizona Foundation data. We can compare the characteristics of the two groups according to sex, residence in Arizona, nature of degree, and graduation year. The sampled populations of non-entrepreneurship and entrepreneurship graduates tended to be male, regardless of whether they received a bachelor's or graduate degree. Over 60 percent of those who were sent questionnaires were male. In terms of respondents, non-entrepreneurship females tended to return their questionnaires with higher frequency than did males, but among entrepreneurship graduates males continued to account for approximately 74 percent of both recipients and respondents. Regarding residency in Arizona, entrepreneurship graduates on average were somewhat less likely to live in the state than were non-entrepreneurship graduates who were sent questionnaires. In terms of responses, however, entrepreneurship graduates who were Arizona residents more frequently returned their questionnaires than did non-Arizona residents. The opposite was observed for non-entrepreneurship graduates. In total, the percentage of respondents who currently live in Arizona is slightly lower (48.0 percent) than that of persons receiving questionnaires (51.3 percent).

We were concerned that entrepreneurship graduates as a group would have substantially fewer years since receiving their degree than the sample of non-entrepreneurship business graduates. All surveyed graduates received their degree between 1985 and 1998, but the Berger Entrepreneurship Program started out small, with only 30 graduates in the first year, growing to 59 graduates by 1999. In contrast, there were 1,138 graduates of the Eller College of Business and Public Administration in 1985 and 1,220 in 1998. This concern, however, turned

out not to be an issue as indicated in Table 2. The data show that the average time since graduation for entrepreneurship graduates is very similar to that for non-entrepreneurship graduates for both those receiving and responding to the survey.

All in all, the characteristics of the respondents and the population surveyed are similar in terms of response rate, gender, and percent living in Arizona and average year of graduation. There appears to be no major bias in the response rate, based on the analysis of the few variables we have available from University of Arizona Foundation alumni data and the respondents to the questionnaire.

Table 2.
Comparison of Characteristics of Graduates Receiving Questionnaires with Respondents,
By Degree and Type of Program

		Bachelor's Degree	Advanced Degrees	TOTALS
	Percent Male			
Graduates Receiving Questionnaires	Non-Entrepreneurship Graduates	55.8%	64.3%	57.1%
	Entrepreneurship Graduates	73.4%	75.5%	74.1%
	TOTAL	58.4%	68.2%	60.3%
Respondents	Non-Entrepreneurship Graduates	48.3%	58.6%	49.8%
	Entrepreneurship Graduates	70.6%	81.1%	74.3%
	TOTAL	51.9%	67.4%	54.8%
	Percent Living in Arizona			
Graduates Receiving Questionnaires	Non-Entrepreneurship Graduates	53.4%	42.9%	52.6%
	Entrepreneurship Graduates	46.2%	45.3%	45.9%
	TOTAL	52.3%	43.7%	51.3%
Respondents	Non-Entrepreneurship Graduates	48.3%	43.1%	47.5%
	Entrepreneurship Graduates	45.6%	56.8%	49.5%
	TOTAL	47.8%	48.4%	48.0%
	Average Year of Graduation			
Graduates Receiving Questionnaires	Non-Entrepreneurship Graduates			1992.3
	Entrepreneurship Graduates			1992.4
Respondents	Non-Entrepreneurship Graduates			1992.3
	Entrepreneurship Graduates			1992.8

V. Analysis of Results.

We turn now to the analysis of the effect of entrepreneurship training on various survey responses. Initially, we compare entrepreneurship graduate responses with non-entrepreneurship

graduate responses to reveal the average effects. Then we control for individual characteristics and use regression analysis to examine the marginal effects of the entrepreneurship program.

A. Group-Level Comparisons.

We report the survey results for those graduates who are currently working in Tables 3 through 6. Of the 511 respondents from both non-entrepreneurship and entrepreneurship alumni, 39 were not currently employed. They were running a household/raising children; in between jobs/unemployed (in some cases this includes individuals who just graduated from a degree program), or were currently students in another degree program at the University of Arizona or elsewhere. In Appendix C we provide tables with survey results of all respondents. Analysis of all respondents and just those currently employed reveals very similar results.

A.1. Annual Income and Job Satisfaction.

Table 3 describes annual income and job satisfaction as reported in the survey by those reported as working. Entrepreneurship graduates have an average annual income that is 27 percent higher than the average annual income of non-entrepreneurship graduates. Much of this difference, however, can be attributed to whether the respondents work full or part-time. Entrepreneurship graduates were more likely to work full time. The survey instrument asked for both average annual income and the percent of time each individual worked. FTE annual income was then computed for each respondent by dividing their reported annual income by the percent of time they worked ($/ 100$). In the second row of Table 3, average FTE (full-time equivalent) annual income is reported. When FTE average annual incomes are compared, the entrepreneurship graduates earn only 4 percent more than do other graduates. We do not know whether the lower propensity to work full time that is observed for non-entrepreneurship graduates is by choice or

whether they are less able to secure full-time positions. The job satisfaction rating is similar for graduates from both types of programs.

Table 3
Survey Results: Income and Job Satisfaction for Working Respondents
– by Type of Program

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Average Response	Number of Respondents	Average Response	Number of Respondents
Average Annual Income	\$56,543	334	\$71,573	85
Average Annual FTE Income	\$71,544	330	\$74,393	83
Job Satisfaction (1=least satisfied, 10= most satisfied)	7.7	343	7.8	89

A.2. Type of Employment.

Table 4 reports respondents’ type of employment for both entrepreneurship and non-entrepreneurship graduates. As indicated, over 27 percent of entrepreneurship graduates are self-employed as either business owners or consultants, compared to 9.0 percent of non-entrepreneurship graduates. Therefore, the propensity for entrepreneurship graduates to own their own business is *three* times that for non-entrepreneurship graduates. As substantial as this difference is, it is impossible at this point to tell whether it is due to entrepreneurship training and education or other characteristics associated with entrepreneurship graduates, such as prior business experience. We can control for these effects in the regression analysis provided in the following section.

Just as there are more self-employed entrepreneurship graduates than non-entrepreneurship graduates, fewer entrepreneurship graduates are employees than non-entrepreneurship graduates. In the table, 291 or 91 percent of the non-entrepreneurship graduates were employees of a business, government, or non-profit organization. By contrast, 67 or 73 percent of the entrepreneurship graduates were employed by a business, government, or

non-profit. Entrepreneurship graduates also were less likely to be employed by government of a non-profit organization. A Chi-squared test for independence between “type of employment” and “type of program” was found to be very significant. The computed Chi-squared statistic is 24.1 with 9 d.f., which is significant at the 0.5 percent level. Thus, there is a very strong relationship between the type of business program and the type of employment selected by graduates.

Table 4
Survey Results: Type of Employment by Type of Program

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Number Reporting	Percent of Total	Number Reporting	Percent of Total
Self-employed	29	9.0%	25	27.2%
Employed by a Business	228	71.3%	59	64.1%
Employed in Government, including educational institutions	44	13.8%	7	7.6%
Employed in a non-profit	19	5.9%	1	1.1%
TOTAL EMPLOYED RESPONDENTS	320	100.0%	92	100.0%

A.3. Role in Starting New Businesses and Prior Business Ownership.

The survey responses reported in Table 5 address the important question of whether graduates have been involved in starting a new business venture and whether or not they owned a business or were starting a business prior to entering their educational program. As indicated, 54 percent of entrepreneurship graduates report that they have been instrumental in starting a business venture, compared with only approximately 17 percent of non-entrepreneurship respondents. The propensity for entrepreneurship graduates to be instrumental in starting a business venture is again three times that for non-entrepreneurship graduates.

About 17 percent of entrepreneurship graduates either owned a business or were starting a business before coming to the Eller College. In comparison, less than one percent of non-

entrepreneurship respondents were starting a business and only 2.5 percent owned a business before entering the business school. The answers to these two questions are critical when comparing other statistics relative to these two programs because they suggest that the individuals had very different objectives in their business education. For example, in Table 4, it is shown that over 27 percent of entrepreneurship graduates are self-employed, which is three times higher than the 9 percent for non-entrepreneurship graduates. Further analysis is necessary to determine whether the observed 18 percent difference between the two groups is due to the entrepreneurship program or due to the fact that entrepreneurship graduates were much more likely to be starting or owning a business before coming to the University of Arizona. This difference clearly demonstrates that analyzing only group data makes it extremely difficult to isolate the effects of the entrepreneurship training.

Table 5
Survey Results: Role in Starting New Ventures and Previous Business Activity –
Affirmative Responses of Working Respondents as a Percent of those who Responded to
the Question

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Percent of Respondents	Number of Respondents	Percent of Respondents	Number of Respondents
Were you ever instrumental in starting a business venture?	17.4%	322	54.0%	87
Were you starting a business when you came to the University of Arizona?	0.6%	333	17.2%	93
Did you own a business before coming to the University of Arizona	2.5%	361	17.2%	93

A.4. Assets of Entrepreneurship and Non-Entrepreneurship Graduates.

Table 6 shows the distribution of reported assets of non-entrepreneurship and entrepreneurship graduates. The survey question regarding assets asked individuals to report only assets that were associated with their work effort; they were asked to exclude non-work related assets such as inheritance, lottery winnings, and so forth. As shown in the table,

approximately 71 percent of non-entrepreneurship graduates fall in the lowest three asset categories of \$0 through \$100,000, whereas less than 60 percent of the entrepreneurship graduates are within those asset limits. About 4 percent of the non-entrepreneurship graduates have assets of over \$500,000, whereas nearly 9 percent of the entrepreneurship graduates fall in these top three asset categories. If we compute weighted average assets for each group by using the midpoint of each asset category and using \$7.5 million as the midpoint of the highest category, the entrepreneurship graduates' weighted average assets are \$278,000, compared to the non-entrepreneurship graduates' weighted average assets of \$172,000. These figures suggest a 62 percent gain in assets for entrepreneurship graduates relative to non-entrepreneurship graduates. These results indicate that entrepreneurship graduates have been more successful in accumulating assets since graduation.

Table 6
Survey Results for Working Respondents
– Reported Personal Assets

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Number Reporting	Percent of Total	Number Reporting	Percent of Total
\$0-\$10,000	51	14.4	11	12.4
\$10,001-\$50,000	121	34.2	25	28.1
\$50,001-\$100,000	79	22.3	17	19.1
\$100,001-\$250,000	47	13.3	19	21.3
\$250,001-\$500,000	43	12.0	9	10.0
\$500,001-\$1,000,000	6	1.7	5	5.6
\$1,000,001-\$5,000,000	6	1.7	2	2.2
Over \$5,000,000	1	0.3	1	1.1
TOTALS	354	100	89	100

A.5. The Relative Effects of Entrepreneurship and Non-entrepreneurship Graduates on Firm Growth: Changes in Firm Employment and Sales for Small and Large Firms and the Relative Annual Income of Graduates by Firm Size.

In Section A.3 we examined the relative likelihood of entrepreneurship and non-entrepreneurship graduates to start new ventures. These two groups also may have differential effects in helping existing businesses to expand. We explore the group effects regarding that issue in this section by examining changes in employment and sales.

Because entrepreneurship education emphasizes risk taking and the identification of new products, services, markets, and other opportunities, we anticipate that businesses owned by entrepreneurship graduates will have greater growth than will those owned by non-entrepreneurship graduates. Similarly, we anticipate that entrepreneurship graduates would contribute more significantly to the growth of small firms in which they are employed. We expect that it will not be possible to isolate the employment or sales effects associated with an entrepreneurship graduate working for a large firm because the effect of any one employee becomes subsumed within overall operations of a large firm. For graduates working for larger firms, their contribution to the economy would be measured by their salary differential (if any). If labor markets are efficient, and entrepreneurship training contributes to the value of marginal product of its graduates, then we should observe a salary differential for entrepreneurship graduates working for large firms.

Table 7 presents various growth statistics firms employing Eller College graduates. As shown in the table, there is evidence that the growth of small firms (under 100 employees) is greater for those employing entrepreneurship graduates than non-entrepreneurship graduates. Change in employment, percent change in employment, and the percent change in employment divided by the number of years the graduate has been employed are all greater for firms

employing entrepreneurship graduates than for non-entrepreneurship graduates. For small firms, the percent change in sales and the percent change in sales divided by the number of years the graduate has been employed also is greater for firms employing entrepreneurship graduates than for those employing non-entrepreneurship graduates.

Table 7
Analysis of Changes in Employment, Sales, and Income, by Firm Size

	Current Firm Size Distribution of Employed Persons					Total
	<=25	<=100	<=500	<=1000	>1000	
Change in Employment						
Non-Entrepreneurship	3	9	45	154	3,846	1,759
Number Reporting	35	25	28	6	78	172
Entrepreneurship	5	28	41	104	3,716	1,476
Number Reporting	7	9	6	5	16	43
Percent Change in Employment						
Non-Entrepreneurship	68%	33%	98%	49%	168%	113%
Number Reporting	34	25	28	6	79	172
Entrepreneurship	85%	290%	24%	39%	35%	100%
Number Reporting	7	9	6	5	16	43
Percent Change in Employment/Years Employed						
Non-Entrepreneurship	30%	15%	31%	19%	33%	29%
Number Reporting	31	25	28	6	77	167
Entrepreneurship	30%	86%	4%	11%	10%	30%
Number Reporting	7	9	6	5	16	43
Percent Change in Sales						
Non-Entrepreneurship	114%	52%	65%	161%	327%	197%
Number Reporting	20	16	19	4	51	110
Entrepreneurship	685%	1051%	64%	133%	35%	335%
Number Reporting	4	6	5	4	14	33
Percent Change in Sales/Years Employed						
Non-Entrepreneurship	40%	17%	36%	70%	62%	47%
Number Reporting	19	16	19	4	50	108
Entrepreneurship	230%	211%	12%	17%	5%	77%
Number Reporting	4	6	5	4	14	33
Income						
Non-Entrepreneurship	\$47,868	\$63,140	\$50,679	\$67,500	\$63,962	\$56,468
Number Reporting	32	24	28	8	79	171
Entrepreneurship	\$46,250	\$94,250	\$59,000	\$102,000	\$85,224	\$79,580
Number Reporting	6	8	6	4	17	41
FTE Income						
Non-Entrepreneurship	\$51,604	\$69,037	\$50,333	\$67,500	\$63,962	\$78,171
Number Reporting	32	23	27	8	79	169
Entrepreneurship	\$50,324	\$94,250	\$70,800	\$102,000	\$85,225	\$81,647
Number Reporting	6	8	5	4	17	40

According to the data in Table 7, large firms that employ entrepreneurship graduates tend to grow more slowly than those that employ non-entrepreneurship graduates. We had hypothesized in the original proposal that there would be no measurable effect of entrepreneurship training on large firms; however, why large firms that employ entrepreneurship graduates appear to grow more slowly than do larger firms employing other graduates is unclear.

If differential income represents the incremental value of the marginal product of entrepreneurship graduates to large firms, however, then that value is substantial. Income differences between entrepreneurship graduates and non-entrepreneurship graduates range from \$9,000 per year for firms with over 100, but less than 500 employees to \$34,500 for firms with more than 500, but less than 1000 employees. Incomes for entrepreneurship graduates are also substantially higher for the 75- 100 employee firm size.

Note that while Table 7 is suggestive, the evidence on employment and sales growth is extremely limited because of small sample sizes. By the time the data are bifurcated into two types of programs (entrepreneurship and non-entrepreneurship) and divided into five firm size groupings, the samples falls to as low as 4 observations per cell for some cells. Thus, while observations can be drawn from this table, conclusions should be tempered due to the small sample sizes.

Table 8 summarizes data regarding firm size for establishments owned by Eller College graduates who responded to the questionnaire. Firms owned by entrepreneurship graduates have an average employment of 199.9, sales of \$50 million, and assets of \$4.0 million. These are roughly 10 times the corresponding figures for firms owned by non-entrepreneurship graduates. Statistics for start-ups are also substantially larger for firms owned by entrepreneurship graduates than for non-entrepreneurship graduates.

Table 8
Summary of Data for Firms Owned by Those Who are Self-employed

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Average Response	Number Reporting	Average Response	Number Reporting
All Self-employed-owned Firms				
Employment	9.9	27	199.9	23
Sales	\$4.8M	24	\$50.0M	21
Assets	\$0.6M	22	\$4.0M	19
Start-ups				
Employment	10.0	21	229	18
Sales	\$5.9M	18	\$56.5M	18
Assets	\$0.4M	17	\$3.0M	16

The averages shown in Table 8, however, may be misleading due to the presence of outliers in the data for both groups. The size distribution of firms owned by self-employed graduates is shown in Table 9. The performance of establishments owned by entrepreneurship graduates is influenced by the presence of a major outlying firm with a disproportionately large number of employees and annual sales. There are also outlying firms among those owned by non-entrepreneurship graduates. Accordingly, we did not remove the outliers and report the data from the complete sample. As indicated in Table 9, the distribution of firm sizes for self-employed entrepreneurship graduates and non-entrepreneurship graduates is similar for firms up to 50 employees. Non-entrepreneurship graduates report two firms employing more than 50, but less than 100, and one entrepreneurship graduate reports a firm employing well over 1,000 employees. Again, because of the small sample sizes caution is in order in drawing conclusions from the firm employment distribution data.

Table 9
Distribution of Firm Employment for Establishments Owned by Self-employed
Individuals, by Type of Program

	Number of Jobs of Firms						TOTALS
	<5	>5 but < 10	>10 but < 50	>50 but <100	>100 but <1000	>1000	
Non-Entrepreneurship Graduates	13	3	3	2	0	0	21
Entrepreneurship Graduates	12	2	3	0	0	1	18

B. Analysis of the Marginal Effects of Entrepreneurship Education.

To examine the marginal effects of the entrepreneurship program we estimated equations designed to explain the variation across surveyed individuals for different variables. Four of the key variables are:

- (1) whether or not the individual had ever been “instrumental in a new business venture or start-up,”
- (2) whether or not the individual is self-employed (i.e., a business owner),
- (3) annual income of the individual,
- (4) job/position satisfaction,

In modeling, we examine (a) whether or not entrepreneurship training explains why those variables differ across individuals and, if so, (b) how important entrepreneurship training is in explaining those differences, and (c) what other characteristics of the individual might affect those variables. By using multivariate methods, we will be separating the effects of the entrepreneurship training on each of the variables from the effects of other characteristics.

The second two variables that are estimated, annual income and job satisfaction, are continuous variables. Annual income can take on almost any value (greater than 0) and job satisfaction can take on values between 0 and 10 as outlined in the survey, including fractional

numbers. Because they are continuous, Ordinary Least Squares is used to estimate the relevant equations.

In contrast, the first two variables listed above take on values of only 0 and 1. For example, when coded, the variable ‘whether or not the individual was instrumental in a new business venture or start-up’ is equal to 1 if the individual responded positively to the question and 0 otherwise. When an equation for this type of variable is estimated, these 0-1 variables are referred to as ‘limited dependent variables,’ because they are limited in the values they can assume. Ordinary Least Squares is not appropriate for limited dependent variables because OLS can result in predicted values greater than 1 and/or less than 0. Instead, Probit analysis is used. Probit is a common approach to estimation of limited dependent variables. Discussion of Probit can be found in Kmenta (1986, 553-55).

In estimating the first variable above, Probit analysis estimates the probability that a person has been instrumental in a new business venture or start-up, conditional upon various characteristics of that individual. Estimating an equation for ‘whether or not an individual was instrumental in a new business venture or start-up’ with Probit analysis determines which individual characteristics best predict the probability of being involved in a new business venture/start-up. It also predicts the change in the probability of being involved in a new business venture/start-up associated with each characteristic.

We used a statistical package LIMDEP(Version 7.0) for the regression analysis. LIMDEP is particularly useful for limited dependent variables. Not only does it compute the equation coefficients for limited dependent variable methods, such as Probit, it computes the *marginal effects* of each independent variable. When Probit analysis is specified, the program first computes Ordinary Least Squares coefficients as its start point, then computes Probit

coefficients, and finally computes the marginal effects (partial derivatives) for each variable, along with the standard errors and the level of significance for the marginal effects. Appendix D includes all regression results and a variable list for each estimated relationship discussed in this report, but only abbreviated results will be presented in the text.

As with all survey data there are missing values throughout the database. EXCEL was used to replace blanks with -999, which are interpreted by LIMDEP as missing data. LIMDEP's SKIP command was used to eliminate all observations for which there are missing data. SKIP eliminates observations only when they are included in a model/equation specification. Therefore, the number of observations will vary across each equation presented, according to which observations have missing values in the variables contained in each specification.

B.1. Analysis of Whether a Graduate was Instrumental in Starting a Business Venture.

One of the questions on the survey asked graduates whether or not they had ever been “instrumentally involved in a new business venture” (Section 9 of the survey). A positive response did not require that the venture had been successful, nor did it require that the graduate be currently involved with the venture. We examined a variety of variables that seemed likely to affect whether an individual would be involved in a new business start up. For example, it was expected that entrepreneurship training would significantly affect whether or not a graduate was involved in a new business venture. It also was expected that prior business ownership would increase the probability that the graduate had been instrumental in a new business venture. Since questionnaires were sent to some graduates who were only out of school a short time, it was believed that the time since receiving a degree from the Eller College would be positively related to a graduate's involvement in a business venture. Other education, either before or after receiving an Eller College degree could influence the likelihood that a person had been involved

in a new business venture. Personal characteristics, such as gender, ethnicity, or age, could also influence new business venturing, but no prior expectations were formed regarding the signs or magnitudes of these variables. Preliminary analysis indicated which variables appeared to have a significant effect, and we eliminated those that did not influence the results of the estimation. In a few cases, the questionnaire responses were too limited to provide sufficient information for a variable's use in the statistical analysis. The following is the final specification of the equation:

Equation 1:

STARTUP = Probit function of ENTREPRENEUR, OWNED BUSINESS, YEARS, SEX, AGE.

- STARTUP = 1 if an individual was instrumental in starting a new business venture/start-up, 0 otherwise.
- ENTREPRENEUR = 1 if an individual is a graduate of the Berger Entrepreneurship Program, 0 otherwise.
- OWNED BUSINESS = 1 if the individual owned a business prior to coming to the Eller College, 0 otherwise.
- YEARS = the number of years since an individual's Eller College Business Degree.
- SEX = 1 if an individual is a Male, 0 otherwise.
- AGE = individual's age in years.

Table 10 provides the results of the statistical analysis of equation 1.

Table 10
Whether or not an individual was instrumental
in a new business venture or start-up

Estimation Method:		Probit Analysis			
Dependent Variable: STARTUP	Mean = .249382716	St. Dev.= .4331908598			
Model Size: 405 Observations	Parameters = 6	Degrees of Freedom. = 399			
OLS Start Equation Fit:	R-squared =.241346	Adjusted R-Squared =.23184			
Probit Model Fit:	Chi-squared (5 d.f.) =95.88996	Significance level = .0000000			
Estimates of Marginal Effects: Partial Derivatives of E[Y] with respect to the vector of characteristics, computed at the mean of the Xs.					
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-.7009060667	.98486973E-01	-7.117	.0000	
ENTREPRENEUR	.2540164327	.52512546E-01	4.837	.0000	.20740741
OWNEDBUSINESS	.5072723326	.12666838	4.005	.0001	.51851852E-01
YEARS	.1495979004E-01	.63131782E-02	2.370	.0178	6.6888889
SEX	.6646060786E-01	.45719561E-01	1.454	.1460	.55802469
AGE	.7963288313E-02	.34899954E-02	2.282	.0225	32.125926

As indicated Table 10, entrepreneurship training increased the estimated probability of a graduate being involved in a business venture by 25 percent. This marginal effect of entrepreneurship training was highly significant; the marginal effect divided by its standard error is almost 5. The estimated probability in the tail of the distribution is 0.0000, which indicates that the chance of entrepreneurship training *not* being an important determinant of business ventures/start-ups is essentially zero.

Whether or not a graduate had owned a business prior to entering the Eller College is also very significant and has a substantial magnitude in this equation. Prior business ownership increases the estimated probability of having been instrumental in a business venture by 51 percent. While only 5 percent of the individuals examined in this estimation owned a business prior to entering business school, that experience substantially affects their willingness to attempt a business venture. Since graduates with prior business ownership were more likely have entered the entrepreneurship program, according to the group data analysis above, failure to control for prior business ownership could substantially bias the estimated marginal effects of

entrepreneurship training. When this variable is eliminated from the regression, the marginal effect of entrepreneurship training increases by approximately 5 percentage points.

Each year a business graduate is out of school increases the probability of being involved in a business venture by 1.5 percent. Since all individuals in this study received business degrees during or after 1985, it is probable that more graduates will get involved in a business venture in years to come.

Gender was not found to be a significant determinant of business venturing. The variable for gender is not significant even at the 10 percent level of significance. Interestingly, when this equation was estimated over all respondents rather than just working respondents, gender was found to be significant. This is consistent with women being more likely to choose not to work outside the home. Finally, the age of graduates positively affects their business venturing. For each year of age, an individual's probability of attempting a new business start up increases by 0.8 percent.

B.2. Analysis of Whether or Not an Individual is Self-employed.

The group data analysis in Table 4 indicates that entrepreneurship graduates are three times as likely to own and operate their own business than are non-entrepreneurship graduates. From the group data results, however, it is difficult to tell whether or not that result is due to the marginal effect of the entrepreneurship program or due to other characteristics of the entrepreneurship graduates, such as whether they owned a business prior to coming to the University of Arizona.

As with equation 1, we experimented with various specifications for examining the determinants of whether or not an individual graduate is self-employed. We hypothesized that self-employment would be positively affected by a graduate's business experience prior to

attending the university, their participation in the entrepreneurship program, and the length of time since they received their last degree from the Eller College. It takes time for graduates to organize a business or to obtain sufficient capital to obtain an existing firm. We also examined the effects of personal characteristics, such as age and sex, on the probability of self-employment. Sometimes, what is not significant in an estimated relationship is as interesting as what is significant. The dummy for an individual's gender was not significant in any of the specifications that were tried. Therefore, being a female does not reduce the estimated probability that a graduate is self-employed. The final specification and the estimation results are shown below.

Equation 2:

SELF EMPLOY = Probit function of ENTREPRENEUR, OWNED BUSINESS, YEARS, AGE.

- SELF EMPLOY = 1 if an individual is self-employed, 0 otherwise.
- ENTREPRENEUR = 1 if an individual is a graduate of the Berger Entrepreneurship Program, 0 otherwise.
- YEARS = the number of years since an individual's Eller College Business Degree.
- OWNED BUSINESS = 1 if they owned their own business prior to coming to the Eller College, 0 otherwise.
- AGE = age of the individual.

Table 11
Estimation for Equation 2: Whether or not an individual is self-employed.

Estimation Method:		Probit Analysis			
Dependent Variable: SELF EMPLOY		Mean = 0.130982		St. Dev.=.3378068	
Model Size: 397 Observations		Parameters = 5		Deg. Fr. = 392	
OLS Start Equation Fit:		R-squared =.092185		Adjusted R-Squared =.08292	
Probit Model Fit:		Chi-squared (4 d.f.) =35.02727		Significance level =.0000000	
Estimates of Marginal Effects: Partial Derivatives of E[Y] with respect to the vector of characteristics, computed at the mean of the Xs.					
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-.4892526253	.65903365E-01	-7.424	.0000	
ENTREPRENEUR	.1109704617	.34178765E-01	3.247	.0012	.21914358
YEARS	.7880643108E-02	.42644374E-02	1.848	.0646	6.7455919
OWNEDBUSINESS	.6042641312E-01	.55268625E-01	1.093	.2743	.57934509E-01
AGE	.5544876483E-02	.22409126E-02	2.474	.0133	32.455919

As indicated in the table, graduating from the entrepreneurship program increases the probability of being self-employed by 11 percent, holding all else constant. In the analysis of group data, it was shown that entrepreneurship program graduates are more likely to own and operate their own business. The group data analysis suggested that the higher incidence of prior business ownership among entrepreneurship program graduates might explain a major portion of the propensity to be self-employed. Whether or not an individual owned a business prior to entering the business school, however, is insignificant in the multivariate analysis.

In addition to the entrepreneurship program variables and previous experience variables, personal characteristics such as age and the number of years since leaving the Eller College were entered into the equation. The number of years since graduating from the Eller College and the individual's age were found to be statistically significant. For each year a graduate is out of school, the probability of becoming self-employed increases by almost 0.8 percent. In addition, as graduates age, their propensity to become self employed increases by 0.6 percent. Thus, a graduate who has been out of school for 10 years is 14 percent (combining the effects of age and

years since graduation) more likely to be self-employed than a new graduate, holding other characteristics constant.

B.3: Analysis of the Determinants of Individuals' Annual Income.

The income of a graduate is not only a measure of the graduate's well being (among other measures), it also represents the value of the marginal product of that graduate, if labor markets are efficient. We hypothesized that a graduate's annual income would be dependent on: whether or not a graduate participated in the entrepreneurship program; other education that the graduates may have received before entering or after leaving the University of Arizona; the type of work selected by the graduate, such as whether they choose to work in the public or the private sector; their work effort; and personal characteristics such as age, gender and the number of years since the graduate received their last Eller College degree.

Because the dependent variable has continuous data, in the following estimation we use Ordinary Least Squares:

Equation 3.

$$\text{ANNUAL INCOME} = a + b_1 \text{ SELF EMPLOY} + b_2 \text{ SEX} + b_3 \text{ GOVERNMENT} + b_4 \text{ PERCENT TIME WORKING} + b_5 \text{ ENTREPRENEURSHIP} + b_6 \text{ YEARS.}$$

- ANNUAL INCOME = an individual's annual income.
- SELF EMPLOY = 1 if an individual is self-employed, 0 otherwise.
- SEX = 1 if individual is Male, 0 otherwise.
- GOVERNMENT = 1 if the individual works for a government entity, 0 otherwise.
- PERCENT TIME WORKING = percent of time working, e.g., 100, 90.
- ENTREPRENEURSHIP = 1 if an individual went through the Berger Entrepreneurship Program, 0 otherwise.

- YEARS = years since individual received their last Eller College degree.

Table 12
Estimation of Equation 3: Annual income of graduates

Estimation Method:		Ordinary Least Squares			
Dependent Variable: ANNUAL INCOME		Mean = 60410.106		St. Dev.= 39358.169	
Model Size: 366 Observations		Parameters = 7		Deg. Fr. = 359	
Model Fit:		R-squared =.270868		Adjusted R-Squared =.25868	
Model Test:		F[6, 359]= 22.23		Prob value = .00000	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-27841.15108	14908.664	-1.867	.0627	
SELF EMPLOY	9973.991018	5778.0429	1.726	.0852	.11748634
SEX	13733.79647	3709.9523	3.702	.0002	.59016393
GOVERNMENT	-19532.86106	5533.1073	-3.530	.0005	.12021858
PERCENT TIME WORKING	567.1348438	148.77445	3.812	.0002	97.222678
ENTREPRENEUR	12431.17894	4516.2416	2.753	.0062	.20765027
YEARS	3572.627055	435.08506	8.211	.0000	6.6065574

According to the regression results, entrepreneurship education increases individuals' incomes by \$12,431 *per year*, holding other variables constant. Whether or not a person is self-employed increases their annual income by \$9,974 per year. This self-employed variable implicitly incorporates an indirect effect of entrepreneurship education on annual income. Recall from Equation 3 that entrepreneurship training increases the probability of being self-employed by 11 percent. If the mean of SELF EMPLOY in Table 12 is increased by 11 percent (i.e., an increase of .01292), then estimated annual income increases by approximately \$130 (.01292 x the coefficient of SELF EMPLOY in Equation 3). The combined effect of entrepreneurship training on a graduate's income is then \$12,561, which is the sum of the entrepreneurship program's direct effect (\$12,431) and its indirect effect through its influence on the propensity to be self-employed (\$130).

In addition to the effect of the entrepreneurship program on annual income, other programs within the college, including accounting, management information systems, and finance, were entered into the equation. None were found to have a significant effect. A dummy

representing whether or not the individual received an advanced degree was also insignificant. Attempts to control for college degrees earned either before or after their Eller College experience also failed to show any significance in explaining graduates' annual income. Several variables were entered to control for training received other than their Eller College education, including whether the graduate received another bachelors' degree elsewhere, whether they received an advanced degree elsewhere, or whether they received another business degree elsewhere. Again, none were significant.

The number of years since receiving their last degree from the Eller College is very significant. On average, graduates' incomes increase \$3,573 each year after leaving the Eller College. In addition, work effort is also significant in explaining their income. Individuals increase their income \$567 for each additional percent of full time they choose to work. An individual who chooses to work 90 percent of full time foregoes \$5,670 in annual income.

Whether a graduate chooses to work in the public sector has a substantial negative impact on their annual income. Graduates working for a government agency, including educational institutions, earn \$19,532 less than other graduates, *ceteris paribus*.

Gender also plays a significant role in explaining earnings. Males earn \$14,406 more than females, holding other characteristics constant. Why the differential between male and female income is so large is unclear. We estimated this regression only over working individuals, so the choice to work in the home rather than in the workplace is not an issue here. Similarly, we controlled for percent of time worked, which should have controlled for the lower income of women choosing to work part-time. Of course, there are many remaining factors for which we cannot control for that could affect this income differential. For example, we did not collect a complete history of how graduates spent their time since graduation. Although all

women included in this regression were working at the time of the survey, some may have been out of the labor market for a period of time prior to the survey. This experience factor, if it exists, cannot be controlled for with the data drawn from the survey.

B.4. Analysis of Graduate Job Satisfaction.

In analyzing the determinants of job satisfaction, we hypothesized earnings and self-employment (being one's own boss) would have positive effects. In addition, the type of business education was predicted to contribute to a graduate's job satisfaction in the work place because one type of business training may prepare them for the business world better than did others. Years since graduation was hypothesized to have a positive effect on job satisfaction because additional time would allow graduates to start new businesses or advance within an existing firm. Firm size was also considered as a possible determinant of job satisfaction. After experimenting with various possible variables for which we had data, we selected the following final specification for the job satisfaction equation.

Equation 4.

$$\text{SATISFACTION} = a + b_1 \text{ ANNUAL INCOME} + b_2 \text{ YEARS.}$$

- SATISFACTION = satisfaction with current position.
- ANNUAL INCOME = an individual's annual income.
- YEARS = the number of years since an individual's last Eller College degree.

Job satisfaction is a difficult variable to explain. As defined, it can take on values from 1 for 'very unsatisfied' to 10 for 'very satisfied.' Although a few respondents reported satisfaction ratings below 5, the vast majority reported satisfaction ratings between 7 and 10. Therefore, the variation in this variable is low. Out of 511 returned questionnaires, 443 responded to the job satisfaction question. The mean response of the 443 was 7.7 with a standard deviation less than

2.0, so the responses were bunched in the 7's, 8's and 9's.

Table 13
Estimation of Equation 4: Job Satisfaction

Estimation Method:		Ordinary Least Squares			
Dependent Variable: SATISFACTION		Mean = 7.65712		St. Dev.= 1.99368	
Model Size: 393 Observations		Parameters = 3		Deg. Fr. = 390	
Model Fit:		R-squared = .035450		Adjusted R-Squared = .0305	
Model Test:		F[2, 390]=7.17		Prob value = .00088	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	6.939776485	.21383863	32.453	.0000	
ANNUAL INCOME	.5871273094E-05	.27258506E-05	2.154	.0319	60526.809
YEARS	.5446311519E-01	25540907E-01	2.132	.0336	6.6463104

As indicated in Table 13, the regression was able to explain less than 3 percent of the variation in job satisfaction, which is low, even for cross-section analysis. The F-statistic, however, is easily significant at the 1- percent level of significance. According to the regression results, the satisfaction rating increases 0.00587 for each \$1,000 of income. The regression predicts that a graduate earning \$50,000 would report a job satisfaction of 7.23 (the constant of 6.939 plus 0.00587×50) while a graduate earning \$100,000 would report a job satisfaction of 7.53 (6.939 plus 0.00587×100), holding the other variables constant.

The only other variable found significant in explaining job satisfaction was the number of years since graduates received their last Eller College degree. Their job satisfaction rating increases by .0545 for each year out of school. This means that, overtime, graduates advance and earn their way into work situations that give them higher satisfaction levels.

Entrepreneurship training enters into the equation for job satisfaction only indirectly through its effects on annual income, and its effect is quite small. Recall from the discussion of Equation 3 that entrepreneurship training increases annual income by \$12,561 (both directly and indirectly). By increasing annual income in Equation 4 by \$12,561, the estimated job

satisfaction rating increases by 0.074. Thus, entrepreneurship education is estimated to increase job satisfaction by approximately 1 percent.

B.5. Marginal Analysis of Change in Employment and Sales, and Income.

In Tables 7 and 8 we reported group averages for changes in firm employment and sales and individual incomes by firm size category for entrepreneurship and non-entrepreneurship graduates. In this section, we examine those data and control for individual characteristics in order to isolate the incremental effects of the entrepreneurship program.

As we suggested in Section A.5, we anticipated that it would be difficult to isolate the incremental effects of an entrepreneurship graduate on employment and sales changes within large firms. We experimented with various specifications for the large firm data set. In these experiments we attempted to explain (a) employment change, (b) percent change in employment, (c) percent change in employment per year of employment, (d) change in sales, (e) percent change in sales, and (f) percent change in sales per year of employment. Each measure was specified as a function of: (1) entrepreneurship training of the individual, (2) whether or not the individual had previously owned a business prior to coming to the Eller College, (3) other majors the individual may have had, (4) other degrees the individual may have earned, (5) age of the individual, (6) years since receiving their last degree from the Eller College, and (7) whether or not the firm they were working for was a high-technology firm.

None of these specifications, however, resulted in a significant model. In each case, the fit of the model was so poor that there was well over 10 percent probability left in the tail of the probability distribution of the F-statistic. None of the individual characteristics were statistically significant. Although disappointing, these results confirmed our expectation that the characteristics of a single employee cannot importantly explain the growth of a large firm.

We had more success in examining the determinants of individual incomes within larger firms (>100 employees). We investigated various independent variables including those described above. The only statistically-significant variables were entrepreneurship education and whether or not the establishment was a high-technology firm. The results are shown in Table 14. As indicated, entrepreneurship education was a significant factor in annual income for individuals working for large firms. The estimation of equation 5 suggests that entrepreneurship graduates working for large firms earn approximately \$23,500 more per year than do other graduates working for such establishments. Similarly, high technology firms tend to pay over \$17,000 per year more than do non-high technology firms, *ceteris paribus*.

Equation 5.

$$\text{ANNUAL INCOME} = a + b_1 \text{ ENTREPRENEUR} + b_2 \text{ HIGH-TECH.}$$

- ANNUAL INCOME = an individual's annual income, in dollars;
- ENTREPRENEUR = 1 if an individual is a graduate of the Berger Entrepreneurship Program, 0 otherwise;
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise.

Table 14
Estimation of Equation 5: Annual Income for Individuals Employed by Firms > 100 Employees

Estimation Method:		Ordinary Least Squares			
Dependent Variable: ANNUAL INCOME		Mean = 65805.30303		St. Dev.=33942.6083	
Model Size: 132 Observations		Parameters = 3		Deg. Fr. = 129	
Model Fit:		R-squared = .152292		Adjusted R-Squared = .13915	
Model Test:		F[2, 129]= 11.59		Prob value = .00002	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	52182.74420	3915.8154	13.326	.0000	
ENTREPRENEURSHIP	23543.76349	6912.0822	3.406	.0009	.19696970
HIGH-TECHNOLOGY	17279.34287	5513.8432	3.134	.0021	.46212121

We then turned to examine the data for individuals working for small firms (<100 employees) and to estimate equations for the incremental effect of entrepreneurship education on changes in firm employment and changes in sales. These equations were estimated for both individuals working for small firms and for owners of small firms. We could not estimate a significant model for change in sales, but we were able to estimate a significant model for change in employment across individuals working for small firms. The results are shown in Table 15. As indicated, the model is significant and the coefficient on entrepreneurship training is positive, but it is not significant at the 10 percent level of significance. Small high-technology firms grew by 19 employees more than did other firms, *ceteris paribus*. We expected that the number of years the individual worked for the firm would be significant in explaining firm growth, but it was not. This equation was estimated across individuals working for small firms *and* individuals owning small firms (<=100 employees).

Equation 6.

$$\text{EMPLOYMENT CHANGE} = a + b_1 \text{ENTREPRENEUR} + b_2 \text{HIGH-TECH} + b_3 \text{YEARS-ON-JOB}.$$

- EMPLOYMENT CHANGE = change in employment at individual's firm since hire/start/obtain date.
- ENTREPRENEUR = 1 if an individual graduated from the Berger Entrepreneurship Program, 0 otherwise.
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise.
- YEARS-ON-JOB = number of years individual has been at their current position.

Table 15
Estimation of Equation 6: Employment Change within Small Firms (<=100 employees)
across Individuals Working for small firms

Estimation Method:		Ordinary Least Squares			
Dependent Variable: EMPLOYMENT CHANGE		Mean = 8.788732394		St. Dev.=20.38691141	
Model Size: 71 Observations		Parameters = 4		Deg. Fr. = 67	
Model Fit:		R-squared = .259411		Adjusted R-Squared =.22625	
Model Test:		F[3, 67]= 7.82		Prob value = .00015	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-.3497854506	3.4615388	-.101	.9198	
ENTREPRENEUR	7.484929851	5.2067485	1.438	.1552	.22535211
HIGH-TECH	22.95691018	5.8044960	3.955	.0002	.16901408
YEARS-ON-JOB	1.342116789	.90073151	1.490	.1409	2.6612676

We now turn to an analysis of the impact of entrepreneurship graduates on firm growth using only data for those who were employed by small firms. We attempted to analyze small firm growth for establishments owned by Eller College graduates, but were unsuccessful. Annual income for owners of small firms could not be modeled significantly and there were insufficient observations to estimate change in employment and sales. For individuals employed by small firms, we estimated equations for: (i) percent change in jobs (equation 7), (ii) percent change in jobs divided by the number of years the individual has been with the firm (equation 8), (iii) percent change in sales (equation 9), and (iv) percent change in sales divided by the number of years the individual has been with the firm (equation 10). Each of the equations for (i) through (iv), estimated across individuals employed by small firms, had a significant F-statistic (Tables 16 through 19). In the two equations related to percent change in employment (i) and (ii), entrepreneurship training had a positive coefficient but was not significant (Tables 16 and 17, respectively).

Equation 7.

$$\% \text{EMPLOYMENT CHANGE} = a + b_1 \text{ ENTREPRENEUR} + b_2 \text{ HIGH-TECH} + b_3 \text{ YEARS-ON-JOB.}$$

- %EMPLOYMENT CHANGE = percent change in employment at individual's firm since hire/start/obtain date;
- ENTREPRENEUR = 1 if an individual graduated from the Berger Entrepreneurship Program, 0 otherwise;
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise;
- YEARS-ON-JOB = number of years individual has been at their current position.

Table 16
Estimation of Equation 7: Percent Change in Employment, estimated across Individuals Employed by Small Firms (<=100 employees)

Estimation Method:		Ordinary Least Squares			
Dependent Variable: %EMPLOYMENT CHANGE		Mean = 90,593246		St. Dev.= 253.7247697	
Model Size: 70 Observations		Parameters = 4		Deg. Fr. = 66	
Model Fit:		R-squared = .351893		Adjusted R-Squared =.32243	
Model Test:		F[3, 66]= 11.95		Prob value = .00000	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-66.19417703	40.631450	-1.629	.1080	
ENTREPRENEUR	82.91732705	60.728051	1.365	.1768	.22857143
HIGH-TECH	306.5110433	67.658136	4.530	.0003	.17142857
YEARS-ON-JOB	31.93532944	10.495440	3.043	.0034	2.6707143

Equation 8.

$$\%EMPLOYMENT\ CHANGE/YEARS-ON-JOB = a + b_1\ ENTREPRENEUR + b_2\ HIGH-TECH.$$

- %EMPLOYMENT CHANGE/YEARS-ON-JOB = percent change in employment since hire/start/obtain date divided by years on the job.
- ENTREPRENEUR = 1 if an individual graduated from the Berger Entrepreneurship Program, 0 otherwise.
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise.

Table 17
Estimation of Equation 8, Percent Change in Employment/Years Individual Was Employed, estimated across Individuals Employed by Small Firms (<=100 employees)

Estimation Method:		Ordinary Least Squares			
Dependent Variable: %EMPLOYMENT CHANGE/YEARS-ON-JOB		Mean = 31.47352960		St. Dev.=64.61015919	
Model Size: 73 Observations		Parameters = 3		Deg. Fr. = 70	
Model Fit:		R-squared =.345443		Adjusted R-Squared =.32674	
Model Test:		F[3, 70]=18.47		Prob value = .00000	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	11.47357594	7.3302474	1.565	.1220	
ENTREPRENEUR	20.39389332	15.346733	1.329	.1882	.21917808
HIGH-TECH	94.47452704	17.130018	5.515	.0000	.16438356

In the estimation of equation 9 shown in Table 18, small firms employing entrepreneurship graduates are estimated to have sales that are higher by 542 percent than other firms, over an average three-year time period (the mean of the variable years –on-job). And if that firm is a high-technology firm, it’s sales are expected to grow by 732 percent more than non-high technology small firms.

These incremental effects appear to be very large, but they must be placed into context. The average growth rate for all firms over the three years is 224 percent (mean of %SALES CHANGE). This suggests that firms employing entrepreneurship graduates had percent sales increases of 318 percent more than the average (542%-224%).

Equation 9.

$$\%SALES\ CHANGE = a + b_1\ ENTREPRENEUR + b_2\ HIGH-TECH + b_3\ YEARS-ON-JOB.$$

- %SALES CHANGE = percent change in sales at an individual’s firm since their hire/start/obtain date.
- ENTREPRENEUR = 1 if an individual graduated from the Berger Entrepreneurship Program, 0 otherwise.
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise;

- YEARS-ON-JOB = number of years individual has been at their current position.

Table 18
Estimation for Equation 9: Percent Change in Sales, estimated across Individuals Employed by Small Firms (<=100 employees)

Estimation Method:		Ordinary Least Squares			
Dependent Variable: %SALES CHANGE		Mean = 224.4703690		St. Dev.=878.2430199	
Model Size: 53 Observations		Parameters = 4		Deg. Fr. = 49	
Model Fit:		R-squared =.254242		Adjusted R-Squared =.20858	
Model Test:		F[3, 49]= 5.57		Prob value = .00228	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-189.3865187	178.27845	-1.062	.2933	
ENTREPRENEUR	542.4038190	261.75580	2.072	.0435	.22641509
HIGH-TECH	732.6602025	261.54511	2.801	.0073	.22641509
YEARS-ON-JOB	42.78391997	46.774640	.915	.3648	2.9254717

Table 19 describes the results from the estimation of equation 10. In the equation for the percent change in sales divided by the number of years the individual was employed, we get results comparable to those reported in Table 18. Percent change in sales is 126 percent higher per year for firms employing entrepreneurship graduates than for other firms. Similarly, high technology firms have a percent change in sales that is 194 percent higher than for non-high technology small firms.

Equation 10.

$$\%SALES\ CHANGE/YEARS-ON-JOB = a + b_1\ ENTREPRENEUR + b_2\ HIGH-TECH.$$

- %SALES CHANGE/YEARS-ON-JOB = percent change in sales since hire/start/obtain date divided by years on the job.
- ENTREPRENEUR = 1 if an individual graduated from the Berger Entrepreneurship Program, 0 otherwise.
- HIGH-TECH = 1 if an individual is with a high technology firm, 0 otherwise.

Table 19
Estimation of Equation 10: Percent Change in Sales/Years Individual was Employed,
estimated across Individuals Employed by Small Firms (<=100 employees)

Estimation Method:		Ordinary Least Squares			
Dependent Variable: %SALES CHANGE/YEARS-ON-JOB		Mean = 58.20398		St. Dev.=188.0901541	
Model Size: 53 Observations		Parameters = 3		Deg. Fr. = 50	
Model Fit:		R-squared = .286926		Adjusted R-Squared =.25840	
Model Test:		F[2, 50]= 10.06		Prob value = .00021	
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-12.36417211	27.378908	-.452	.6535	
ENTREPRENEUR	125.5886472	53.677675	2.340	.0233	.22641509
HIGH-TECH	186.0873587	53.677675	3.467	.0011	.22641509

In summary, the empirical results from examining the effect of entrepreneurship education on firm growth as indicated by employment change and change in sales are mixed. As predicted, large firms pay entrepreneurship graduates more than they do other graduates, and we interpret that income differential as the incremental marginal value of entrepreneurship graduates. For small firms employing graduates (including start-ups) we were unable to show a significant effect of entrepreneurship education for change in employment or change in sales, although the signs of the coefficients were always as expected. For small firms (excluding start-ups), we were not able to find a significant effect for entrepreneurship education on one measure of firm growth: the percent change in employment or the percent change in employment per year the graduate was employed. We found, however, a strong relationship between entrepreneurship education and another measure of firm growth: the percent change in sales and the percent change in sales per year the graduate was employed.

C. The Effect of the Entrepreneurship Program on Technology Transfer from the University to the Private Sector.

Survey questions in Section 10 of the questionnaire dealt with the use of and the licensing of technologies. Questions included: an assessment of time involved in research and development activities; the estimated life span of major products; whether the firm was part of a

high-technology industry; whether the firm licensed technology to other businesses; estimated royalty amounts; whether the individual had been instrumental in developing products that ultimately were patented; and finally, whether the firm used licensed technology and if so, the sources of that technology (particularly, the University of Arizona).

Table 20 summarizes survey results from all working respondents and self-employed respondents to basic questions regarding technology. Entrepreneurship graduates are more likely to be with firms that use licensed technologies, and importantly, they are more likely to be with firms that license technologies to others. Also according to the survey results, entrepreneurship graduates are more likely to be involved with a high technology firm. Similarly, self-employed, entrepreneurship program graduates are more likely to both use licensed technologies and to license technologies to others. Among the self-employed respondents, nearly 23 percent of the entrepreneurship graduates own a high technology firm compared to less than 15 percent of non-entrepreneurship graduates.

The fourth question in Table 20 relates to whether they have ever been instrumental in developing new products. Over 21 percent of all responding entrepreneurship program graduates were instrumental in developing new products compared with just over 7 percent of all responding non-entrepreneurship graduates. Among the self-employed respondents, almost 29 percent of entrepreneurship program graduates stated they had been instrumental in developing new products, compared to 22 percent of non-entrepreneurship program graduates.

It is not surprising that the difference between the responses for ‘self-employed’ entrepreneurship graduates and non-entrepreneurship graduates is smaller than for ‘working respondents.’ The fact that they are self-employed would make this group of non-entrepreneurship graduates similar to this group of entrepreneurship graduates. In interpreting

these results, however, recall that the entrepreneurship graduates are three times more likely to be self-employed than non-entrepreneurship graduates.

Table 20
Survey Responses to a Select Set of Questions Related to Licensed Technology– Affirmative Responses as a Percent of Those who Responded

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Percent of Respondents	Number Reporting	Percent of Respondents	Number Reporting
All Working Respondents				
Do you use licensed technologies?	22.7%	313	26.0%	81
Do you license technologies to others?	17.8%	275	23.8%	80
Is your firm considered to be a high technology industry?	27.0%	318	33.7%	89
Have you ever been instrumental in developing new products?	7.2%	276	21.1%	76
Self-employed Respondents				
Do you use licensed technologies?	16.0%	25	21.0%	19
Do you license technologies to others?	4.2%	24	10.0%	20
Is your firm considered to be a high technology industry?	14.8%	27	22.7%	22
Have you ever been instrumental in developing new products?	21.7%	23	28.6%	21

We asked graduates how many licensed technologies that they used. The response rate for this question was very low (less than 53 out of all 511 respondents) and some of those responses made the results difficult to interpret. For example, a non-entrepreneurship graduate currently working in a bank reported using 75 licensed technologies to determine different loan risks. This was an outlier among the reported number of licensed technologies used by other respondents. Also, there were many respondents (both entrepreneurship program graduates and non-entrepreneurship graduates) who work for very large companies and simply could not estimate the number of licensed technologies used. Similarly, we asked, “How many University of Arizona licensed technologies do you use?” We hoped to capture direct information on

technology transfer from the University of Arizona. Only six graduates responded to this question and of them, only one reported buying licensed technologies from Arizona. That respondent was an entrepreneurship program graduate, but conclusions can't be drawn from this limited information. We return to an analysis of university-based technology when we examine the business plans of entrepreneurship graduates below.

Table 21 relates indirectly to technology. High technology industries tend to be characterized by relatively high research and development effort and short life-spans for their products. According to the survey results, entrepreneurship graduates spend more of their time on R&D than do their counterparts who did not participate in the entrepreneurship program, and the average life-span of their major products is two years shorter than all working respondents and 3 years shorter for self-employed entrepreneurship and non-entrepreneurship graduates. There were more respondents to the "average life-span" question that is shown for the second question in the table. Many graduates wrote NA for "Not Applicable" for their responses. The NA response was usually used by graduates who are working in service-related industries, such as law offices, accounting firms, or banks.

Interpretation of the product life-span questions should include both the second and third lines of Table 21, for both the "All Working Respondents" group and the "Self-employed" group. For example, 235 of the non-entrepreneurship graduates responded to the product life-span question. Of those, 157 reported a life-span for their major product, while the remaining reported NA. For self-employed entrepreneurship program graduates, 18 responded to the product life-span question, 14 provided a life-span estimate for their major product, and the remaining 22 percent responded with NA. NA responses are interpreted by us to indicate a product for which it is difficult to estimate a life-span and is, therefore, probably not a high-tech

product. In general then, entrepreneurship graduates on average appear to be more involved in research and development, to work with products with shorter life spans, and to work in high-tech industries.

Table 21
Survey Responses to a Select Set of Questions Related to R&D and Life Span of Major Product

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Average Response	Number Reporting	Average Response	Number Reporting
All Working Respondents				
What percent of your time is spent on R&D?	12.1%	321	14.6%	89
Average life span of major product?	7.7 years	157	5.6 years	60
Percent Reporting Not Applicable to Life-Span of Product Question	33.2%	235	20.0%	75
Self-Employed Respondents	Average Response	Number Reporting	Average Response	Number Reporting
What percent of your time is spent on R&D?	12.4%	25	13.5%	23
Average life span of major product?	8.9 years	11	5.7 years	14
Percent Reporting Not Applicable to Life-Span of Product Question	47.6%	21	22.2%	18

C.1. Analysis of whether or not the graduate is with a high-technology firm.

Multivariate regressions were estimated for two technology variables: whether or not a graduate is with a high-technology firm; and whether or not the graduate has ever been instrumentally involved in developing new products. We examined a variety of possible variables available to us that might affect the likelihood that a graduate would be involved in a high-tech firm, including entrepreneurship, whether the graduate had a MIS (management information systems) degree, whether the individual owned a business prior to entering the business school, and whether or not they were self employed upon graduation. The results of the Probit estimation are shown in Table 22 below.

We expected that graduates who attended the entrepreneurship program would be more likely to be in a high-technology firm than would other Eller College graduates. We were only partly right on that issue. Eller College graduates receiving either an undergraduate or advanced degree in Management Information Systems were the most likely to be with a high technology firm. MIS graduates are 34 percent more likely to be with a high-technology firm than other graduates, *ceteris paribus*. Since a relatively high portion of the reported 'high-technology' firms are related to communications, the Internet, and the development/sale of specialized software, it is not surprising that MIS graduates are likely to be with high-technology firms.

Even so, participation in the entrepreneurship program increases a graduate's estimated probability of being with a high-technology firm by close to 13 percent, holding other effects constant. For those graduates receiving both an entrepreneurship degree and MIS degree, they are approximately 47 percent more likely to be with a high technology firm. About 9 percent of the entrepreneurship graduates who responded to the survey had a combined MIS/Entrepreneurship major.

The results in Table 22 also indicate that graduates who owned a business prior to entering the Eller College are less likely to be involved with a high-technology business, and that self-employed graduates are about 16 percent less likely to be with a high-technology firm. These results may reflect the costs of entry and risks associated with many types of high-technology businesses. Accordingly, the estimation should be interpreted to mean that a graduate is more likely to be *employed* by a high technology firm than to *own* one. Since entrepreneurship education is a significant factor in explaining the propensity to be self-employed, the indirect effect of entrepreneurship on whether a graduate is with a high-technology firm is approximately -1.5 percent.

Equation 11.

HIGH-TECH = Probit function of ENTREPRENEUR, MIS, SELF EMPLOY, OWNED BUSINESS

- HIGH-TECH = 1 if individual is with a high technology firm, 0 otherwise.
- ENTREPRENEUR = 1 if individual went through the Berger Entrepreneurship Program, 0 otherwise.
- MIS = 1 if the individual received a degree (undergraduate or graduate) in Management Information Systems, 0 otherwise.
- SELF EMPLOY = 1 if the individual is self-employed, 0 otherwise.
- OWNED BUSINESS = 1 if the individual owned a business prior coming to the Eller College, 0 otherwise.

Table 22

Estimation for Equation 11: Whether or not an individual is with a high technology firm

Estimation Method:		Probit Analysis			
Dependent Variable: HIGH-TECH	Mean = .27170868	St. Dev.= .4454648			
Model Size: 357 Observations	Parameters = 5	Deg. Fr. =352			
OLS Start Equation Fit:	R-squared = .090166	Adjusted R-Squared =.07983			
Probit Model Fit:	Chi-squared (4 d.f.) =30.52335	Significance level =.000003829			
Estimates of Marginal Effects: Partial Derivatives of E[Y] with respect to the vector of characteristics, computed at the mean of the Xs.					
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-.2460161568	.21494693E-01	-11.445	.0000	
SELF EMPLOY	-.1646991608	.78344956E-01	-2.102	.0355	.13165266
ENTREPRENEUR	.1272788350	.58853966E-01	2.163	.0306	.22969188
MIS	.3404599214	.70636973E-01	4.820	.0000	.12044818
OWNED BUSINESS	-.1996327091	.11865327	-1.682	.0925	.56022409E-01

C.2: Analysis of whether an individual has been instrumental in developing new products.

We anticipated that the determinants of whether an individual is likely to develop new products would include the type of degree program and training received by the graduate; personal characteristics, such as sex, ethnicity, or age; and the amount of time that has passed since the graduate received their last Eller College degree. In terms of degree program, we

expected that participation in the entrepreneurship program would increase the propensity to develop new products, whereas we expected that participation in certain other business majors, such as accounting and finance would decrease the probability of developing new products. Students in these two majors tend to be employed in large accounting and financial firms, where new product development may be more difficult. The final estimation is shown in equation 12, and the results are described in Table 23.

Equation 12.

**NEW PRODUCT = Probit function of ENTREPRENEUR, FINANCE,
ACCOUNTING, SEX, YEARS.**

- NEW PRODUCT = 1 if an individual has been instrumental in developing new products, 0 otherwise;
- ENTREPRENEUR = 1 if an individual went through the Berger Entrepreneurship Program, 0 otherwise;
- FINANCE = 1 if an individual received a degree in finance (undergraduate or graduate), 0 otherwise;
- ACCOUNTING = 1 if an individual received a degree in accounting (undergraduate or graduate), 0 otherwise;
- SEX = 1 if an individual is a Male, 0 otherwise;
- YEARS = the number of years since receiving their last Eller College Degree.

As indicated in the table, entrepreneurship graduates are almost 9 percent more likely to have been instrumental in developing new products. Both of the two other business school majors that were entered into the regression are negative, but only the finance major is significant. Finance majors tend to be 8 percent less likely to develop new products than other business majors and 17 percent less likely than entrepreneurship graduates. The MIS major was entered into earlier versions of this equation, but was always very insignificant. Males are almost 5 percent more

likely to develop new products than females. The length of time since their Eller College degree is also significant in explaining the propensity to develop new products. For each year out of business school, the probability that a graduate will develop a new product increases by 0.6 percent.

Table 23
Estimation of Equation 12: Whether or not the graduate
was instrumental in developing new products

Estimation Method:		Probit Analysis			
Dependent Variable: NEW PRODUCT		Mean = 0.1014084507		St. Dev.= .302294875	
Model Size: 355 Observations		Parameters = 6		Deg. Fr. =349	
OLS Start Equation Fit:		R-squared = .067001		Adjusted R-Squared =.05363	
Probit Model Fit:		Chi-squared (5 d.f.) =25.00942		Significance level =.00013875	
Estimates of Marginal Effects: Partial Derivatives of E[Y] with respect to the vector of characteristics, computed at the mean of the Xs.					
Variable X	Coefficient b	Standard Error	b/Stan. Error	P[Z > z]	Mean of X
Constant	-.2641631238	.37260057E-01	-7.090	.0000	
ENTREPRENEUR	.8956621258E-01	.30702871E-01	2.917	.0035	.21126761
FINANCE	-.8239884386E-01	.39004413E-01	-2.113	.0346	.22816901
ACCOUNTING	-.6417004597E-01	.47837470E-01	-1.341	.1798	.17464789
SEX	.4885233497E-01	.29686119E-01	1.646	.0998	.55211268
YEARS	.6408818285E-02	.33855151E-02	1.893	.0584	6.7070423

C.3. Analysis of Entrepreneurship Program Business Plans and Technology Transfer.

In addition to the survey responses, the Berger Entrepreneurship Program maintains data files on all of the business plans written by students who participate in the curriculum. 289 plans were written between 1985 and 1999. Many of these involved new technology. Some technologies were from the University of Arizona, whereas others were developed elsewhere. Additionally, some of the plans were implemented by graduating students, while in other cases, the ideas were developed by different individuals with limited involvement of the graduates. In a few cases, we do not know whether or not the technology was commercialized. It seems likely that even when the technology was not commercialized, the process of business plan development and presentation in the business plans competitions publicized the process of

technology transfer to the community and thereby encouraged further transfers. We cannot, however, document this precisely.

Table 24 lists the business plans developed in the Berger Entrepreneurship Program since 1985 and categorizes them as to whether they were technology based. A description of all technology-based plans is in Appendix E. As indicated in the table, over time the portion of business plans written that were based on innovative technologies has increased, from 15 percent in 1985 to 50 percent by 1999. The plans that were developed have ranged from a software firm that valued and managed collectibles to a firm based on new technology to track and analyze cell migration to a firm that developed software for collection and analysis of environmental data and GIS mapping. Other plans included a firm that developed vascular graft tissue for use in bypass operations, a firm that specialized in treating seeds with electrolysis and enzymes to increase productivity, a firm that developed dust control devices for mining equipment, another with technology for wine quality analysis, and finally a firm that specialized in wheat milling machinery production in Turkey.

Table 24
Berger Entrepreneurship Program Business Plans
Portion that were Technology-based.

YEAR	TOTAL BUSINESS PLANS WRITTEN	TECHNOLOGY-BASED BUSINESS PLANS	PERCENT OF TOTAL
1985	13	2	15%
1986	12	2	17%
1987	13	2	15%
1988	15	6	40%
1989	18	7	39%
1990	18	6	33%
1991	20	3	15%
1992	22	6	27%
1993	19	7	37%
1994	15	7	47%
1995	16	4	25%
1996	22	4	18%
1997	25	10	40%
1998	29	15	52%
1999	32	16	50%
Total	289	97	34%

Examples of two technology-based firms developed from business plans written by Berger Entrepreneurship Program students illustrate the process by which technology transfer can occur from the university to the private sector. The first is Split Engineering. Founded in 1997, Split Engineering provides digital image analysis systems, software and service to the international mining industry. The products provide the firm's customers improved process management and control of the crush of rock that is integral to mining and construction. The founding members were two entrepreneurship program students, one an MBA and the other a

graduate student in mechanical engineering. The technology was under development by faculty in the University of Arizona College of Engineering. The two students wrote the plan as part of the entrepreneurship program, competed in various intercollegiate business plans competitions, and then pooled \$20,000 in savings together to start the company. They have raised additional funds, and after three years, the company employs ten full and part-time employees. Before the end of 2000, Split Engineering hopes to open an office in Chile to service the large Latin America market and is beginning to develop a new, related products with two key industry partners.

The second firm is Pegasus (Rome-Pegasus). This plan was written by two students in the entrepreneurship program, one an MBA and the other from the College of Agriculture. The primary product was a specialized plow for cotton and corn cultivation. The plow reduces dust pollution, fuel use, and enhances the soil. In one pass the plow cuts and buries cotton and corn stocks. The technology was developed in the College of Agriculture at the University of Arizona. The company, Pegasus Plow was founded in 1992 and was sold to the Rome Plow Company in 1999 and is marketed through caterpillar dealers world wide.

VI. Pedagogical Contributions of the Entrepreneurship Program.

Entrepreneurship programs contribute to the training of future business leaders. At the University of Arizona, entrepreneurship education is interdisciplinary and not bound by discipline-based protocols. As such, entrepreneurship programs can have flexibility in developing new teaching methods, coursework and projects that prepare business students to recognize a business opportunity and to know how to build and expand a business. In many instances, the demonstrated successes of these teaching programs are borrowed and incorporated into the general business curriculum. The extent to which changes in the business and MBA

curriculum have been changed to reflect the philosophy of the entrepreneurship program was documented and quantified. The MBA curriculum has been revised, an International Business Program started, and discipline courses restructured borrowing from the innovations of the Berger Entrepreneurship Program. The format of the business plans competition was modified for use in the MBA case analysis competition; business planning consulting was established through the creation of a MBA Consulting Desk; MBA and undergraduate courses were made more integrative and based on real-world applications; and the International Business Program adopted the use of program certificates for graduates as has been done in the entrepreneurship program.

To assess these effects, questions regarding the academic achievements and pedagogical contributions of the entrepreneurship program were prepared and sent to 27 deans, directors, and department heads within the University of Arizona who were familiar with the entrepreneurship program's curriculum and who had familiarity with changes made in other Eller College programs. The survey was sent in August 1999. Appendix F contains the questionnaire sent to administrators. The survey asked administrators to rank the program's teaching methods, coursework, and impact on general business and MBA programs. They also were asked to provide descriptions of the effects they observed. The survey instrument contained questions regarding both pedagogical questions and financial contributions attributable to the Berger Entrepreneurship Program. Because not all deans, directors and department heads would have information regarding both types of information, several different versions of the questionnaire were sent to different individuals. Some form of the survey instrument was sent to a total of 34 deans, directors and department heads.

Table 25 presents the response rate of the administrators to the survey. Response rates ranged from 33 to 44 percent for the four check-off questions. The response rate fell to under 21 percent when they were asked to list specific innovations and/or coursework introduced by the Berger Entrepreneurship Program that had been incorporated into other business courses.

Table 25

Number of Questionnaires Sent and Responses From Deans and Department Heads Regarding Academic Achievements and Pedagogical Contributions of the Entrepreneurship Program

Questions Regarding the Entrepreneurship Program's Pedagogical Contributions					
	New Teaching Methods	New Course work	New Projects	Other Program Curriculum Benefited	List Specific Innovations
Number Receiving	23	26	27	20	24
Number Responding	10	12	9	7	5
Response Rate	43.5%	46.2%	33.3%	35.0%	20.8%

Table 25 describes the responses of the respondents to the questions regarding pedagogical effects. As is shown, none disagreed with the very positive statements contained in the questionnaires. A few responded that they didn't know or didn't have enough information to respond. Among the rest, about 75 percent strongly agreed with the statements and 25 percent somewhat agreed with the statements.

Table 26
Frequency Distributions of Responses Regarding
Academic Achievements/Pedagogical Contributions

	Strongly Agree	Somewhat Agree	Don't Know/Have no Opinion	Somewhat Disagree	Strongly Disagree
The Berger Entrepreneurship Program has been a leader in developing new teaching methods to prepare students to identify business opportunity and to build and expand a new venture.	7	2	1	0	0
The Berger Entrepreneurship Program has been a leader in developing new coursework to prepare students to identify business opportunity and to build and expand a new venture.	7	4	1	0	0
The Berger Entrepreneurship Program has been a leader in developing new projects to prepare students to identify business opportunity and to build and expand a new venture.	7	1	1	0	0
Business and MBA course curriculums have benefited by incorporating teaching philosophy practiced in the Berger Entrepreneurship Program.	3	2	2	0	0

Two statistical tests were performed on the response frequencies. The first test assigned values of +2 for “strongly agree,” +1 for “somewhat agree,” 0 for “don’t know/have no opinion,” –1 for “somewhat disagree,” and –2 for “strongly disagreed.” Then t-tests were performed on the frequency mean using the null hypothesis $H_0: \mu=0$ against the alternative $H_a: \mu>0$. In addition, a chi-squared test for goodness of fit was performed using the null hypothesis H_0 : the responses are evenly distributed over the five categories against the alternative H_a : the responses are significantly different from a uniform distribution. The results of these two hypothesis tests for the above responses are summarized in Table 27:

Table 27

Statistical Tests for Responses Regarding Academic Achievements/Pedagogical Contributions

Questions: The Berger Entrepreneurship Program:	Test for Ho: m=0 Ha: m>0			Test for Goodness of fit using Ho: responses are uniformly distributed
	Mean	t-stat	d.f.	χ^2 statistic with 4 d.f.
Is a leader in developing new teaching methods	1.6	4.41***	9	17.0***
Is a leader in developing new coursework	1.5	4.01***	11	15.5***
Is a leader in developing new projects	1.5	3.31***	8	19.3***
Benefits business and MBA curriculum	1.14	2.15**	6	5.1
*** denotes significance at the 1% level of significance ** denotes significance at the 5% level of significance				

All of the responses are significantly greater than 0 (don't know/have no opinion) at either the 5% or 1% level of significance. Using the chi-squared test for goodness of fit, which tests whether the responses are evenly spread across the five categories, the first three questions were found to be significantly different than a uniform distribution, but the fourth was not. The latter suggests a broader array of opinions regarding the effect of the entrepreneurship program on the overall business and MBA curricula. This result is understandable in that it is easier to observe the changes adopted by the entrepreneurship program than it is to determine just how those innovations were incorporated into other programs.

Specific contributions that were listed by administrators included: a). introduction of new venture finance classes open to both entrepreneurship and non-entrepreneurship students; b). frequent use of guest speakers from the business community to illustrate how concepts were used in practice; c). expansion of consulting projects for both undergraduate and graduate students; d). the overall emphasis on blending theory and practice that distinguishes the entrepreneurship program; and e). and use of capstone presentations similar to the business plans competition.

VII. The Impact of the Entrepreneurship Program on Private Fundraising for the College.

The entrepreneurship program has also assisted the business college in private fundraising. Most notably was the seed gift from Karl and Stevie Eller to inaugurate the Eller Center and the entrepreneurship program in 1984. Satisfaction with the Center and the entrepreneurship program led the Ellers to commit to a \$10,000,000 gift in 1998. A subsequent \$10,000,000 pledge was made by the Ellers to the College of Business and Public Administration that was renamed the Eller College in 1999. The H.N. and Frances C. Berger Foundation has contributed over one million dollars to the entrepreneurship program, and building on its relationship with the Berger Entrepreneurship Program, the Berger Foundation also has contributed to the business college.

The entrepreneurship program promotes stronger ties with the business community and private support of business education in a variety of ways. First, it offers alumni and the business community a tangible and attractive program for contributions. While business disciplines have become increasingly theoretical, the integrative, applied approach of the entrepreneurship program is understandable and is viewed positively by the community. Second, program graduates are considered to have more valuable attributes than do general business graduates. The preparation of a business plan, year-long team work, increased written and oral communication, and experience in communicating with technical students on technology products are highly valued by employers. Third, the new businesses created by program graduates are seen as contributing to the economic growth of the community. Fourth, mentoring business plans, serving as judges in the business plans competition and giving class presentations provide opportunities for alumni and other business leaders to be involved in the business college. This involvement, in turn, often leads to financial support. Finally, the success of the

Berger Entrepreneurship Program and its national ranking is appreciated by the community and is used by the College as evidence of the strength of its overall programs.

Financial contributions come from general alumni, entrepreneurship graduates, and from other members of the community. We analyzed these in the following study.

A. Contributions of the Berger Entrepreneurship Graduates.

As part of our effort to determine contributions of entrepreneurship program graduates, data were requested from the University of Arizona Foundation. We asked them to search their databases for graduates from the program and to compute their average contribution per alumni. In addition, we requested similar figures for non-entrepreneurship graduates who received their degrees since 1985. These figures are presented in Table AA. Entrepreneurship graduates contributed, on average, 25 percent more than did non-entrepreneurship graduates, as indicated in Table 27.

Table 28
Alumni Contributions to the University of Arizona –
Berger Entrepreneurship Graduates vs. Non-Entrepreneurship Graduates

	Number Graduates Identified	Average UA Contribution per Alum
Entrepreneurship Graduates	315	\$150
Eller Graduates (1985 forward)	15,572	\$120

Source: University of Arizona Foundation

We believe these figures underestimate the actual differences between the contributions of entrepreneurship and non-entrepreneurship graduates because of the problems with the Foundation data. The University of Arizona Foundation data typically assign double majors to

the discipline (such as marketing), rather than to entrepreneurship. Hence, there is under counting.

Additionally, entrepreneurship graduates have somewhat fewer years of work experience than do general graduates. The Berger Entrepreneurship Program has graduated 539 individuals since 1985. In its first five years (1985 through 1989), the entrepreneurship program graduated 134 students, or about 25 percent of its total graduates. In contrast, 32 percent of the Eller College graduates since 1985 were in the five years between 1985 and 1989. [Source, UA Fact Book, various years, and Berger Entrepreneurship enrollment figures, both compiled by Sherry Hoskinson.] Earlier, in our statistical sampling for the empirical analysis of the performance of entrepreneurship and non-entrepreneurship graduates, we selected smaller samples of non-entrepreneurship graduates for 1985 through 1990 than we did for 1991 through 1995, and smaller samples for 1991 through 1995 than we did for 1996 through 1998. The reason was to reflect the growth in the entrepreneurship program and to better “match” graduation dates of entrepreneurship and non-entrepreneurship graduates. The Foundation contribution data do not reflect such adjustments. Accordingly, non-entrepreneurship graduates in Table 28 most likely have earlier average graduation dates than do the entrepreneurship students in the data set.

Some entrepreneurship alumni have made large and very visible donations to the entrepreneurship program, and these serve as examples to alumni in general. One example is John Buttery, a 1989 graduate, who has funded the BLR Data and Skiview Business Plans Competitions and provided scholarship funds with a grant of over \$100,000.

Examining the contributions of entrepreneurship graduates is only a small part of contributions to the Eller College and the University *attributable* to the entrepreneurship program. As we have indicated the entrepreneurship program attracts contributions from many

individuals who believe in the type of training provided by the program. Total gifts to the program exceeded \$15,000,000 (\$3,160,000 in private gifts and \$12,500,000 in endowments). Some of these are Eller graduates who earned their degree prior to the existence of the entrepreneurship program and some are successful business people who are not University of Arizona alumni. These other contributions represent substantial support to both the Eller College and the University of Arizona.

B. Contributions to the College and University Attributable to the Berger Entrepreneurship Program.

Entrepreneurship education programs have demonstrated an ability to attract private funding, both from large corporations and from successful entrepreneurs. This ability to attract private funding spills over beyond the entrepreneurship program to the college as a whole and to the university. Measuring the differential funding the Eller College and University receive as a result of the entrepreneurship program is difficult to assess.

Questionnaires were also sent to 25 Deans, Development Officers, and Directors, and Department Heads, and the questions are included in Appendix F. Table 29 outlines the response rate and Table 30 presents the assessment of those who responded to the questionnaire. As indicated in the tables, between 29 and 56 percent of the administrators responded to the check-off questions regarding the Berger Entrepreneurship Program's ability to attract outside funding and whether the program enhances the ability of the Eller College and the University to attract outside finding. Of those who responded, some didn't know the answer or didn't have an opinion. Among the others, none disagreed with the statements regarding the Berger Entrepreneurship Program's contributions to fund development, and almost all strongly agreed with them. The responses regarding Berger Entrepreneurship Program alumni contributions were somewhat more tentative, most likely because of a lack of knowledge of specific donations.

Table 29
Number of Questionnaires
Sent to and Received From Deans and Department Heads Regarding
Development and Institutional Contributions of the Entrepreneurship Program

Question					
	Program's Ability to Attract Private Funding	Program Increases College's Outside Funding	Program Increases UA's Outside Funding	Berger Alumni Contribute Significantly to College	Berger Alumni Contribute Significantly to UA
Number Receiving	24	24	25	9	8
Number Responding	8	7	7	5	4
Response Rate	33.3%	29.2%	28.0%	55.6%	50.0%

Table 30
Frequency Distributions of Responses Regarding
Development and Institutional Contributions

	Strongly Agree	Somewhat Agree	Don't Know/Have No Opinion	Somewhat Disagree	Strongly Disagree
The Berger Entrepreneurship Program has a strong ability to attract private funding.	7	0	1	0	0
The Berger Entrepreneurship Program's ability to attract private funding enhances the overall ability of the business College to also attract outside funding.	6	1	0	0	0
The Berger Entrepreneurship Program's ability to attract private funding enhances the overall ability of the University to also attract outside funding.	5	0	2	0	0
Berger Entrepreneurship Alumni contribute significantly to the College, as compared to other Eller College Graduates.	2	2	1	0	0
Berger Entrepreneurship Program alumni contribute significantly to the University, as compared to other Eller College graduates.	2	0	3	0	0

Statistical tests of the distribution of the responses are shown in Table 31. Responses to questions regarding the Berger Entrepreneurship Program's ability to attract private funding and its enhancement of the Eller College and University's ability to attract private funding are very significant, except for those regarding the specific gifts of entrepreneurship alumni. The tests are the same as those described for Table 26 regarding the assessment of the entrepreneurship program's pedagogical contributions.

Table 31
Statistical Tests for Responses Regarding
Development and Institutional Contributions

Questions	Test for Ho: m=0 Ha: m>0			Test for Goodness of fit Ho: responses are uniformly distributed
	Mean	t-stat	d.f.	χ^2 statistic with 4 d.f.
The Berger Entrepreneurship Program:				
Has a strong ability to attract private funding	1.75	5.29***	7	23.3***
Enhances the college's ability to attract private funding	1.86	9.93***	7	19.4***
Enhances the university's ability to attract private funding	1.43	2.29**	6	13.7***
Alumni contribute significantly to the college compared to other Eller graduates	1.2	2.63**	4	4.0
Alumni contribute significantly to the University compared to other Eller graduates	0.8	1.05	4	8.0*
*** denotes significance at the 1% level of significance ** denotes significance at the 5% level of significance * denotes significance at the 10% level of significance				

Table 32 summarizes the responses to more specific questions regarding how much the Eller College and the University of Arizona would have lost (or gained) in funding if the Berger Entrepreneurship Program did not exist or did not enjoy a high national ranking. Four administrators estimated that the Eller College would have received, on average, 34 percent less in outside funding without the Berger Entrepreneurship Program and 23 percent less in funding if it had not been a top-ranked program. Three estimated that the University of Arizona would have received an average of \$11.7 million less in outside funds without the Berger Entrepreneurship Program and \$7.5 million less if it had not been top ranked. These administrators were Deans, former Deans, and Development Officers who were knowledgeable in gifts associated with the entrepreneurship program.

Table 32
Summary of Responses of Deans and Fundraisers
Regarding the Berger Entrepreneurship Program's
Fund Development Contributions over the Past Seven Years

	Number of Responses	Average Response
% Difference the Eller College would have received if:		
Berger Entrepreneurship Program did not exist	4	-34%
Berger Entrepreneurship Program existed but not top ranked	4	-23%
\$ Difference the University would have received if:		
Berger Entrepreneurship Program did not exist	3	-\$11.7 M
Berger Entrepreneurship Program existed but not top ranked	2	-\$7.5M

VIII. Conclusion.

In conclusion, for the first part of the study, we surveyed 2,484 surveyed graduates of the Eller College of Business and Public Administration at the University of Arizona from 1985 through 1998 (2,024 non-entrepreneurship and 460 entrepreneurship graduates). Analysis of the 406 non-entrepreneurship alumni and 105 entrepreneurship alumni who responded, as well as examination of Berger Entrepreneurship Program business plans data indicates conclusively that entrepreneurship education makes a difference. Comparison of entrepreneurship and non-entrepreneurship group averages and statistical examination of the marginal effects of entrepreneurship education both provide similar results. Entrepreneurship education clearly contributes to risk-taking and the formation of new ventures. On average, entrepreneurship graduates are *three times* more likely than non-entrepreneurship graduates to start new business ventures. Controlling for the personal characteristics of graduates and other environmental factors, entrepreneurship education increased the probability of an individual being instrumentally involved in a new business venture by 25 percent over non-entrepreneurship graduates.

Similarly, there is clear evidence that entrepreneurship education increases the propensity of graduates to be self-employed. Once again, entrepreneurship graduates on average are *three*

times more likely to be self-employed than are general business graduates. Controlling for personal characteristics and other factors, entrepreneurship education increases the likelihood that a graduate alumnus owns his or her business by 11 percent relative to non-entrepreneurship graduates. Entrepreneurship education has a significant impact on the income of graduates. On average entrepreneurship graduates have an average annual income that is 27 percent higher than the average annual income of non-entrepreneurship students, and entrepreneurship graduates are more likely to be employed full time. Further, they have 62 percent more assets than do their counterparts. Controlling for personal characteristics, entrepreneurship education increases the income of graduates by \$12,561 beyond that of other business graduates. There is weaker evidence that entrepreneurship education increases job satisfaction through greater income. Controlling for other factors, entrepreneurship education increases job satisfaction by approximately 1 percent.

Entrepreneurship education contributes to the growth of firms, especially small firms. On average, small firms employing entrepreneurship graduates have greater sales and employment growth than do those that employ non-entrepreneurship graduates. For larger firms, the growth effects of a graduate are more difficult to detect. Nevertheless, larger firms pay entrepreneurship graduates substantially more than they do non-entrepreneurship graduates. Firms owned by entrepreneurship graduates also appear to be larger and have more sales than do those owned by non-entrepreneurship graduates. Controlling for individual characteristics, entrepreneurship graduates working for large firms earn approximately \$23,500 more per year than do other graduates. Small firms employing entrepreneurship graduates have substantially greater growth as measured by percent change in sales than do those employing non-entrepreneurship graduates.

Entrepreneurship education also promotes the transfer of technology from the university to the private sector and promotes technology-based firms and products. On average, entrepreneurship graduates are more likely to be with firms that use licensed technologies and to be with firms that license technologies to others. They also are more likely to be involved with a high-technology firm than are non-entrepreneurship graduates. Among self-employed entrepreneurship graduates, nearly 23 percent own a high-technology firm, compared to less than 15 percent of non-entrepreneurship graduates. Entrepreneurship program graduates also are more apt to be instrumental in developing new products. Further, entrepreneurship graduates spend more time in R&D, work with products that have shorter life spans, and are more apt to work in high-tech industries. Controlling for other factors, entrepreneurship education increases the graduate's probability of being with a high-tech firm by close to 13 percent and of developing new products by almost 9 percent. Analysis of business plans written in the Berger Entrepreneurship Program since 1985 indicates a growing trend toward more technical products and services, with 50 percent of all 1999 business plans involving innovative technologies.

We also surveyed 27 administrators and obtained financial donation data from the University of Arizona Foundation. We used this information to assess the pedagogical and development effects of the entrepreneurship program on the college in general and also more broadly to the University. The survey responses indicate a strong belief that entrepreneurship education has provided innovations worth adopting in other programs and courses. Further, the surveyed administrators consistently believe that the entrepreneurship program has been a valuable mechanism for increasing financial contributions to the college and university. The University of Arizona Foundation data indicate somewhat greater contributions from entrepreneurship alumni than from non-entrepreneurship alumni.

These results suggest that the investment in entrepreneurship education in business schools throughout the U.S. and elsewhere can bring important returns to graduates and to society. At a time when technology is changing rapidly and when university graduates must be adept in seeking and implementing new products and new technologies, entrepreneurship education can be an important instrument for success. Entrepreneurship education also can provide spill over effects to the broader society by making it more responsive to new technology and more supportive of risk taking and technology transfer.

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APPENDIX

APPENDIX A: The Survey Instrument.

THE UNIVERSITY OF ARIZONA
ELLER COLLEGE OF BUSINESS AND PUBLIC ADMINISTRATION
Alumni Questionnaire

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(Survey responses will be kept strictly confidential and will not be used for any purposes other than program evaluation.)

SECTION 1: PERSONAL INFORMATION

Year of Birth: _____ Gender: _____ Year of High School Graduation: _____

Primary Ethnicity? (please check one)

Caucasian___; African_American___; Hispanic___; Pacific Rim___; Other (please specify)_____

SECTION 2: EDUCATIONAL HISTORY

List any institutions of higher education (post high school) attended prior to attending The University of Arizona:

Institution	Major	Years of Attendance	Degree (N/A if none)
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List college attendance and all degrees and majors obtained at the University of Arizona:

College	Major	Years of Attendance	Degree (N/A if none)
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List all institutions of higher education attended after graduation from the University of Arizona:

Institution	Major	Years of Attendance	Degree (N/A if none)
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SECTION 3: SEMINARS & TRAINING PROGRAMS

Have you attended seminars or training programs relating to your work other than those taken as part of the degree programs listed above? _____

If Yes, the number of Seminars/Training Programs attended: _____

Please list/describe two seminars or training programs that were the most helpful in your work:

1) _____

2) _____

SECTION 4: WORK HISTORY–Prior to or While Attending the University of Arizona

Did you own a business when you began your last degree program at The University of Arizona? _____

If Yes, approximate annual income from business: \$_____

Did an employer pay for any of your University of Arizona education? _____

If Yes, please provide the percentage of total education costs paid _____%

Please provide the number of years of business/work experience you had prior to or while attending the University of Arizona, _____ (If '0' years of business/work experience, *please proceed to SECTION 5.*)

Please list the two most important positions held either prior to or while attending the University of Arizona:

Business/ Employer Name	Position Title/ Description	Position Specifics	Type of Organization (Check all that apply)	Type of Position (check all that apply)
<i>Position 1</i>		Yrs Employed _____ % of Full Time _____ Annual Income _____	<input type="checkbox"/> self employed/own business <input type="checkbox"/> self employed/consultant <input type="checkbox"/> family business <input type="checkbox"/> employed in private firm (>500 emp) <input type="checkbox"/> employed in private firm (25-500 emp) <input type="checkbox"/> employed in private firm (<25 emp) <input type="checkbox"/> employed in gov't (incl educ inst) <input type="checkbox"/> employed in non-profit org <input type="checkbox"/> other (specify) _____	<input type="checkbox"/> managerial <input type="checkbox"/> tech/analytical <input type="checkbox"/> marketing <input type="checkbox"/> buy/sell/trade <input type="checkbox"/> entrepreneurial <input type="checkbox"/> instruct/training <input type="checkbox"/> other(specify) _____
<i>Position 2</i>		Yrs Employed _____ % of Full Time _____ Annual Income _____	<input type="checkbox"/> self employed/own business <input type="checkbox"/> self employed/consultant <input type="checkbox"/> family business <input type="checkbox"/> employed in private firm (>500 emp) <input type="checkbox"/> employed in private firm (25-500 emp) <input type="checkbox"/> employed in private firm (<25 emp) <input type="checkbox"/> employed in gov't (incl educ inst) <input type="checkbox"/> employed in non-profit org <input type="checkbox"/> other (specify) _____	<input type="checkbox"/> managerial <input type="checkbox"/> tech/analytical <input type="checkbox"/> marketing <input type="checkbox"/> buy/sell/trade <input type="checkbox"/> entrepreneurial <input type="checkbox"/> instruct/training <input type="checkbox"/> other(specify) _____

Please list other positions held, prior to or while attending The University of Arizona:

Business/Employer Name	Position Title/Description	Years of Attendance	% of Full Time

SECTION 5: WORK HISTORY--Since Last Attending the University of Arizona (prior to your current position)

Please give the total number of years of business/work experience you have had since last attending the University of Arizona -but prior to your current position_____. If '0' years experience, *please go to SECTION 6*, otherwise, please list the two most important positions held since last attending the University of Arizona but *prior to your current position*.

Business/ Employer Name	Position Title/ Description	Position Specifics	Type of Organization (Check all that apply)	Type of Position (check all that app)
<i>Position 1</i>		Yrs Employed_____ % of Full Time_____ Annual Income_____	<input type="checkbox"/> self employed/own business <input type="checkbox"/> self employed/consultant <input type="checkbox"/> family business <input type="checkbox"/> employed in private firm (>500 emp) <input type="checkbox"/> employed in private firm (25-500 emp) <input type="checkbox"/> employed in private firm (<25 emp) <input type="checkbox"/> employed in gov't (incl educ inst) <input type="checkbox"/> employed in non-profit org <input type="checkbox"/> other (specify)_____	<input type="checkbox"/> managerial <input type="checkbox"/> tech/analytical <input type="checkbox"/> marketing <input type="checkbox"/> buy/sell/trade <input type="checkbox"/> entrepreneurial <input type="checkbox"/> instruct/training <input type="checkbox"/> other(specify) _____
<i>Position 2</i>		Yrs Employed_____ % of Full Time_____ Annual Income_____	<input type="checkbox"/> self employed/own business <input type="checkbox"/> self employed/consultant <input type="checkbox"/> family business <input type="checkbox"/> employed in private firm (>500 emp) <input type="checkbox"/> employed in private firm (25-500 emp) <input type="checkbox"/> employed in private firm (<25 emp) <input type="checkbox"/> employed in gov't (incl educ inst) <input type="checkbox"/> employed in non-profit org <input type="checkbox"/> other (specify)_____	<input type="checkbox"/> managerial <input type="checkbox"/> tech/analytical <input type="checkbox"/> marketing <input type="checkbox"/> buy/sell/trade <input type="checkbox"/> entrepreneurial <input type="checkbox"/> instruct/training <input type="checkbox"/> other(specify) _____

Please list other positions held since last attending The University of Arizona (*prior to your current position*)

Business/Employer Name	Position Title/Description	Years of Attendance	% of Full Time
------------------------	----------------------------	---------------------	----------------

SECTION 6: CURRENT SITUATION

Please check the phrase that best describes your current situation:

I am currently a student. If so,where?

Please provide a brief program description:_____
If checked, Please skip SECTION 7 and go to SECTION 8

I am currently running a household and/or raising children and I am not in the work force.

If checked, Please skip SECTION 7 and go to SECTION 8

I am currently in the work force but I am between jobs or unemployed.

If checked, Please skip SECTION 7 and go to SECTION 8

I am currently working ___either part_time or full_time, as an employee or self_employed.

If checked, Please fill out SECTION 7 and continue through the questionnaire

I am other (Please specify)_____

If checked, Please fill out all relevant sections of this questionnaire

SECTION 7: CURRENT POSITION

Please rate your satisfaction with your current work position (1-10) _____
 (1= very unsatisfied, 10 = very satisfied)

Please provide information about your current position:

Business/ Employer Name	Position Title/ Description	Position Specifics	Type of Position (check all that apply)
		Yrs Employed _____ % of Full Time _____ Annual Income _____	<input type="checkbox"/> managerial <input type="checkbox"/> tech/analytical <input type="checkbox"/> marketing <input type="checkbox"/> buy/sell/trade <input type="checkbox"/> entrepreneurial <input type="checkbox"/> instruct/training <input type="checkbox"/> other(specify)- _____ _____
Type of Organization (check all that apply)			
<input type="checkbox"/> Self employed/own business Did you start the business or did you obtain an existing business? (start/obtained existing) _____ Currently, your business has approximately: _____ employees; \$ _____ in sales; \$ _____ in assets If you started a business, the year the business was started was _____ If you obtained an existing business, please answer the following: In _____, the year you took ownership, the business had approximately: _____ employees; \$ _____ in sales; \$ _____ in assets			
<input type="checkbox"/> Self employed as private consultant Approximate gross consulting fees billed this past year: \$ _____			
<input type="checkbox"/> Employed in private business Is it family owned? _____ At your date of hire, the approximate size of your employing firm was: Number of employees _____ \$ _____ in sales Currently, the approximate size of your employing firm is: Number of employees _____ \$ _____ in sales Was your employing business in existence 5 years prior to your hire date? _____ At 5 years prior to your hire date, the approximate size of your employing firm was: Number of employees _____ \$ _____ in sales			
<input type="checkbox"/> Employed in government, including public teaching institutions			
<input type="checkbox"/> Employed in a non-profit organization			
<input type="checkbox"/> Other, please specify _____			

SECTION 8: OTHER FINANCIAL INFORMATION

Please estimate the change in your net worth since receiving your last degree from The University of Arizona.
 Please include only the change in personal/business assets that relate to your work experience (ie: exclude change in assets due to inheritance, insurance payments, litigation awards, gambling/lottery winnings or other non-work-related gains)

- \$0 - \$10,000
 \$50,001-\$100,000
 \$250,001-\$500,000
 \$1,000,001-\$5,000,000
 \$10,001-\$50,000
 \$100,001-\$250,000
 \$500,001-\$1,000,000
 over \$5,000,000

SECTION 9: NEW BUSINESS VENTURE/START-UP EXPERIENCE

Were you starting or operating a new business venture when you began your last degree program at The University of Arizona? _____

Have you ever been instrumental in a new business venture/start-up? _____
 if Yes, how many (successful or not)? _____ *If No, please go to SECTION 10*

Please answer the following questions that relate to your two *most successful* new business ventures/start-ups

Ownership Structure (please check/fill in that which best describes the business(s):	Business venture/start-up #1 (N/A if none)	Business venture/start-up #2 (N/A if none)
<i>Independently started, wholly owned</i>		
<i>Independently started, % equity position</i>	_____ % equity	_____ % equity
<i>Joint venture with your employer, % equity position</i>	_____ % equity	_____ % equity
<i>Joint venture with an existing company, % equity position</i>	_____ % equity	_____ % equity
<i>Other ownership structure. Please describe:</i>		
<i>Are you still involved with this business venture/start-up?</i>		
<i>If No, the year you left/sold/closed the venture/business</i>		
<i>When you left/sold/closed the venture/business, it had approximately</i>	_____ employees \$ _____ in sales \$ _____ in assets	_____ employees \$ _____ in sales \$ _____ in assets

SECTION 10: TECHNOLOGY/TECHNOLOGY TRANSFER INFORMATION

At your current place of business (whether you are an employee or owner), the approximate percentage of your time in research and development is _____ %

The approximate, average life span of the firm's major product/products - excluding major modifications (*for example, in software development, a specific version of commercial software*)? _____
 (months or years)

Is this business considered to be part of a high technology industry? _____ If Yes, please explain:

Does this firm license technology to other businesses? _____ If Yes, how many separate technologies does it license? _____

Approximately how much does it receive in royalties per year? \$ _____

Please describe the most important technology you license to others: _____

Please describe the second most important technology you license to others: _____

Have you ever been instrumental in developing products or materials that obtained intellectual property rights (e.g., patented products, copyrighted materials, protected biological materials)? _____
 If Yes, _____ % ownership of property rights

SECTION 10 (con't)

Do you, in the course of your job/work/business directly utilize any licensed technology (other than widely available computer software)? _____ If Yes, what are the sources of technologies that you use in your firm's product or services? *If No, go to SECTION 11.*

- From within your current place of business _____% (*see B below*)
- From private firms _____% (*see B below*)
- From the University of Arizona _____% (*see A below*)
- From other universities or research facilities _____% (*see B below*)
- Other (specify)_____ _____% (*see B below*)

100%

A. If you license technology from the University of Arizona,

How many University of Arizona licensed technologies do you use? _____
How much do you pay in royalties/year to the University of Arizona? \$ _____
Please describe the most important technology you license from the U of A:

Please describe the second most important technology you license from the U of A:

B. If you license technology from sources other than the University of Arizona:

How many licensed technologies do you use? _____
How much do you pay in royalties/year? \$ _____

Please describe the nature of the most important technology you license from *non U of A* sources:

Please describe the second most important technology you license from *non U of A* sources:

SECTION 11: GENERAL QUESTIONS REGARDING THE ELLER COLLEGE OF BUSINESS AND PUBLIC ADMINISTRATION

What did you like best about your experience with the college?

What one thing would you most recommend improving for the current dean of the Eller College of Business and Public Administration?

APPENDIX B: The Survey Instrument Cover Letter.

Name
Address
Address

Dear

The KARL ELLER CENTER and ELLER COLLEGE of Business and Public Administration, in conjunction with the KAUFFMAN FOUNDATION, is conducting a study to measure the effectiveness and impact of business education at the UNIVERSITY OF ARIZONA. This study will provide valuable information about the contribution of our programs to our graduates, to the University of Arizona, and to the broader economy.

I hope you will take a few minutes to complete the enclosed survey and return it to us. We appreciate the value of your time, so as a thank you for your efforts. All who return surveys will be entered in drawing to win one of 10 pairs of tickets the November 27th (Thanksgiving weekend) UA-ASU football game. This is a great rivalry and promises to be one of the best games of the year.

This is an exciting year for the ELLER COLLEGE and we appreciate the pathways that have been opened by the work of our alumni. I hope to see you at our homecoming festivities this year, or at one of our alumni events. Please call on me anytime.

Best wishes,

Mark Zupan
Dean

-Survey respondent pool consists of 2,500 randomly selected business graduates-
-All responses are confidential-

Please return your survey soon, the Wildcat Ticket drawing will be held on September 15, 1999

APPENDIX C: Survey Results for All Respondents

Table B1
Survey Results: Income and Job Satisfaction for All Respondents
– by Type of Program

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Average Response	Number of Respondents	Average Response	Number of Respondents
All Respondents				
Average Annual Income	\$56,518	339	\$71,544	85
Average Annual FTE Income	\$71,323	335	\$74,393	83
Job Satisfaction (1=least satisfied, 10= most satisfied)	7.7	351	7.8	92

Table B2
Survey Results: Role in Starting New Ventures and Previous Business Activity –
Affirmative Responses of All Respondents as a Percent of those who Responded to the
Question

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Percent of Respondents	Number of Respondents	Percent of Respondents	Number of Respondents
All Respondents				
Were you ever instrumental in starting a business venture?	16%	356	53%	95
Were you starting a business when you came to the University of Arizona?	0.5%	369	17%	102
Did you own a business before coming to the University of Arizona	2.2%	401	17.7%	102

Table B3
Survey Results for All Respondents
– Reported Personal Assets

	Non-Entrepreneurship Graduates		Entrepreneurship Graduates	
	Number Reporting	Percent of Total	Number Reporting	Percent of Total
All Respondents				
\$0-\$10,000	60	15.6	13	13.4
\$10,001-\$50,000	131	34.1	29	29.9
\$50,001-\$100,000	86	22.4	18	18.6
\$100,001-\$250,000	49	12.8	19	19.6
\$250,001-\$500,000	45	12.0	9	9.3
\$500,001-\$1,000,000	6	1.6	8	6.2
\$1,000,001-\$5,000,000	6	1.6	2	2.1
Over \$5,000,000	1	0.3	1	1.0
TOTALS	384	100	97	100

APPENDIX D: Equations and Variable List

Variable List:

ACCOUNTING =	1 if an individual received a degree in accounting (undergraduate or graduate), 0 otherwise
AGE =	individual's age in years
ANNUAL INCOME =	an individual's annual income
EMPLOYMENT CHANGE=	change in employment at individual's firm since hire/start/obtain date
%EMPLOYMENT CHANGE =	percent change in employment at individual's firm since hire/start/obtain date
%EMPLOYMENT CHANGE/YEARS-ON-JOB=	percent change in employment at an individual's firm since hire/start/obtain date divided by years on job
ENTREPRENEUR =	1 if an individual is a graduate of the Berger Entrepreneurship Program, 0 otherwise
FINANCE =	1 if an individual received a degree in finance (undergraduate or graduate), 0 otherwise
GOVERNMENT =	1 if the individual works for a government entity, 0 otherwise
HIGH-TECH =	1 if individual is with a high technology firm, 0 otherwise
MIS =	1 if the individual received a degree (undergraduate or graduate) in Management Information Systems, 0 otherwise
NEW PRODUCT =	1 if an individual has been instrumental in developing new products, 0 otherwise
OWNED BUSINESS =	1 if the individual owned a business prior to coming to the Eller College, 0 otherwise
PERCENT TIME WORKING =	percent of time working, e.g., 100, 90
%SALES CHANGE =	percent change in sales at an individual's firm since hire/start/obtain date
%SALES CHANGE/YEARS-ON-JOB =	percent change in sales at individual's firm divided by years on the job
SATISFACTION =	satisfaction with current position (1 through 10)
SELF EMPLOY =	1 if an individual is self-employed, 0 otherwise
SEX =	1 if an individual is a Male, 0 otherwise
STARTUP =	1 if an individual was instrumental in starting a new business venture/start-up, 0 otherwise
YEARS =	the number of years since an individual's Eller College Business Degree
YEARS-ON-JOB =	years individual has been at their current position

Equation 1.

Probit Equation for STARTUP, whether or not a graduate was instrumental in starting a business venture

```

+-----+
| Dependent variable is binary, y=0 or y not equal 0
| Ordinary least squares regression Weighting variable = none
| Dep. var. = STARTUP Mean= .2493827160 , S.D.= .4331908598
| Model size: Observations = 405, Parameters = 6, Deg.Fr.= 399
| Residuals: Sum of squares= 57.51533234 , Std.Dev.= .37967
| Fit: R-squared= .241346, Adjusted R-squared = .23184
| Model test: F[ 5, 399] = 25.39, Prob value = .00000
| Diagnostic: Log-L = -179.4234, Restricted(b=0) Log-L = -235.3559
| LogAmemiyaPrCrt.= -1.922, Akaike Info. Crt.= .916
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.1968133863	.92432910E-01	-2.129	.0332	
ENTREPRENEUR	.2605296897	.49065584E-01	5.310	.0000	.20740741
OWNEDBUSINESS	.5042038098	.89233325E-01	5.650	.0000	.51851852E-01
YEARS	.1119873544E-01	.57489830E-02	1.948	.0514	6.6888889
SEX	.5472656729E-01	.38686923E-01	1.415	.1572	.55802469
AGE	.8110911460E-02	.33584201E-02	2.415	.0157	32.125926

Normal exit from iterations. Exit status=0.

```

+-----+
| Binomial Probit Model
| Maximum Likelihood Estimates
| Dependent variable STARTUP
| Weighting variable ONE
| Number of observations 405
| Iterations completed 5
| Log likelihood function -179.5257
| Restricted log likelihood -227.4707
| Chi-squared 95.88996
| Degrees of freedom 5
| Significance level .0000000
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Index function for probability					
Constant	-2.371767495	.36123226	-6.566	.0000	
ENTREPRENEUR	.8595558618	.17614305	4.880	.0000	.20740741
OWNEDBUSINESS	1.716538188	.40664020	4.221	.0000	.51851852E-01
YEARS	.5062182427E-01	.21456617E-01	2.359	.0183	6.6888889
SEX	.2248933444	.15507171	1.450	.1470	.55802469
APPAGE	.2694664702E-01	.11862524E-01	2.272	.0231	32.125926

```

+-----+
| Partial derivatives of E[y] = F[*] with
| respect to the vector of characteristics.
| They are computed at the means of the Xs.
| Observations used for means are All Obs.
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.7009060667	.98486973E-01	-7.117	.0000	
ENTREPRENEUR	.2540164327	.52512546E-01	4.837	.0000	.20740741
OWNEDBUSINESS	.5072723326	.12666838	4.005	.0001	.51851852E-01
YEARS	.1495979004E-01	.63131782E-02	2.370	.0178	6.6888889
SEX	.6646060786E-01	.45719561E-01	1.454	.1460	.55802469
AGE	.7963288313E-02	.34899954E-02	2.282	.0225	32.125926

Equation 2 .

Probit Equation for SELF EMPLOY, whether or not a graduate is self-employed

```

+-----+
| Dependent variable is binary, y=0 or y not equal 0
| Ordinary least squares regression Weighting variable = none
| Dep. var. = SELF EMPLOY Mean= .1309823678 , S.D.= .3378067886
| Model size: Observations = 397, Parameters = 5, Deg.Fr.= 392
| Residuals: Sum of squares= 41.02319035 , Std.Dev.= .32350
| Fit: R-squared= .092185, Adjusted R-squared = .08292
| Model test: F[ 4, 392] = 9.95, Prob value = .00000
| Diagnostic: Log-L = -112.7636, Restricted(b=0) Log-L = -131.9613
| LogAmemiyaPrCrt.= -2.245, Akaike Info. Crt.= .593
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.1768702410	.75106004E-01	-2.355	.0185	
ENTREPRENEUR	.1411939119	.40605958E-01	3.477	.0005	.21914358
YEARS	.5791359304E-02	.47727709E-02	1.213	.2250	6.7455919
OWNEDBUSINESS	.9142431223E-01	.72038267E-01	1.269	.2044	.57934509E-01
AGE	.7165044310E-02	.27043826E-02	2.649	.0081	32.455919

Normal exit from iterations. Exit status=0.

```

+-----+
| Binomial Probit Model
| Maximum Likelihood Estimates
| Dependent variable SELF EMPLOY
| Weighting variable ONE
| Number of observations 397
| Iterations completed 6
| Log likelihood function -136.6216
| Restricted log likelihood -154.1352
| Chi-squared 35.02727
| Degrees of freedom 4
| Significance level .0000000
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Index function for probability					
Constant	-2.678701432	.38923029	-6.882	.0000	
ENTREPRENEUR	.6075731007	.18751454	3.240	.0012	.21914358
YEARS	.4314721861E-01	.23808839E-01	1.812	.0699	6.7455919
OWNEDBUSINESS	.3308399608	.30204190	1.095	.2734	.57934509E-01
AGE	.3035868957E-01	.12266524E-01	2.475	.0133	32.455919

```

+-----+
| Partial derivatives of E[y] = F[*] with
| respect to the vector of characteristics.
| They are computed at the means of the Xs.
| Observations used for means are All Obs.
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.4892526253	.65903365E-01	-7.424	.0000	
ENTREPRENEUR	.1109704617	.34178765E-01	3.247	.0012	.21914358
YEARS	.7880643108E-02	.42644374E-02	1.848	.0646	6.7455919
OWNEDBUSINESS	.6042641312E-01	.55268625E-01	1.093	.2743	.57934509E-01
AGE	.5544876483E-02	.22409126E-02	2.474	.0133	32.455919

Equation 3.
 Ordinary Least Squares estimation for ANNUAL INCOME

```

+-----+
| Ordinary least squares regression   Weighting variable = none |
| Dep. var. = ANNUAL INCOME Mean= 60410.10656 , S.D.= 39358.16937 |
| Model size: Observations = 366, Parameters = 7, Deg.Fr.= 359 |
| Residuals: Sum of squares= .4122574648E+12, Std.Dev.= 33887.30565 |
| Fit: R-squared= .270868, Adjusted R-squared = .25868 |
| Model test: F[ 6, 359] = 22.23, Prob value = .00000 |
| Diagnostic: Log-L = -4333.4689, Restricted(b=0) Log-L = -4391.2788 |
| LogAmemiyaPrCrt.= 20.881, Akaike Info. Crt.= 23.718 |
| Autocorrel: Durbin-Watson Statistic = 1.87907, Rho = .06047 |
+-----+
+-----+-----+-----+-----+-----+-----+
| Variable | Coefficient | Standard Error | t-ratio | P[|T|>t] | Mean of X |
+-----+-----+-----+-----+-----+-----+
| Constant | -27841.15108 | 14908.664 | -1.867 | .0627 | | |
| SELF EMPLOY | 9973.991018 | 5778.0429 | 1.726 | .0852 | .11748634 |
| SEX | 13733.79647 | 3709.9523 | 3.702 | .0002 | .59016393 |
| GOVERNMENT | -19532.86106 | 5533.1073 | -3.530 | .0005 | .12021858 |
| PERCENT TIME | | | | | | |
| WORKING | 567.1348438 | 148.77445 | 3.812 | .0002 | 97.222678 |
| ENTREPRENEUR | 12431.17894 | 4516.2416 | 2.753 | .0062 | .20765027 |
| YEARS | 3572.627055 | 435.08506 | 8.211 | .0000 | 6.6065574 |
  
```

Equation 4.

Ordinary Least Squares estimation of SATISFACTION, job satisfaction

```

-----+-----
| Ordinary      least squares regression      Weighting variable = none
| Dep. var. = SATISFACTION Mean= 7.657124682 , S.D.= 1.993682657
| Model size: Observations = 393, Parameters = 3, Deg.Fr.= 390
| Residuals: Sum of squares= 1502.874710 , Std.Dev.= 1.96304
| Fit: R-squared= .035450, Adjusted R-squared = .03050
| Model test: F[ 2, 390] = 7.17, Prob value = .00088
| Diagnostic: Log-L = -821.2133, Restricted(b=0) Log-L = -828.3057
|              LogAmemiyaPrCrt.= 1.357, Akaike Info. Crt.= 4.194
| Autocorrel: Durbin-Watson Statistic = 2.03170, Rho = -.01585
-----+-----
|-----+-----+-----+-----+-----+-----+
| Variable | Coefficient | Standard Error | t-ratio | P[|T|>t] | Mean of X|
|-----+-----+-----+-----+-----+-----+
| Constant | 6.939776485 | .21383863 | 32.453 | .0000 |
| ANNUAL INCOME | .5871273094E-05 | .27258506E-05 | 2.154 | .0319 | 60526.809
| YEARS | .5446311519E-01 | .25540907E-01 | 2.132 | .0336 | 6.6463104

```

Equation 5.

Ordinary Least Squares estimation of ANNUAL INCOME, for graduates employed by large firms (>100 employees)

```

+-----+
| Ordinary least squares regression      Weighting variable = none
| Dep. var. = ANNUAL INCOME Mean= 64805.30303 , S.D.= 33942.60831
| Model size: Observations = 132, Parameters = 3, Deg.Fr.= 129
| Residuals: Sum of squares= .1279404860E+12, Std.Dev.= 31492.64538
| Fit: R-squared= .152292, Adjusted R-squared = .13915
| Model test: F[ 2, 129] = 11.59, Prob value = .00002
| Diagnostic: Log-L = -1552.9738, Restricted(b=0) Log-L = -1563.8783
| LogAmemiyaPrCrt.= 20.737, Akaike Info. Crt.= 23.575
| Autocorrel: Durbin-Watson Statistic = 2.06843, Rho = -.03422
+-----+

```

Variable	Coefficient	Standard Error	t-ratio	P[T >t]	Mean of X
Constant	52182.74420	3915.8154	13.326	.0000	
ENTREPRENEUR	23543.76349	6912.0822	3.406	.0009	.19696970
HIGH-TECH	17279.34287	5513.8432	3.134	.0021	.46212121

Equation 6.

Ordinary Least Squares estimation of EMPLOYMENT CHANGE (small firms ≤ 100 including startups)

```

+-----+
| Ordinary least squares regression      Weighting variable = none
| Dep. var. = EMPLOYMENT CHANGE Mean=8.788732394, S.D.= 20.38691141
| Model size: Observations =      71, Parameters =      4, Deg.Fr.=      67
| Residuals: Sum of squares= 21546.58083 , Std.Dev.=      17.93295
| Fit: R-squared= .259411, Adjusted R-squared =      .22625
| Model test: F[ 3,      67] =      7.82, Prob value =      .00015
| Diagnostic: Log-L = -303.6375, Restricted(b=0) Log-L = -314.2985
|              LogAmemiyaPrCrt.=      5.828, Akaike Info. Crt.=      8.666
| Autocorrel: Durbin-Watson Statistic =      1.81546, Rho =      .09227
+-----+
+-----+-----+-----+-----+-----+-----+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+-----+-----+-----+-----+-----+-----+
|Constant | -.3497854506 | 3.4615388 | -.101 | .9198 |
|ENTREPRENEUR | 7.484929851 | 5.2067485 | 1.438 | .1552 | .22535211
|HIGH-TECH | 22.95691018 | 5.8044960 | 3.955 | .0002 | .16901408
|YEARS-ON-JOB | 1.342116789 | .90073151 | 1.490 | .1409 | 2.6612676

```


Equation 7.

Ordinary Least Squares estimation for %EMPLOYMENT CHANGE (small firms \leq 100 employees)

```

+-----+
| Ordinary least squares regression      Weighting variable = none |
| Dep. var. = %EMPLOYMENT CHANGE Mean= 90.59324569 , S.D.= 253.7247697 |
| Model size: Observations =      70, Parameters =      4, Deg.Fr.=      66 |
| Residuals: Sum of squares= 2878866.671 , Std.Dev.=      208.85208 |
| Fit:      R-squared= .351893, Adjusted R-squared =      .32243 |
| Model test: F[ 3,      66] =      11.95, Prob value =      .00000 |
| Diagnostic: Log-L =      -471.1801, Restricted(b=0) Log-L =      -486.3596 |
|           LogAmemiyaPrCrt.=      10.739, Akaike Info. Crt.=      13.577 |
| Autocorrel: Durbin-Watson Statistic =      2.04096, Rho =      -.02048 |
+-----+
+-----+-----+-----+-----+-----+-----+
| Variable | Coefficient | Standard Error | t-ratio | P[|T|>t] | Mean of X |
+-----+-----+-----+-----+-----+-----+
| Constant | -66.19417703 | 40.631450 | -1.629 | .1080 |
| ENTREPRENEUR | 82.91732705 | 60.728051 | 1.365 | .1768 | .22857143
| HIGH-TECH | 306.5110433 | 67.658136 | 4.530 | .0000 | .17142857
| YEARS-AT-JOB | 31.93532944 | 10.495440 | 3.043 | .0034 | 2.6707143

```

Equation 8.

Ordinary Least Squares estimation of %EMPLOYMENT CHANGE/YEARS-ON-JOB, percent change in employment divided by years on the job (small firms \leq 100 employees)

```

+-----+
| Ordinary least squares regression Weighting variable = none |
| Dep. var. = %EMPLOYMENT CHANGE/YEARS-ON-JOB |
| Mean= 31.47352960 , S.D.= 64.61015919 |
| Model size: Observations = 73, Parameters = 3, Deg.Fr.= 70 |
| Residuals: Sum of squares= 196735.0534 , Std.Dev.= 53.01416 |
| Fit: R-squared= .345443, Adjusted R-squared = .32674 |
| Model test: F[ 2, 70] = 18.47, Prob value = .00000 |
| Diagnostic: Log-L = -391.9016, Restricted(b=0) Log-L = -407.3702 |
| LogAmemiyaPrCrt.= 7.981, Akaike Info. Crt.= 10.819 |
| Autocorrel: Durbin-Watson Statistic = 2.07214, Rho = -.03607 |
+-----+
+-----+-----+-----+-----+-----+-----+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+-----+-----+-----+-----+-----+-----+
|Constant | 11.47357594 | 7.3302474 | 1.565 | .1220 |
|ENTREPRENEUR | 20.39389332 | 15.346733 | 1.329 | .1882 | .21917808
|HIGH-TECH | 94.47452704 | 17.130018 | 5.515 | .0000 | .16438356

```

Equation 9.

Ordinary Least Squares estimation for %SALES CHANGE, percent change in sales (for small firms ≤100 employees)

```

+-----+
| Ordinary least squares regression      Weighting variable = none
| Dep. var. = %SALES CHANGE Mean= 224.4703690 , S.D.= 878.2430199
| Model size: Observations = 53, Parameters = 4, Deg.Fr.= 49
| Residuals: Sum of squares= 29910973.78 , Std.Dev.= 781.29894
| Fit: R-squared= .254242, Adjusted R-squared = .20858
| Model test: F[ 3, 49] = 5.57, Prob value = .00228
| Diagnostic: Log-L = -426.1550, Restricted(b=0) Log-L = -433.9289
|              LogAmemiyaPrCrt.= 13.395, Akaike Info. Crt.= 16.232
| Autocorrel: Durbin-Watson Statistic = 1.85444, Rho = .07278
+-----+
+-----+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+-----+
|Constant | -189.3865187 | 178.27845 | -1.062 | .2933 |
|ENTREPRENEUR | 542.4038190 | 261.75580 | 2.072 | .0435 | .22641509
|HIGH-TECH | 732.6602025 | 261.54511 | 2.801 | .0073 | .22641509
|YEARS-ON-JOB | 42.78391997 | 46.774640 | .915 | .3648 | 2.9254717
+-----+

```

Equation 10.

Ordinary Least Squares estimation of %SALES CHANGE/YEARS-ON-JOB, percent change in sales at individual's firm divided by years at job (small firms ≤100 employees)

```

+-----+
| Ordinary least squares regression Weighting variable = none |
| Dep. var. = %SALES CHANGE/YEARS-ON-JOB |
| Mean= 58.20398017 , S.D.= 188.0901541 |
| Model size: Observations = 53, Parameters = 3, Deg.Fr.= 50 |
| Residuals: Sum of squares= 1311808.077 , Std.Dev.= 161.97581 |
| Fit: R-squared= .286926, Adjusted R-squared = .25840 |
| Model test: F[ 2, 50] = 10.06, Prob value = .00021 |
| Diagnostic: Log-L = -343.2943, Restricted(b=0) Log-L = -352.2558 |
| LogAmemiyaPrCrt.= 10.230, Akaike Info. Crt.= 13.068 |
| Autocorrel: Durbin-Watson Statistic = 1.56768, Rho = .21616 |
+-----+
+-----+-----+-----+-----+-----+-----+
|Variable | Coefficient | Standard Error |t-ratio |P[|T|>t] | Mean of X|
+-----+-----+-----+-----+-----+-----+
|Constant | -12.36417211 | 27.378908 | -.452 | .6535 |
|ENTREPRENEUR | 125.5886472 | 53.677675 | 2.340 | .0233 | .22641509
|HIGH-TECH | 186.0873587 | 53.677675 | 3.467 | .0011 | .22641509

```

Equation 11.

Probit Estimation of HIGH-TECH, whether or not an individual is with a high tech firm

```

+-----+
| Dependent variable is binary, y=0 or y not equal 0
| Ordinary least squares regression Weighting variable = none
| Dep. var. = HIGH-TECH Mean= .2717086835 , S.D.= .4454648428
| Model size: Observations = 357, Parameters = 5, Deg.Fr.= 352
| Residuals: Sum of squares= 64.27454486 , Std.Dev.= .42732
| Fit: R-squared= .090166, Adjusted R-squared = .07983
| Model test: F[ 4, 352] = 8.72, Prob value = .00000
| Diagnostic: Log-L = -200.5099, Restricted(b=0) Log-L = -217.3770
| LogAmemiyaPrCrt.= -1.687, Akaike Info. Crt.= 1.151
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	.2262335839	.28057873E-01	8.063	.0000	
SELF EMPLOY	-.1411224113	.68327943E-01	-2.065	.0389	.13165266
ENTREPRENEUR	.1243040950	.57100249E-01	2.177	.0295	.22969188
OWNED BUSINESS	-.1716089071	.10297109	-1.667	.0956	.56022409E-01
MIS	.3745722379	.70101520E-01	5.343	.0000	.12044818

Normal exit from iterations. Exit status=0.

```

+-----+
| Binomial Probit Model
| Maximum Likelihood Estimates
| Dependent variable HIGH-TECH
| Weighting variable ONE
| Number of observations 357
| Iterations completed 5
| Log likelihood function -193.5658
| Restricted log likelihood -208.8275
| Chi-squared 30.52335
| Degrees of freedom 4
| Significance level .3828524E-05
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Index function for probability					
Constant	-.7583556344	.91841141E-01	-8.257	.0000	
SELF EMPLOY	-.5076924142	.24256530	-2.093	.0363	.13165266
ENTREPRENEUR	.3923426124	.18165023	2.160	.0308	.22969188
OWNED BUSINESS	-.6153766147	.36665918	-1.678	.0933	.56022409E-01
MIS	1.049482697	.21570776	4.865	.0000	.12044818

```

+-----+
| Partial derivatives of E[y] = F[*] with
| respect to the vector of characteristics.
| They are computed at the means of the Xs.
| Observations used for means are All Obs.
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.2460161568	.21494693E-01	-11.445	.0000	
SELF EMPLOY	-.1646991608	.78344956E-01	-2.102	.0355	.13165266
ENTREPRENEUR	.1272788350	.58853966E-01	2.163	.0306	.22969188
OWNED BUSINESS	-.1996327091	.11865327	-1.682	.0925	.56022409E-01
MIS	.3404599214	.70636973E-01	4.820	.0000	.12044818

Equation 12.

Probit estimation of NEW PRODUCT, whether or not a graduate was instrumental in developing new products

```

+-----+
| Dependent variable is binary, y=0 or y not equal 0
| Ordinary least squares regression Weighting variable = none
| Dep. var. = NEW PRODUCT Mean= .1014084507 , S.D.= .3022948750
| Model size: Observations = 355, Parameters = 6, Deg.Fr.= 349
| Residuals: Sum of squares= 30.18185215 , Std.Dev.= .29408
| Fit: R-squared= .067001, Adjusted R-squared = .05363
| Model test: F[ 5, 349] = 5.01, Prob value = .00019
| Diagnostic: Log-L = -66.2075, Restricted(b=0) Log-L = -78.5174
| LogAmemiyaPrCrt.= -2.431, Akaike Info. Crt.= .407
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	.2545461951E-01	.36310251E-01	.701	.4833	
ENTREPRENEUR	.1252057664	.39270118E-01	3.188	.0014	.21126761
FINANCE	-.6866985900E-01	.36591056E-01	-1.877	.0606	.22816901
ACCOUNTING	-.4784564469E-01	.40997961E-01	-1.167	.2432	.17464789
SEX	.5163072259E-01	.32530607E-01	1.587	.1125	.55211268
YEARS	.6712408449E-02	.37975066E-02	1.768	.0771	6.7070423

Normal exit from iterations. Exit status=0.

```

+-----+
| Binomial Probit Model
| Maximum Likelihood Estimates
| Dependent variable NEW PRODUCT
| Weighting variable ONE
| Number of observations 355
| Iterations completed 7
| Log likelihood function -103.9945
| Restricted log likelihood -116.4992
| Chi-squared 25.00942
| Degrees of freedom 5
| Significance level .1387507E-03
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Index function for probability					
Constant	-1.839378079	.25217950	-7.294	.0000	
ENTREPRENEUR	.6236530127	.21216921	2.939	.0033	.21126761
FINANCE	-.5737463463	.28355349	-2.023	.0430	.22816901
ACCOUNTING	-.4468185194	.34124173	-1.309	.1904	.17464789
SEX	.3401607035	.20895198	1.628	.1035	.55211268
YEARS	.4462485034E-01	.23889535E-01	1.868	.0618	6.7070423

```

+-----+
| Partial derivatives of E[y] = F[*] with
| respect to the vector of characteristics.
| They are computed at the means of the Xs.
| Observations used for means are All Obs.
+-----+

```

Variable	Coefficient	Standard Error	b/St.Er.	P[Z >z]	Mean of X
Constant	-.2641631238	.37260057E-01	-7.090	.0000	
ENTREPRENEUR	.8956621258E-01	.30702871E-01	2.917	.0035	.21126761
FINANCE	-.8239884386E-01	.39004413E-01	-2.113	.0346	.22816901
ACCOUNTING	-.6417004597E-01	.47837470E-01	-1.341	.1798	.17464789
SEX	.4885233497E-01	.29686119E-01	1.646	.0998	.55211268
YEARS	.6408818285E-02	.33855151E-02	1.893	.0584	6.7070423

APPENDIX E: Business Plans Written In The Berger Entrepreneurship Program, 1985-99.

CLASS OF 1999

EARTH FORMS

Randy Huggins and Todd Allen

Manufacturer of construction equipment for rammed earth walls.

PUTTING -A- ROUND

Aaron Zeese and J.P. Schrage

Putting -A- Round, L.L.C. is a Scottsdale based business that builds eighteen hole putting courses onto existing golf facilities. The holes are made using bent grass and have sand traps, water hazards, and rough areas. Each hole varies in length from 60 to 130 feet and can be completed using only a putter.

VERITEXT LLC

J. Brunner and W. Gyllenhaal

Veritext is a medical software company that will offer a cost-effective means for medical service providers to ensure compliance with government regulations and avoid fines; increase service provider revenue by minimizing under billing for legitimate medical services; and educate clinicians about current government documentation guidelines.

BREATH CHECK

Elon Flegenheimer and Jason Rutka

An inexpensive, pocket - sized, easy - to - use, disposable, and personal alcohol detector with stylish and functional key chain carrying case.

DI GHIACCIO (ITALIAN WATER ICE)

Tara Armstrong and Matt Brinkman

Di Ghiaccio, Italian for "made from ice", is a producer of Italian water ice, an age-old Italian delicacy that bears strong semblance to ice cream though lacks the fat and cholesterol, and is a non-dairy product. Di Ghiaccio will be located in Tempe, Arizona and cater to (literally) one of the hottest U.S. markets.

TSUNAMI PARK

Travis Todd and John Henrickson

Tsunami Park is a family oriented water park that will be located in Chandler, AZ. Tsunami Park will offer the newest rides attractions and its goal is to provide the highest quality water leisure entertainment in the industry.

ENERGYNET

Marianne Jodie and Cortez Smith

EnergyNet is a computer software company that is seeking to develop a live Internet closed -

captioning software product. The software will be targeted towards Internet browser software developers and telecommunication companies. Our goal is to provide Internet access for the deaf /hard of hearing population worldwide.

TRINAMIX SYSTEMATIC SOFTWARE SOLUTIONS

Jason Geitzenauer and Cliff Unger

A diversified solutions provider specializing in proprietary software and consulting. Our products include the Trimble Poker Manager, Equity Run Analyzer, and Sales Force Management Solutions. In addition, Trinamix is also the founder and administrator of the National Poker Association

PAUL MARVEL CO.

Matt Dorband and Robert Paul

The PaulMarvel Company is a management firm that specializes in professional Sports Entertainment. The operations of this firm will include a Minor League Baseball franchise, restaurant, concert productions, and batting cages all in the same facility.

QUICKSILVER COMPUTER TRAINER

Mary Schimmel

Home -based computer tutorial service for senior citizens

CAMPUS TAXI LLC.

Chris Landry and Marc Lemoine

Campus taxi provides parents with a piece of mind by offering their children prepaid unlimited transportation service.

OPENING DOORS

Erik Nelson and Laura Holloway

Opening Doors, LLC is a production company that specializes in the creative development of children's programming- the first of which is Opening Doors. Opening Doors is an educationally effective children's show, starring Neal Dorr, that aims to confront socially important issues faced by today's children.

PERSONAL SMARTCARD SOLUTIONS, LLC.

Scott Forgues and Robert Farrell

PSS will develop, manufacture, and market personal smartcard accessories enabling users to gain control over their electronic transactions. PSS is dedicated to providing smartcard solutions to individuals in a worldwide market.

CELLTECH

Donny Dal Ponte and Alex Kolovyansky

Our motto is "Advancing the science of medical implants". We are a technology management company specializing in the development of medical-related projects. In addition to managing outside proposals, CellTech plans to develop its own line of products and services. The first line of production involves the development of a tissue engineered vascular graft for use in bypass operations. Future goals include the expansion of this technology into other medical implant areas as well as into the

genetic engineering realm.

APPLIED CLIMATE FORECASTS COMPANY

Brad Wolaver

Company that will be the market leader in providing easy-to-understand value-added climate forecasts of precipitation, temperature, wind, flash flood, and fire potentials to assist farmers in making more intelligent resource management decisions. Applied Climate Forecasts Company will produce a climate forecast that is tailored to the needs of farmers by integrating local meteorological data into regional climate forecasts to produce more accurate forecasts.

INFOSTAR

Robert Cronrod and Jeffrey Kopelman

Affordable background checks on prospective mates -- from social security numbers and asset searches to criminal history; possible future application to include employment, tenant, and prospective-roommate screenings

NOLAN

Matthew Everitt and Wayne Phillips

Company specializing in carving, etching and casting artwork and designs on architectural glass and glass furniture

BARS CONSULTING, LTD

Samagan Nasypbek and Michael Lew

BARS is a business development consulting firm in the emerging market of Kyrgyz Republic, former soviet state in Central Asia. Locally born us educated BARS' professionals will assist new private business with the adaptation of western styles of management and business practices.

INTERNATIONAL SIDEWALK LLC

Amanda Schreiner and Kubra Coldren

An Internet company that provides travel consulting for trips to Latin America on an easy to use - one stop web site.

NEIGHBOR NET

Jeff Allen and Rick Yngve

Neighbor Net's mission is to serve as a community development partner. We propose to do this by serving as Internet "consultants" for communities. Our core service will be the custom design of community Internet portals.

KNOWLEDGE COMPUTING CORPORATION (KCC)

Adrienne Gutierrez and Kevin Kraus

Consulting and software company that specializes in knowledge management technologies. Knowledge management captures and evaluates a company's information assets. KCC's software suite

has the ability to automatically process large amounts of textual information, precisely categorize the text, and provide conceptual and visual ways to navigate and access the information.

CELLS-ON-THE-GO; A DIVISION OF DESERT CELL TECHNOLOGIES L.L.C.

Kameha Kidd and Ryan Hass

System for observing and analyzing the migration (movement) of cells.

SIANG SIANG CHUI KWAY PTE LTD.

Larry Gartner and Choon-wei Ong

Siang Siang Chui Kway currently is a food retailer in Singapore. We are planning on creating a franchising process including the manufacturing, distributing, and marketing of our products.

SAFETY COMPLIANCE CONSULTANTS

Annamarie Urias and Graham Swanson

International trucking firm that will transport general freight between Mexico and the United States

SPORTS 101 GRILL

Jason Duffy and R. Sean Lowry

Sports 101 Grill is a high energy, non-alcoholic, Utah based sports grill aimed at offering the best in sports, food, and interactive entertainment for the college and young at heart crowd.

WONDERFUL OUTRAGEOUS WEDDINGS (W.O.W.)

Cansu Bulgu & Jacob L. Barr

WOW is an internet-based company that provides turn-key wedding packages that are unique in content, affordable in price and professional in terms of planning.

PRESENTATION MEDIA

Brent Reed & Jonathan E. Siegel

Presentation Media is the premier supplier of presentation hardware & services. We will be the Total Presentations Solutions Provider for the business professional, government and educational markets.

dECade

Mary Vasatka and April Kelly

Solutions for business and public schools, ensuring investment in communities, promoting educational opportunities for youth, and preparing the 21st-century workforce

THE "OPEN AIR" GOLF SANDAL

Scott Quinn and Dan Mertens

Our venture is to introduce a new brand of golf sandals to the golfing world. The sandals are light and comfortable and revolutionary in form and style. Superior product quality and comfort and aggressive branding give the "Open Air" Golf Sandal its competitive advantages.

SMALL ENTERPRISES ASSOCIATES, LLC (SEA)

Daniel R. Oseran and Terry R. Wilson

Small Enterprise Associates (SEA) is a company that provides consulting services for startup and small businesses throughout Arizona. SEA provides expertise to small business in all aspects of company operations - from legal to financial and management structures. With a unique payment structure and dedicated founders, SEA will help small companies navigate through the world of business.

ULTIMATE IMAGING TECHNOLOGIES, LLC

Henry Pang

UIT develops technologically advanced surveillance products with distinct, sustainable competitive advantages.

CLASS OF 1998

DATA SOLUTIONS

Pete Aldridge and Brad Schwartz

Software designed to increase the efficiency of the admissions process.

XPANSION CONCEPTS

Cheyenne Arreola and Karl Himes

Company devoted to the development and expansion of applications into new markets utilizing existing technology. Premier product is a wireless personal asset monitoring system applying existing digital PCS technology.

CORTEZ SEAFOOD

Aaron Avery and Juan Cordero-Gutierrez

Mexican shrimp processing company with a distribution arm in the United States that seeks to create demand at the wholesale level.

DISCOVERY ANTIBODIES

Greg Baker and Vaughn Hromiko

Producers and suppliers of antibodies for research and diagnostics.

MUSICNOW

Ben Bartley and Adam Jubela

Internet based music journal specializing in folk and world music.

INDOOR FAIRWAYS

Michael Bednarik and Michael Wagner

Indoor golfing simulators in an exclusive atmosphere.

AUTOGRAPH BATS

Tom Berger and Tom Curley

Utilizing a state-of-the-art laser engraver, Autograph Bats will engrave a customer's signature or team logo on an aluminum alloy baseball or softball bat provided by the customer. A line of Easton brand bats will be offered for resale in conjunction with the engraving service via the Internet.

STRATEGIC CAPITAL INVESTMENTS

Arthur Bergmann and Nathan Handelsman

An investment company offering limited partnerships that invests in stocks and sells options for income.

THE EXECUTIVE SUITE ON THE ROAD INC.

Jacob Bierner and Robert Singer

Professional business shuttle that commutes between Tucson and Phoenix.

PROFESSIONAL LANGUAGE SOLUTIONS, CORP.

Bernie Block and Gerardo Rodriguez-Pompa

First Product: MedSpan-spanish training CD-ROM for medical applications.

COLLECTIBLE MANAGEMENT & ENTERTAINMENT GROUP (COLMEG)

Paul Borboa and Chris Wells

ColMEG provides inventory management software, valuation and investment information, and internet-based entertainment for collectors. Our first product, SCIMITS software, focuses on the sports card industry.

AIR DEFLECTOR TECHNOLOGIES

Chris Broberg and Tom Holland

Company who produces and markets aerodynamic products for long haul truck trailers.

POLTRADE

Holly Brown and Adam Grodzki

Export and distribution of athletic apparel from U.S. to Poland.

J/TECH CORPORATION

Melissa Burkland and Jeremy O'Day

An educational online service.

ENVIRODATA TECHNOLOGIES, INC.

Seton Claggett and Lisa Short

GIS/Database development of local and national environmental data for the use in risk assessment, planning, and consulting.

SUN TRAVEL SYSTEMS

John Erikson and Jeff Wright

Software designed for consumer travel.

THE HARDCORE JUICE CAFÉ

Cody Faller and Ross Lampert

Trendy juice café located in the heart of the business district in downtown Tucson.

ZEPHYR PERFORMANCE PRODUCTS

Bryan Giglia and Kirk Vidinghoff

Air induction system that will enhance automotive performance.

NATIVE AMERICAN BOTANICS

A. Teena Hayden and G. Bill Quiroga

Native American products by Native Americans. The best of the American continent's herbal dietary supplement products offered to health conscious consumers by the original Americans.

CELTECH

Michael Hill and Brad Warezak

Micro-machined microwave devices that will significantly increase the battery life of cellular and PCS phones.

IMMUNE DYNAMICS INC.

Dan Kinsfogel and Mike Lavin

Using its patented ISO-STIM technology to produce nonprescription treatments for worldwide infectious diseases. With this we help our friends...our children...our world.

QUALITY ELDERCARE SERVICES INC.

Christopher Michaels and Ted Walton

Supportive in-home living services for the elderly that maintain independence and dignity.

INFOTONE™ CORPORATION

Avery Moon

Provider of network storage.

SAKOYANNIS AND NABAHE ENTERPRISES

Travis Nabahe and Nick Sakoyannis

Downtown Tucson Complex.

GOBI OUTDOOR

Tony Poer and Ryan Watts

A company that will provide a more comfortable backpack to its consumers.

THE GOLF UNIVERSITY

Craig Rochette and Matthew Strube

A unique golf instructional facility offering superior training to its guests by offering them the opportunity to practice in "real" golf situations on actual golf holes.

CHILLY ROCK CREAMERY

Kelsie Schmit and Matt Vuturo

Ice cream store located in Yuma, Arizona.

INDIGENOUS MUSIC

Craig Vigor and Jason Wagner

An Internet haven for aficionados of independent music. Indigenous music allows independent labels to offer information and single songs on the Internet and consumers the ability to purchase custom-made compilations of independently-produced music.

INFOFLASH

Becca Williams and Chell Williams

Shopping cart monitors that display targeted ads and promotions (coupons) to shoppers. Maximizes ad effectiveness for manufacturers and retailers.

CLASS OF 1997

ADVENTURE SAIL TOURS

Rodrigo Enriquez and Adam Sheafe

Adventure sailing yacht cruise in the Sea of Cortez.

PERSONAL PREVENTIVE MEDICINE NEWSLETTER

Charles Combs

Medical newsletter for HMO/PPO, medical insurance CO's, employers, as well as other health care consumers and for subscription on Internet.

SELECT FITNESS WORKOUT

Brandi Beougher and Frank Busch

An upscale fitness facility located in Tucson's Catalina Foothills.

FITNESS CONSULTANTS

Nikki Baumgartner and Jason Frierott

Home fitness product manufacturer dedicated to providing innovative fitness equipment specifically developed for the fitness enthusiast.

SKWALKS™ LLC

Fred Cox and Michael Carlson

Skwalk™ the toesock, is a sock that covers the first few inches of the foot and provides a familiar "sock like" comfort to those who traditionally wear shoes without socks. It is designed for low cut, open backed and lace up shoes.

IRONSTONE

Matt Mertel and Gray Adams

A service company that addresses employers' growing concerns about sexual discrimination and harassment in the workplace, by implementing measures, in accordance with Federal and state standards, that reduce an employer's liability to such claims.

PANOPTTECH

Ben Williams and Josh Eskin

Producers of digital panoramic cameras for multimedia applications.

DRY CREEK HOMES

Stefanie Sosnowski

Development company that builds affordable starter homes in communities throughout Arizona.

FLAGSTAFF SHOOTING CLUB

Liz Crampton

First and only indoor shooting range in Flagstaff, Arizona. With a retail shop and a variety of tactical handgun classes, the facility will be the authority in Flagstaff's marksmanship needs.

ANTENNA TOPPERS

Brooke Smith and Heather Weiss

Antenna toppers produce three-inch foam basketballs, baseballs, and football helmets with university logos imprinted on them, which are to be placed on antennas.

THE LAUGHING SWEDE BREWPUB AND GRILL

Melissa George and Derek Mirza

The Laughing Swede features a large selection of premium, hand crafted brews, complimented by traditional pub style food.

PROMETHEUS SOFTWARE INC.

Punkaj Srivastava

Uses 3-D digital imaging to create innovative solutions to visualizing environments and selling products.

BRIDGES/DAY COMMERCIAL DEVELOPMENT

Mike Day and Byron Bridges

A real estate development firm specializing in build-to-suit call centers.

BRAVO!

Demetrius Minor and Mike Ratto

Mediterranean theme dinner show in Orlando.

WEDDING SOURCE USA

Jill Clark and Brandon Smith

An innovative marketing company that utilizes a unique CD-ROM medium to connect wedding advertisers with thousands of engaged couples nationwide.

ABSOLUTLEY HORSES. COM

James Walbom and Joe Del Giorgio

A world wide web advertising company targeting the horse industry.

BLOWN AWAY

Lisa Sherman and Kyla Williams

Indoor vertical skydiving simulator located in Orlando, Florida. At Blown Away you can conquer gravity as 120 MPH of wind gently push your body upward and you achieve autonomous human flight.

CARAVANS ESPRESSO BISTRO

Desmond Chong Kar Yung and Scott Sloane

Premium coffee bistro for business and technical professionals as a place to unwind and network. A place for the select few.

SPLIT ENGINEERING LLC

Tom BoBo and Brian Norton

Software system that helps mines improve their efficiency and productivity. The system creates and analyzes video images of rock fragments and empowers mine engineers with crucial operational data.

URBAN TERRITORY DEVELOPMENT (UTD)

Ted Kay and Hannah Zwiebel

UTD will provide superior student accommodations for those students who have lived in dorms and other apartment complexes, but are now looking to live in an upscale apartment environment.

NETX

Carol Arakaki

Software development kit that allows game developers to quickly build a reliable multi-player Internet game without the complexities of integrating the game onto the Internet.

CAMPUS OF LEARNERS

David Bizak and Scott Meredith

A non-profit community center that educates low-income adults and at-risk children in necessary computer skills.

WATCHDOG

Jeff Klinger and Darlene Newman

A service designed to increase the effectiveness of dog licensing while offering added benefits to our customers, veterinarians and the government.

LEGAL EDGE TECHNOLOGIES

Lisa Hay and Gina Diaz

Company that will develop informational CD-ROMs for legal profession. The software advises on alternative methods for incorporating courtroom technology to create effective presentations.

MOLECULAR VENTURES, INC.

M'liz Robinson and Matt Lincoln

Educational software firm that designs interactive, three-dimensional molecular visualization software tools for use in the instruction of biology and chemistry related sciences.

CLASS OF 1996

BETTER BASEBALL, INC.

Kory Fuller and Jason Kanner

The Perfect Curve: A fun, simple and effective training device for pitchers.

BOELTS BROS. ASSOCIATES

Eric Boelts

Creative communications company that produces graphic design and advertising for a broad range of clients.

CAMP LAS VEGAS

Kristin Hitzeman and Megan McDonald

A Las Vegas tour service for children ages 6-12 that allows parents to participate in adult activities while their children are entertained on a supervised tour.

COLLEGIATE TILE TABLES

Steve Levine and Mike McAndrews

Produces ceramic tile-inlaid coffee tables featuring collegiate logos fired into the tile surface.

CUSTOMER CONNECTION

Valerie Karvinen and Matt Olsen

A customer service outsourcing company, targeting small to medium sized businesses.

DANTZWARE

Bridget Fox and Jill Gillespie

A dancer-owned design and wholesale apparel company created to meet the neglected needs of the men's danceware niche market.

DINE'COPY CENTER

Lester K. Tsosie

A bilingual information technology company offering high-quality copying products and services to Navajo people and other consumers in northeastern Arizona and northwestern New Mexico.

THE GENERAL STORE EXPRESS

Jennifer Haber

A drive-through convenience store offering customers the speed, comfort, and safety of staying in their cars while purchasing convenience store items.

THE GIFT CONNECTION

Kim Nelson and Edwina Richard

"Smart items" are craft kits with all the items needed to create hand made gifts. The target market is national sorority members.

IN-GEAR

Jeanette Janssen and Oriana Lehman

Innovative creator of accessory products for athletic and leisure sports, starting with a product complementary to in-line skating.

OLD PASQUA YOUTH ARTISTS

Dudley Blossom and Chris Feerst

Provides young Tucson artists with the opportunity to learn and experience the business of art.

OUTRIDERS ADVENTURE TOURS

Russell Jones and Cam Welander

Offers "gourmet" outdoor adventures in exotic locations of the Southwest.

PROTECTION PLUS

Mark Hauserman and Steve Stokols

Retail store offering security, emergency and safety products for the individual, automobile and home.

THE PUTTMASTER

Tom Stevenson

A new, unique product to help golfers improve their abilities and reduce frustration levels.

SAFER SWORDS, INC.

Peter Messana

Developer of safe innovative toy products for children of all ages. Wacky Whackers, a firm foam toy sword, is the company's first product.

SAUSAGE DELI

Lee Ann Kalaba and Michael Spacone

Expansion of a successful Tucson sandwich shop serving high quality foods in a friendly, comfortable atmosphere.

STONEBAY COLLECTIBLES

Scott Steinsvaag

Marketing fine collectibles to alumni, students, and other supporters of various universities. The first product is a cold-cast, hand-painted resin sculpture of "Old Main", the landmark building at the University of Arizona.

SUNSET PINES

Dan Daniels and Russ Levine

A small mountain community near Flagstaff, Arizona offering luxurious log homes for nightly rental.

SWIM N' FIT

Cindy Lacey and Kendra Strasburg

Multifunctional swimwear which can be worn while participating in a variety of sports-related activities.

TARGET ADVERTISING INC.

Jason Harrow and Holly Van Cleave

An indoor billboard advertising company that places illuminated billboards on the walls of fitness clubs and sells the advertising space.

VENTANA MORTGAGE CORPORATION

Gary Franks and Benjamin Wellman

Expansion of an innovative mortgage brokerage firm that specializes in serving self-employed and complicated-income borrowers.

ZEPHYR DEVELOPMENT CORPORATION

Morgan Palmer and Sam Valenzuela

Zephyr's first product is VisionDoc, a software that automates and streamlines the management of business documents.

CLASS OF 1995

AMBER YVONNE BOUTIQUE

Susan Grimes and Laura Hearon

An upscale New Orleans women's boutique featuring formal dresses, fine imported fabrics, jewelry and accessories, design consultants and seamstress services.

ARIZONA BREWWORKS

Elizabeth Lynch and Michael Turley

A professionally designed retail facility providing customers the opportunity to brew their own beer.

BAD HAIR DAY, INK.

Gene Kansas

A small publishing company producing humorous, fun products from books and temporary tattoos to a complete line of logo apparel.

COLLEGE DAZE

Grant Maloney and Carleen Sullivan

Fine retail sportswear for the UA community, including the production of custom orders for individuals and large campus organizations.

DESERT HIDEAWAY

Andrew Hirsch and Eric Nelson

Recreational vehicle park set in the Tucson area -- 300 sites with a clubhouse, pool, small activity rooms, a large meeting room, and outside games.

GONK, INC.

James Donelson and Heather Kritzer

Alternative wear t-shirts displaying highly detailed, distinctive designs on non-traditional, unique pub-style food.

IRONWOOD BREWERY & RESTAURANT

Edward Kuehne and Timothy Minnehan

A brewpub that produces and serves its own fresh, all-natural beer and traditional, unique pub-style food.

PARTY IN A BOX

Russell Eickoff and Bradford Woods

A company that offers inexpensive, creative, entertaining and practical alternatives for gift purchasers.

PHAT CAT

Jon Amland and Ihab Ibrahim

University-area restaurant characterized by short orders, a medium sized menu and quick and friendly service.

PHOENIX RESALE

Elizabeth Slocum

A women's designer consignment store offering revitalized clothing at a fraction of the retail price.

PREMIER SPORTS MANAGEMENT

Lucas Murdock and Matthew Wild

A sports management and marketing firm initially promoting the sport of swimming.

PROUD LOGOS

Derek Flowers and Asad Khan

Proud Logos will wholesale carpet products featuring university logos. Products include a framed wall hanging, coasters and a bathroom floor mat.

ROLLPA INTERNATIONAL

Katarina Urikova and Malgorzata Wyzga

An assortment of chairs, desks, display racks and tables assembled from heavy walled cardboard tubing (made from recycled paper), plastic injection molded connectors and shelving.

SPORTECH

Gerry Morton and Alfredo Santini

Innovative products for the sports community include a golf practice aid, which uses audio feedback to develop consistency in the golf swing.

XPOSED

Peter Gugoff and Jason Parsons

Development and manufacture of bicycle accessories in new, fast, growing niches. The first product is a helmet face shield.

ZERO TOLERANCE STANDARDS LABS

Jeannie Hubbell and Mercedes Salomon

A calibration and standards laboratory in the Tucson area to provide National Institute of Standards and Technology (NIST) traceable calibration of measurements.

CLASS OF 1994

5'6 AND RISING PRODUCTIONS

Jason Burns

A socially responsible, educational cartoon show based on what children want to see.

ANIME ECHO

Michael Ferdie

A recording studio for dubbing Japanese animation into English.

BIODYNAMICS TECHNOLOGY

Angelo Perri and James Frey

Biomechanical support services like a back-support belt or a sports belt.

COLLEGE DIRECT

Gary Weaver and Scott Pollov

A direct mailing company offering products to incoming college freshmen.

COOLTECH

Brian Link and Premal Kazi

The first product of this sports company is an insulated water bottle.

DICKSON/PENA MEDICAL PRODUCTS

Christy Dickson and Chris Pena

A company to design innovative medical products, the first being a blood barrier protector.

DOYLE'S DINGHIES

Manolo Doyle and Russ Salmon

Manufacturer of luxury wooden dinghies, adaptable for rowing or sailing.

ESCAPE ARTIST FILM

Alhek Vila and Mike Garito

An audio post-production service for motion pictures focusing on music and sound effects.

FUTURE FITNESS

Fred Silberstein and Lisa Raben

A fitness center for the cost and health conscious.

HADROSAUR PRESS

Kumie Wise and Melissa Guy

A small press for literary science fiction in several formats.

HEAR'S THE WORLD

Tom Golseth and Scott Aldridge

A mail order catalogue for World Music compact discs to eventually be international.

NATURE'S EXPRESS

Brett Heron and Andrea Barrett

A healthy fast food restaurant with seating and a drive-through.

THE SOFTWARE SOURCE

Sean Sullivan and Travis Dobias

A company that markets low-cost software in shopping center malls.

SOUND FOUNDATION

Kirk Winkler and Jeff Jacobs

The first product is ShokBlox which eliminates low-frequency interference in recording studios.

TURKEY JERKY

Helen Lin and Brian Dunn

A company producing an alternative to beef jerky, distributing it in shopping mall push-carts.

CLASS OF 1993

ABLATION INSTRUMENTATION, INC.

Julie Ferguson and Catherine Robertson

The first product uses ultrasound energy to remove cardiac tissue to eliminate arrhythmia.

BELOW THE BELT

Kristal Morel and Ren Chang

A retail men's underwear store specializing in fashion and exercise undergarments.

CHOCOLATE IGUANA

Brooke Lane and Eric Barnes

A plan to expand and franchise a currently operating Tucson retail gourmet candy and coffee store.

DELTAMED/MEDICAL MANAGEMENT SOLUTIONS

Jeff Hinds and Kathy Cleere

Management and technical services for small and medium-sized health care offices.

FIRST STEP

Martha Gonzalez and John Hickey

A Tucson-based company that helps people start new businesses.

GERICARE

Marion Holley and Regina Kaupanger

A company that provides adult day care and drop-in services for elderly individuals with dementia.

GILA BICYCLE PRODUCTS

Wendy Monday and Eugene Alegria

A manufacturer of bicycle accessories and components.

JPB CORPORATION

Clayton Hamilton and Christina Costanza

A worldwide jet parts resale business with a long-term focus on sales in Mexico and Latin America.

L.A.W./LEGAL ASSISTANCE WORKSHOP

Matt Williams and Annalisa Moore

Consulting services for lawyers.

LEAN LINK, INC.

Ray Lamb and Nate Sanders

A company distributing pork from Nebraska and Wyoming into the Denver area.

MACKINAC MUSHROOM FARM

Jeff Cocagne and Kent Hamilton

A Chicago-based grower and seller of fresh and dried exotic mushrooms.

NORTHERN MEDIA, INC.

Joe Natoli and Jeff Lemcke

A corporation providing integrated video editing software solutions.

PETITE PERFECT

Rory O' Neill and Scott MacDonell

A petite casual clothes retailer for women based in Tucson, Arizona.

RESTAURANT SPECIALISTS

Glen Roberts and Dave Bolland

A company assisting restaurants to establish computerized and manual computer systems.

SCAVENGER REFRIGERANT RECOVERY SYSTEM

Joel Clapick and Chad Montgomery

A Phoenix-based division of Total Manufacturing Co., Inc., which produces a freon recovery system.

SPINNING WHEEL PRODUCTIONS

Melanie Sauer and Paul Kirchoff

An independent producer of feature films.

TEMP-CAL-BEAK

Jim Murphy and Todd Luethjohann

A system of chemistry beakers to heat chemical solutions.

U.S. PROPERTY INVESTMENTS

Pete McGinnis and Steve Beeghley

A real estate investment company specializing in distressed residential property in Tucson, Arizona.

VIRTUAL PRESS

Rae Beebe and Roger Lee

A small press publishing company specializing in computer training aids and education related products.

CLASS OF 1992

CINEBAR

Ronald Okpisz and Robert Gaither

A cult-classic theater in the U. of A. area offering spirits, sandwiches and snacks.

(THE) COMPUTER CADDY

Steve Miner and Sharon Walk

Hand-held computer and directional unit to help golfers improve and analyze their game.

C.O.P.S./CUSTOMER ORDER PROCESSING SYSTEMS

Vance Cooney and Daniel Rosengarten

"Front end" multi-media solutions to fast food outlet transactions.

ELOQUENCE: A SALON EXPERIENCE

Kimberley Wells and Kerstin Horton

Upscale salon for affluent women.

EVENTS MANAGEMENT SPECIALISTS

Matthew Newell and Scott Hooper

Fund raising events management for non-profit organizations in Tucson.

FEET FIRST GOLF SHOPPE

Patrick Meiring and Michael Casteel

An off-course retail golf equipment store in the Phoenix/Scottsdale area.

HUIVULAI ISLAND RESORTS

Eduardo Patino and Lyndon Haack

An exotic Mexican island resort.

IMAGE APPLICATIONS, INC.

Tamsin Campbell and Gregory Dyer

A service that fills out applications for entering college students using an 800 number.

(THE) KANGAROO CORPORATION

Jennifer Merz and Mary Ann McLaughlin

Initial product, "the Vault," a theft-proof storage compartment that attaches to a bicycle.

LAKEWOOD INN RESTAURANT

Robert Zanelli and David Bradford

A restaurant in Pinetop /Lakeside, AZ.

PEGASUS/RAPID PLOWDOWN SYSTEM

Gary Thacker and Walt Petraitis

A one-pass plowdown system for cotton farming.

POLLUTION MANAGEMENT SYSTEMS, INC.

Clem Moore and Joshua Weiser

Water purification system in California.

QUITE NATURAL

Mary Groth and Anne Marie Hamilton

Clothing for nursing mothers designed to allow discreet breast-feeding or pump usage.

ROGUE'S HOLLOW PRODUCTION CO.

David Amstutz and Michael Vickroy

Independent production of feature motion pictures.

(THE) ROYAL CANYON INN

Prakash Sundaram and Ted McGuire

A full-service hotel in Williams, AZ, just off Interstate 40 and the Grand Canyon exit.

SANTA FE'S OWN

Douglas Gorthy and Frankie Duran

Manufacturer of kit and knockdown furnishing for residential and commercial markets.

SMART BOOKS

David Webber and Stacy Bercovitch

A mobile bookstore to serve students' textbook needs.

SOFTBALL CITY

Ron Contorno and Curtis Strain

High quality adult recreational facilities and activities for the entire family.

SPECIAL EVENT ENTERTAINMENT

Alan Remer and Robert Wilson

Performing arts on a pay-per-view basis.

SPORTADE

Robert Broad and Mark Ekstorm

Sports drink for health-conscious women.

THEATRICALS

Romi Carrell and Bart Steiner

A "total entertainment" theater, with casual restaurant, full-service bar and showclub.

(THE) WEDDING COMPANY

Stacey Schlegel and Kimberly Boshara

CLASS OF 1991

ABC'S

Jessica Quint

Expandable infant shoe

CHLORINE BLANKET

David Lipman

New method to detoxify swimming pools.

COOLER CLOCK

Paul Efron

Automatic swamp cooler.

DECK THE NURSERY

Deborah Hatem and Carma Leichty

Handmade infant and nursery items.

DECO WALL

Kerwin Krofchik

Stenciled wall painting services.

DESERT DINING PUBLICATIONS

Marcus Feder and Jane Larson

Comprehensive guide to Tucson dining.

EL CHARRO SALSA

Susan Wilke

Famous restaurant's hot salsa bottled for sale.

GLOBAL INNOVATIONS

Roger Allen and Janet Miller

Third World-based product development firm.

HEAR'S MUSIC INC.

Brit Dornquast

Record store featuring customer listening booths.

INFORMED

Fred Kipperman

Medical office wall advertising.

NAVAJO-WAY DWELLINGS

Lorinda Gene and Christine Holland

Resort hotel and cultural center on the reservation.

PARADISE COVE

Kevin John and Dave Weaver

Marina in central Michigan.

PETITION MANAGEMENT RESOURCES

Linda Liguore and Paul Rice

Petition management consulting firm.

PHYSICIAN HOME CARE SERVICE

Kevin Lewis

Home care featuring physician visits.

PREDATOR TACKLE COMPANY

Shawn Mobel and Dave Vonesh

Environmentally safe fishing sinkers.

PRE-SCREENING RECRUITING SERVICE

Kirk Newman and Jodi Sander

Video-taped interview service for recruiters.

SPROUTS RESTAURANT

Davis Klenk and Paul Reynolds

Soup and salad restaurant catering to university crowd.

VIDEO HOTLINE

Kevin Small and Lea Marquez

Home delivery video service.

(THE) WASHROOM

Chris Hunter and Kevin Newman

Laundry facility featuring food and entertainment.

WOMAN SPORT

Imed Bhouri and Cynthia Pearsall

Sports retail store for women.

CLASS OF 1990

ARIZONA DESERT FRESH PRODUCTS, INC.

Carol Walz and Randall Williams

Arizona gourmet food gift baskets.

(THE) BULLET GROUND TRANSPORTATION GROUP

John Heid and Stephen Krawchuk

Airport shuttle services for Albuquerque, NM.

DESERT MIRAGE, INC.

Jeff Zinger

Amusement park for Phoenix.

HEALTH AND NUTRITIONAL ENGINEERING CO., INC.

Simon Ng and Jeffrey Traister

Preventive healthcare services.

INGENIERIA Y EQUIPOS

Jamie Tort-Diaz

Distribution of material handling equipment in Mexico.

LIFTROLL PRODUCTS

Peter DeMangus and Jill Munding

Equipment for moving heavy materials in places of difficult access.

MEETING PRESCRIPTIONS, INC.

Marie McDermott and Bernadine Nanna

Software tools for effective healthcare decision-making.

PIELES DE HERMOSILLO

Eduardo Acedo-Elias

Imported leather goods from Hermosillo, Mexico.

POINT-TO-POINT SYSTEMS

Leslie Schneider and Jay Steinmetz

Airline ticket sales through automated tellers.

REDDINGTON RANCH GOLF CLUB

Matt Halle and Chris Pizinger

A new public golf course for Tucson.

SBR TRI-TECH, INC.

Todd Bookspan and Joshua Goldfarb

Mail order catalog for triathlon equipment.

SCRAP TIRE ENERGY, INC.

Elise Peay and Jim Potter

Conversion of scrap tires into energy.

(THE) SURGILOK CORPORATION

Susan Burkhardt and Teresa Ferris

Hair replacement attachment system.

TECHNICIAN'S ASSISTANT

Ron Janderlich

Computer diagnostic equipment.

TUBE TOWEL, INC.

Tawn Albright and David Gilbert

Recreational equipment.

ULTIMATE GOLF CENTER

Chuck Donnelly and John Waring

Tucson's complete golf practice facility.

VIDCHECK, INC.

Mike Lippman and Steve Lippman

Video identification recording system for establishments selling liquor.

YOUNG AT HEART FITNESS AND HEALTH CLUB

Kerri Roll and Robin Rosema

Fitness center for mature adults.

CLASS OF 1989

ANATOLIAN MACHINES, INC.

James Osslaer and Omer Sinangil

Wheat milling machinery production in Turkey.

BAHILL INTELLIGENT COMPUTER SYSTEMS

Bradley Cloud and Brian Murphy

Computerized baseball bat selector.

BASICSPPLUS

Ann Thomas and Michael Williams

Academic tutorial service.

BEAUTIFUL BUILDINGS

Aleesa Corso and Cristen Jacobsen

Renovation of properties for resale.

BEEF SPECIALISTS

Hector Acedo-Elias

Specialty meat processing in Mexico for export to Japan and the United States.

CAPRA FARMS

Selva Krishnasamy

Production of goat products.

(THE) COLLEGE CONNECTION

Cindy Ostermeyer and Kevin Saxe

University apparel through mail order.

CREATE, INC.

Michael Staub

Electronic checkbook

DESERT VISIONS

Diana Christenson and J. Andrew Gage

Mail order collection of Southwestern furnishings.

FOSTER AND TUMA INDUSTRIES

Gregory Foster and Steven Tuma

Personal security device.

GRUBBS SYSTEM

Robert Grubbs

Duplicating facilities management.

HONOLULU FLYING FISH: GIFTS FOR FRIENDS AND FAMILY

Barbara Black and Vonn Logan

Gift-packaged fresh fish for Japanese tourists to Hawaii.

KIDZERCISE

Kenneth Adelson and Robert Graziano

Physical fitness center for children.

LECTROFOG, INC.

Dale Deming

Dust control devices for mine and construction haulage equipment.

RASTRA BUILDING SYSTEMS

Susan Frost and Paul Wilcox

Specialty construction material.

RETOOL, INC.

William DeJong

Refurbishment of cutting tools.

SIERRA SUN MEDICINAL HERBS

Aalma Saldivar

Bilingual mail order catalog of herbal tea products.

SIGNATURE LIGHT COMPANY

John Buttery and Chris Harris

CLASS OF 1988

ALPHA FARMS

Bill Mujanja and Ken Copic

Commercial poultry production

BLUE BAY

Ellem Zeitzer and David Israel

Designer condoms.

CORADESCHI MOTOR CORPORATION

Andy Coradeschi

High performance sports car.

EFFICIENT HOMES, INC.

Kevin Walsh and Jose Rincon

Residential home construction.

F AND L AERIALS

Dwight Fairback and Anthony Lindo

Remote sensing/agriculture.

MODULAR FURNITURE CONCEPTS

Steve Yin and Doug Clay

Simple, functional modular furniture.

OASIS TECHNOLOGIES

Richard Orwig and Sarah Smallhouse

Outdoor environments for business interiors.

OUTLAW PUBLISHING

Myron Donald and Lisa Leftault

This is Arizona! magazine.

PRODUCTIVITY MANAGEMENT

Patricia Hicks

Productivity and efficiency consulting.

SELECT TAPES

Trisa Schorr and Vito Fenello

Custom cassettes.

SUBLETT/SIRES

Kim Sublett and Shawn Sires

"Black Tie" men's skin care products.

TECHNOLOGIES DEVELOPMENT CENTER

Cynthia Garfield and Greg Watanabe

Commercialization of innovations from physical sciences.

ULTRATHERM CORPORATION

Steve Nelson and Bryan Neff

Ultrasonic thermometers.

VALUETY MARKETING

Raun Trejo

The "Sketcher Board".

VINTAGE LAB

Ely Shemesh

Wine analysis.

CLASS OF 1987

ADVENTURE CONCEPTS INTERNATIONAL

Kathi Blocker and Alex Fraikor

National resort advertising.

ALPERT/BOLLERMANN ENTERPRISES

Gregg Alpert and Doug Bolermann
Manufacture of claw bar hand tool.

A.I.M./ADVERTISING IN MOTION
Marty Clemons and Tim Wall
Indoor video advertising.

THE AUTOMOTIVE EDGE
Scott Ehram and Sean Furrier
Auto styling boutique.

COLLEGIATE SPORTS WEEK
Jay Rochlin
Alumni sports newsletter.

DESERT BERRY PRODUCTS, INC.
George Prentice and Rich Reinert
Dessert products from cactus fruits.

FORT CADY CORPORATION
Bill McCall and Belinda Payne
Boric acid mine.

ISO-TEK, INC.
Jan Horn and Dean Langadas
Dust free environments.

NORTHFIELD RECORDING CO.
Michael Gulezian and Lincoln Nymeyer
Recording company.

O.P.B.C./OLD PUEBLO BREWING CO.
David Keller and Meg Leggette
Micro brewery.

PROJECTIONS
Alberto Voli and Harold Washington

Black greeting cards.

TOTAL CONSULTING

Brian Frost and Linda Wenglikowski

Consultant's network and business seminars.

VIDEOSYNCRACY

Kurt Vogel and Francie Walker

Videotapes for instruction on musical instruments.

CLASS OF 1986

COLLEGIATE COMMUNICATIONS

David Kline and Jack "Jay" Romanoff III

Alumni magazine network.

D.L. WEST MANUFACTURING, INC./HOLD IT

Sandra Lenick and Phillip Bode

Temporary retention device for sheet-like materials.

(THE) DRIVE-ALL SCREWDRIVER

Joseph Dorgan and Warren Harris

Screw holding driver tip for screw shooters.

FRESH AIR INCORPORATED

Graham Sheldon and N. Peter Hasselmo

Evaporative cooler maintenance products.

GREAT LAKES AUTO SALVAGE

John Minore and Tom Ruhoff

Auto dismantler.

H AND H DEVELOPMENT CORPORATION

Anne Hackett and M. Keith Holben

Planning and development of a 26-unit apartment complex in central Phoenix.

HEXTEK CORPORATION

Michael Voevodsky and Peter Wangsness
Ultralightweight glass optical mirror blanks.

LEAK DETECTION TECHNOLOGIES

Steven Figgins and Scott Nance
Device to detect leaks in underground gas tanks.

(THE) MONITOR

G. Leon Tompkins Jr. and Mark Macluso
An investment newsletter digest.

PUNCH ME UP EMPLOYMENT

Ronald Adelson and Glenn Berkeley
A nationally-marketed resume database for college students.

RESPIRE CARE OF ARIZONA, INC.

Paul Ferris and Norman Horn
Specialized, professional home health services.

UPAPIL/UGANDA PULP AND PAPER INDUSTRIES LIMITED

William Mukasa
Pulp manufacturers in Uganda.

CLASS OF 1985

ACCOUNTS RECEIVABLE SPECIALISTS

Steven Strasheim
Accounting and financial services for the medical profession.

AGROTRONICS SEED-PLUS SYSTEM

Christine Christiansen and Douglas Sire
Electrostatic and enzyme treatment of seeds for increased productivity.

ATHLETIC TREATMENT CENTERS, INC.

Valerie Silver
Treatment of athletic injuries.

CAN DEPOT OF CALIFORNIA

Paul Benscoter and David Kinas

Recycling cans in mall locations.

COLLEGIATE CLEANERS, INC.

James Duty and Alan Klibanoff

Nationwide college campus clothes cleaning service.

ELECTRONIC COMMUNICATIONS SYSTEMS AND SALES

Kevin LaRue and James Nayhouse and David Zoller

Electronic billboard advertising and sales.

ESPRIT DE CORPS, INC.

David DeLong and G. Kevin Fechtmeyer and Steven Taylor

Mail order sale of authentic athletic attire.

IMPORT EXCLUSIVES

Michele Baertschi

Import and distribution of Mexican handicrafts.

J.J.'s DESERT GOURMET GOODIES

Judy Jenkins and William Isbell

Production and distribution of cactus jellies.

MAYA CONSTRUCTION

Deanie Elsner and Roberto Ruiz

General construction company

RELIABLE MOTORCYCLE PARTS, INC.

M. Roger Choate and Michael Thomas

Sale of reconditioned motorcycle parts.

SOUTHWEST MEDICAL CORPORATION

Jeff Barker and Mary Lou Forier and Seth Lansky

Acquisition and management of professional medical practices.

STARS RECORDS, TAPES AND COMPACT DISCS

Richard Andrade and John Casey
Retail sales of top 200 records.

Appendix F: Survey of Academic/Pedagogical and Fundraising Effects of the Berger Entrepreneurship Program.

The University of Arizona, Eller College of Business and Public Administration
 Karl Eller Center
 Kauffman Center for Entrepreneurial Leadership

ENTREPRENEURSHIP EDUCATION IMPACT STUDY

SECTION A		ACADEMIC ACHIEVEMENTS/CONTRIBUTIONS
	<p>The Berger Entrepreneurship Program has been a leader in developing new teaching methods to prepare students to identify business opportunity and to build and expand a new venture</p> <p style="text-align: right;">A1</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>The Berger Entrepreneurship Program has been a leader in developing new coursework to prepare students to identify business opportunity and to build and expand a new venture</p> <p style="text-align: right;">A2</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>The Berger Entrepreneurship Program has been a leader in developing new projects to prepare students to identify business opportunity and to build and expand a new venture</p> <p style="text-align: right;">A3</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>Business and MBA course curriculums have benefitted by incorporating teaching philosophy practiced in the Berger Entrepreneurship Program</p> <p style="text-align: right;">A4</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>

Please list specific teaching innovations and/or coursework _____
introduced by the Berger Entrepreneurship Program that have
since been incorporated into business and/or MBA course curriculum

Attach additional pages if necessary) A5 _____

SECTION B DEVELOPMENT & INSTITUTIONAL CONTRIBUTIONS		
	<p>The Berger Entrepreneurship Program has a strong ability to attract private funding</p> <p style="text-align: right;">B1</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>The Berger Entrepreneurship Program's ability to attract private funding enhances the overall ability of the business College to also attract outside funding</p> <p style="text-align: right;">B2</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>The Berger Entrepreneurship Program's ability to attract private funding enhances the overall ability of the University to also attract outside funding</p> <p style="text-align: right;">B3</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>
	<p>Berger Entrepreneurship Program alumni contribute significantly to the College, as compared to other Eller College graduates</p> <p style="text-align: right;">B4</p>	<p>_____ Strongly Agree _____ Somewhat Agree _____ Don't Know/Have no Opinion _____ Somewhat Disagree _____ Strongly Disagree</p>

	Berger Entrepreneurship Program alumni contribute significantly to the University, as compared to other Eller College graduates B5	_____Strongly Agree _____Somewhat Agree _____Don't Know/Have no Opinion _____Somewhat Disagree _____Strongly Disagree
	Please estimate the percentage (%) difference (indicate higher or lower) that the Eller College would have received in overall financial and personal contributions over the past seven years if:) the Berger Entrepreneurship Program did not exist here: + / - _____%) the Berger Entrepreneurship Program existed but was not a top ranked entrepreneurship program: + / - _____%	B6
	Please estimate the dollar amount, higher or lower, that the University of Arizona would have received in overall financial and personal contributions over the past seven years if:) the Berger Entrepreneurship Program did not exist here: + / - \$ _____) the Berger Entrepreneurship Program existed but was not a top ranked entrepreneurship program + / - \$ _____	B7

We welcome and encourage any comments you have regarding the Berger Entrepreneurship Program and/or this survey
