Record-Keeping Technology Adoption in the Louisiana Dairy Industry

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Abstract: Louisiana farmers were surveyed to determine their adoption of information and record-keeping technologies, including the internet, DHIA, use of financial measures, and frequency of use of computerized records. Factors influencing adoption included having a family successor, overall technology adoption propensity, diversification, off-farm income, college degree, and others.

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A number of record-keeping technologies are available to U.S. dairy farmers, including but not limited to those provided by Dairy Herd Improvement Association (DHIA), various internet sources, and other computerized systems. Farm management experts frequently cite the importance of good record-keeping in improving farm efficiency and profitability. The rapid drop in U.S. dairy farm numbers along with increased milk production and relatively stagnant nominal milk prices over recent decades suggests that surviving farms must continue to improve their management in order to remain profitable. Identifying the types of records producers are keeping and the types of producers who are keeping them is of benefit in designing extension programs to assist remaining producers.

This study examines adoption rates of record-keeping technologies by Louisiana dairy farmers. Without an accurate assessment of input use and resulting output, farmers cannot make decisions that will lead to maximum profit. For instance, records are of importance in breeding and culling decisions.

Computerized farm record-keeping systems are relatively easy to adopt since computers and software are readily available. With adequate effort spent to learn how to use the technologies, they can be used by most farmers in any production area and producing any commodity or mix of commodities. Some computerized financial record-keeping systems include basic software programs such as Excel, Quicken, and QuickBooks. Blank spreadsheet programs can be used for more than just accounting information, but it takes significant time and effort to design and set up spreadsheets that meet all of the needs of a farm business. Pre-designed bookkeeping software such as Quicken and QuickBooks are set up for accounting functions such as entering checks and bills or generating financial statements. Such software, however, is generally more expensive than basic spreadsheets, requires significant training, and the accounts, suppliers, customers, and vendors must be set up before use.

The types of production record-keeping systems included in this adoption analysis are basic spreadsheets, DHIA records, milk tickets, and hand-written records. DHIA is a program through which farmers pay a fee for technicians to weigh and test for quantity and quality. DHIA also tracks the genetic history of cattle and can predict the yearly production of the offspring of individual cows and bulls in the database. Additionally, DHIA can track when cows are vaccinated, dried-up, freshened, bred, and when they calve.

Milk tickets are receipts that are mailed out to farmers periodically to inform them of how much milk they shipped during the period. Some farmers keep production figures, cow medications, and breeding records in a notebook or ledger and refer back to them as needed. Other farmers retain most information via memory.

Literature Review

Rogers (1962) defined technology adoption as "the mental process an individual passes from first hearing about an innovation to final adoption." Final adoption at the individual farmer level is defined by Feder, Just, and Zilberman (1985) as, "the degree of use of a new technology in long run equilibrium when the farmer has full information about the new technology and its potential." The shape of the adoption curve is generally an S-shaped logistic curve, where adoption is slow at first, increasing at an increasing rate, then increasing at a decreasing rate, and finally leveling off (Hoag, Ascough, Frasier, 1999).

Among the most widely recognized technology adoption papers is Feder, Just and Zilberman's (1985) survey of studies dealing with technology adoption in developing countries. They discussed factors influencing adoption, including farm characteristics, risk and uncertainty, human capital, labor availability, credit constraints, land tenure, and supply constraints.

Formal education has been found to increase the probability of technology adoption, as shown by Rahelizatovo and Gillespie (2004); Rahm and Huffman (2001); Saha, Love, and Schwart (2001); Barrett et al. (2004); Barham et al. (2004); Zepeda (1994); and Shields, Rauniyar, and Goode (1993). Farm size has been repeatedly shown to increase the probability of technology adoption (Gillespie, Davis, and Rahelizatovo, 2004; Rahelizatovo and Gillespie, 2004; Rahm and Huffman, 2001; Saha, Love, and Schwart, 2001; Barrett et al., 2004; Barham, et al., 2004; Zepeda, 1994; Shields, Rauniyar, and Goode, 1993; and Klotz, Saha, and Butler, 1995).

Rahelizatovo and Gillespie (2004), Klotz, Saha, and Butler (1995), and Zepeda (1994) have found yield (milk/cow/year or bushels/acre) to have a positive and significant relationship with the adoption of technology. Age has been found to have a negative relationship with technology adoption (Rahelizatovo and Gillespie, 2004; Barham et al., 2004; Zepeda, 1994). Positive prior technology adoption has also been associated with probability of new technology adoption (Saha, Love, and Schwart, 2001; Klotz, Saha, and Butler, 1995). Examining the relationship between record-keeping and experience, Zepeda (1994) found a quadratic relationship: with greater experience, initially records were used more, then leveling off and eventually declining.

Other factors that have been found to influence technology adoption include farm diversification, debt-asset ratio (Gillespie, Davis, and Rahelizatovo, 2004), DHIA usage (Rahelizatovo and Gillespie, 2004), conferences and extension use (Rahm and Huffman, 2001; Zepeda, 1994; Barrett et al., 2004), experience (Rahm and Huffman, 2001; Zepeda, 1994), plans to expand (Saha, Love, and Schwart, 2001), farmer management ability and technology use by peers (Barham, et. al, 2004), capital availability (Shields, Rauniyar, and Goode, 1993) and land tenure (Rahelizatovo and Gillespie, 2004; Zepeda, 1994; Rahm and Huffman, 2001).

Computer Adoption

While some work has been conducted on technology adoption by Louisiana dairy producers (Gillespie, Davis, and Rahelizatovo, 2004; Rahelizatovo and Gillespie, 2004), studies are lacking regarding computerized record-keeping systems in Louisiana. Computer adoption studies have included Jarvis (1990) with Texas rice producers; Baker (1992) with non-farm agribusinesses in New Mexico; Hoag, Ascough, and Frasier (1999) with Great Plains farmers; Putler and Zilberman (1988) in Tulare County, California; Gloy and Akridge (2000) with large U.S. farms; Amponsah (1995) with North Carolina farmers; and Iddings and Apps (1990) with Wisconsin and Kansas farmers.

Iddings and Apps (1990) found that the complexity of the farm increased the need for computers, but that older farmers were less likely to adopt computer technology. Hoag, Ascough, and Frasier (1999) found that experience reduced the probability of computer adoption. Putler and Zilberman (1988) found that age affected adoption, with adoption increasing up to age 40 and then decreasing. Farm size was found to positively influence the probability of adopting computer technology (Hoag, Ascough, and Frasier, 1999; Amponsah, 1995). Putler and Zilberman (1988) also found larger farms had higher rates of adoption, but the influence diminished with size. Putler and Zilberman (1988), Gloy and Akridge (2000), and Amponsah (1995) found that increased education led to higher rates of computer adoption.

Some other factors found to influence the adoption of computer technologies by farmers include the degree of external support, network of computer users the farmer is familiar with (Iddings and Apps, 1990), the ownership of a non-farm business, off farm employment, peer's computer use (Doye, 2004), management skills, computer familiarity (Jarvis, 1990), land tenure (Hoag, Ascough, and Frasier, 1999), and income and formal farm record-keeping systems (Amponsah, 1995).

Foltz and Chang (2002) found participation in DHIA (or another similar program) to increase milk output per cow per year by 3,202 pounds. Zepeda (1994) found DHIA to increase production by 783 pounds of milk per cow per year.

Data and Methods

This study uses primary data gathered from personal interviews. The study population was Louisiana dairy farmers (mostly in St. Helena, Washington and Tangipahoa parishes). A list of dairy farmers was obtained, including the entire population of 293 Louisiana dairy farmers, as of July, 2005. Over a two-month period, groups of 50 farmers each were sent letters describing the interview and the purpose of the study. A few days after the letter was expected to have arrived, each was called and asked for an on-farm interview. If farmers agreed to the interview, a time was scheduled for the interview, which normally lasted about 1 ½ hours.

Of the 293 farmers, 50 agreed and 68 did not agree to the survey. Thirty-three were out of the dairy business, 14 did not have a listed phone number, 27 had incorrect or disconnected phone numbers, and 101 never answered the phone when called repeatedly (three days in a row, and about four times each day).

Econometric Analyses

Logit analysis, described in Greene (2000), p. 215, was used to determine factors influencing usage of the internet. The logit is suitable for these questions due to the "yes" or "no" answer to a question regarding adoption. Technology adoption rates over time are consistent with a logistic curve, which is the basis for the logit model.

Ordered probit analysis, described in Greene (2000), p. 876, was conducted to determine the factors influencing (1) frequency of updating farm record systems and (2) farmers' perceived usefulness of their computer system. The question regarding updating of farm record-keeping systems was worded as, "How often do you update your record-keeping system?" Choices were, "annually," "monthly," "weekly," and "daily." The question regarding perceived usefulness of the computer system was worded as, "How useful do you perceive the computer system to be for your farm business?" Choices were, "not at all useful," "of limited usefulness," "moderately useful," and "very useful."

Negative binomial regression analysis, described in Greene (2000), p. 887, was performed to determine the influence of factors on the number of financial measures farmers used to track their financial performance and how many different financial statements were generated to measure their financial performance. Financial measures assessed were: profitability, solvency, repayment capacity, liquidity, and financial efficiency, for a highest potential count of five. Potential financial statements were: net income, balance sheet, cash flow, and owner's equity, for a highest potential count of four. Negative binomial analysis is suitable for count-data, such as the number of statements used.

A double hurdle model, which consists of a probit model in the first stage and a truncated regression in the second, was used to determine, among those who were using DHIA to keep their production records, which factors affected the hours per week spent analyzing the DHIA output. The double hurdle model was also used to determine, among those who used computerized accounting record keeping systems, which factors affected the hours per week spent updating, maintaining, or analyzing the records. The double hurdle model is described in Dong and Saha (1998).

Explanatory Variables

All or some of the following factors were considered in the technology adoption and usage models:

AGE = The operator's age in years. Age is expected to reduce adoption of technologies (Rahelizatovo and Gillespie, 2004; Barham et al., 2004; Zepeda, 1994).

DEGR = A dummy variable taking the value of 1 if the dairy operator has a college degree and 0 if not. Higher levels of farmer education are expected to increase the probability of technology adoption (Rahelizatovo and Gillespie, 2004; Rahm and Huffman, 2001; Saha, Love, and Schwart, 2001).

AVGMC = The average number of milking-aged cows from 2004 and 2005. Farm size is expected to positively influence technology adoption (Hoag, Ascough, and Frasier, 1999; Amponsah, 1995). This is especially true for the computerized record-keeping and internet technologies.

DIVDUM = A dummy variable taking the value 1 if the farm included an additional enterprise other than the dairy, 0 otherwise. Diversification is expected to reduce the probability of adopting dairy specific technologies, such as DHIA.

FAMSUC = A dummy variable taking the value 1 if the operator was planning to pass the dairy operation to a family successor upon retirement, 0 otherwise. Presence of a farm successor would generally be expected to increase technology adoption.

OFFFINC = The percentage of gross household income that was not earned on the farm. Higher levels of off-farm income would be expected to lead to increased adoption of computer record-keeping systems and internet use (Doye, 2004).

OWN = The percentage of total acres operated that the operator owns. Higher levels of ownership would be expected to increase technology adoption (Rahelizatovo and Gillespie, 2004; Zepeda, 1994; and Rahm and Huffman, 2001).

TECH = A count variable representing the number of other technologies adopted to measure the farmer's propensity to adopt new technologies. Technologies included artificial insemination, total mixed ration feeding, DHIA, growth or production hormones, feeding silage, feeding balage, GPS technologies, computer adoption, and rotational grazing. If a farmer has had a positive experience with the adoption of technologies or management practices, he would be expected to be more willing to try other technologies (Saha, Love, and Schwart, 2001). As a note, most surveyed farmers were "pasture-based" operations; rotational grazing would be considered an advanced technology for these farmers.

STMTS = A count variable representing the number of financial statements that are generated for the operator's analysis, including: net income, balance sheet, cash flow, and owner's equity. The relationship of this variable with technology adoption is explored.

IROPER = A dummy variable taking the value of 1 if the farm's financial records are kept internally by the dairy operator, 0 otherwise. The relationship of this variable with technology adoption is explored.

Based upon Pearson correlation coefficients, no evidence of potential multicollinearity problems was detected. The data, however, were heteroskedastic. To correct for this problem, the Robust command in STATA was used. Endogeneity of several suspected independent variables was tested; results showed no evidence of endogeneity.

Results

For the sample, the average farmer had 30 years of experience in the industry, and the average farm size was 326 acres with 111 milking age cows (Table 1). The average annual production per cow was 15,680 lbs, which is higher than the state average, indicating that better managers were more likely to agree to the survey. Forty percent of the farmers had attended college. Thirteen farmers planned to pass the dairy enterprise to their children upon retirement. The other 37 planned to sell the dairy or had no children to take over upon their retirement.

Computers were used by 78% of the surveyed farmers, of which 30% used the computer to keep their financial records (Table 2). On average, these farmers believed their computers were of limited usefulness to the farm operation. Thirty-six percent of the farmers were currently using DHIA to keep their production records. On average, farmers updated their financial records weekly or monthly. Only two farmers filed their own tax returns without the aid of a tax professional. Sixty percent of farmers generated cash flow statements, while only 42% generated balance sheets. Fewer generated income statements and statements of owner's equity: 38% and 20%, respectively. Similarly, 68% tracked their liquidity closely, while 46% tracked their solvency, 42% tracked profitability, 40% tracked their repayment capacity, and 28% tracked their financial efficiency. Only 8% of the farmers used growth hormones, while 50% used artificial insemination. Sixteen percent were feeding total mixed rations, 22% were feeding silage, and 22% were feeding balage.

Table 3 shows results for the adoption of internet usage, analyzed using a logit model. It was found to be influenced by four factors including farm size, family successor, off-farm income, and other technology adoption. For every additional cow in the herd, the probability of internet usage increased by 0.0048. Contrary to expected results, when a farmer had an expected family successor, he was less likely to adopt internet technology. The probability of internet adoption increased by 0.1570 for every additional technological innovation the farmer had adopted.

An ordered probit model was used to analyze the factors that influenced how often farm records were updated (Table 4). Updating once per year was used as the base group. Groups one, two, and three were monthly, weekly, and daily, respectively. In the overall model, having a college degree and a diversified operation both reduced how often records were updated.

An ordered probit model was used to analyze the factors that influenced perceived usefulness of a computer. In the overall model, age, diversification, having a family successor, and previous technology adoption influenced the computer's perceived usefulness.

A negative binomial regression model was used to analyze the number of financial measures that a farm business tracked. The only variable that significantly affected the number of financial measures was the existence of a family successor. When the farm did have a successor, approximately 1.3 additional financial measures were tracked.

A negative binomial regression model was used to analyze the number of financial statements that a farm business generated for their financial analysis and decision making. Only one factor influenced the number of statements generated: whether the financial records were updated by the farm operator himself.

If the records were updated by the operator himself, then 0.86 fewer statements were kept than if another party updated the financial records.

A double-hurdle model was used to analyze the factors affecting DHIA adoption and intensity of use. The first hurdle was a probit model used to analyze the factors affecting DHIA adoption, while the second hurdle was a truncated regression model used to analyze the factors impacting the intensity of DHIA records usage. In the probit model, herd size and prior technology adoption were found to influence the adoption of DHIA. Larger farmers had an increased probability of 0.0036 for each additional cow of using DHIA. Also, for each additional technology previously adopted, the probability of DHIA use increased by 0.30. In the truncated regression, off-farm income, family successor, prior technology adoption, farm operation diversification, and whether or not the operator updated his own financial records had significant effects on the number of hours per week the operator spent reviewing DHIA output. Having a family successor increased the hours spent per week reviewing the output by 1.70 hours. Surprisingly, each new technology a farmer adopted reduced the hours spent reviewing the output by 0.47. Diversification in the farming operations increased the time spent assessing the farm's performance. When the operator himself updated the financial records, then he spent 0.72 more hours per week analyzing the DHIA output.

A double hurdle model was used to analyze the factors affecting computerized record-keeping systems adoption and intensity of use. The first hurdle was a probit model used to analyze the factors affecting computerized record-keeping systems adoption, and the second hurdle was a truncated regression to analyze the factor impacts on the time spent updating records. In the probit adoption model, only the number of financial statements and the presence of a farm successor influenced the probability of computerized record-keeping systems adoption. For every additional statement the farmer used to assess financial condition, the probability of adoption increased by 0.17. Surprisingly, having a farm successor reduced the probability of adoption by 0.25. In the truncated regression model, off-farm income and whether or not the operator himself kept and updated the record-keeping system affected the hours spent per week updating the computerized record-keeping system. For every one percent increase in the total income coming from off-farm sources, farmers spent 0.05 fewer hours per week updating the records. Also, if the operator himself kept the records, then he spent 1.72 fewer hours per week updating the record system.

Summary and Conclusions

A number of insights can be gleaned from the results of this study, though a larger sample size would likely have resulted in better explanatory power. Of the computer adopters, older farmers tended to believe their computers were of greater usefulness for business purposes than did younger farmers. This does not imply that older farmers were the greater adopters, as this result was not found. Farmers holding college degrees were more likely to update their financial records on a monthly basis and less likely to update them on a daily basis. Otherwise, education did not affect record-keeping adoption in this study.

Size (measured in average number of milking-aged cows) increased DHIA and internet adoption. These results are consistent with the results found in previous technology adoption studies that larger producers are the greater technology adopters.

Higher levels of off-farm income increased internet adoption, which is consistent with expectations because many farmers are exposed to the internet and its benefits for a farm operation at their off-farm jobs. On the other hand, higher levels of off-farm income reduced the hours spent reviewing DHIA output and updating computerized record-keeping systems per week. This is likely due to the tighter time constraints imposed by the off-farm job.

Diversified operations were more likely to update their financial records monthly and less likely to update them daily. They were also more likely to view their computer as not at all useful or of limited usefulness. Diversified operations were less likely to view their computer systems as very useful and they spent more hours per week reviewing their DHIA output.

The number of other technologies adopted had a positive relationship with the probability of adopting DHIA and internet technologies. Also, farmers who had been technology adopters were more likely to view their computer as very useful.

Having a family successor for the farm increased the time spent on management activities: it increased the time spent reviewing DHIA output and increased the number of financial measures tracked.

On the other hand, farmers with family successors to the farm were less likely to adopt internet technologies and were more likely to view their computer as of limited usefulness to the farm operation.

Overall, adopters of record-keeping technologies were found to be the more productive producers who were also adopters of other technologies. While those with off-farm income were more likely to use the internet, their intensity of use of record-keeping systems, if adopted, was lower. This may suggest that, while they are information adopters, they have less time to devote to analyzing the acquired information.

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Table 1. Descriptive Statistics.

Measure	Mean
Years of Experience in Dairy Production	30 yrs.
Acres Operated	326
Number of Milking Age Cows	111
Production per Cow	15,680 lbs.
Percentage Planning to Pass the Farm to Family Successor	26
Percentage Who Were College Attendees	40

Table 2. Adoption Statistics	% of Total
Computers	78%
Computerized Financial Records	30%
Growth Hormones	8%
Artificial Insemination	50%
DHIA Records	36%
Total Mixed Ration	16%
Silage Fed	22%
Balage Fed	22%
Cash Flow Statements	60%
Balance Sheets	42%
Income Statements	38%
Owner's Equity Tracking	20%
Liquidity	68%
Solvency	46%
Profitability	42%
Repayment Capacity	40%
Financial Efficiency	28%

Table 3. Logit and Negative Binomial Regression Models

Logit Model, Adoption of Internet Technologies

Variable	Coefficient	Std. Error	P Value	Marg Effect	Std. Error	P-Value
age	0.050728	0.037221	0.173	0.012679	0.00929	0.172
degr	1.125230	0.939837	0.231	0.270477	0.20944	0.197
avgmc	0.019161	0.000948	0.043	0.004789	0.00237	0.043
divdum	-1.057980	0.984343	0.282	-0.258131	0.22849	0.259
famsuc	-1.992231	1.072605	0.063	-0.440137	0.18828	0.019
offfinc	0.044661	0.019358	0.021	0.111631	0.00483	0.021
own	-0.699425	1.344010	0.603	-0.174822	0.33592	0.603
tech	0.628182	0.377076	0.096	0.157015	0.09425	0.096
iroper	-0.220915	0.764014	0.772	-0.055167	0.19040	0.772
constant	-6.307549	2.807133	0.025			

Negative Binomial Regression, Number of Financial Measures Tracked

Variable	Coefficient	Std. Error	P Value	Marg Effect	Std. Error	P-Value
Age	0.006293	0.0103	0.542	0.014771	0.0242	0.541
Degree	0.115479	0.2283	0.613	0.277184	0.5603	0.621
Avgmc	0.002157	0.0023	0.338	0.005063	0.0053	0.337
Divdum	0.163733	0.2458	0.505	0.391097	0.5974	0.513
Famsuc	0.470095	0.2231	0.035	1.255749	0.6701	0.061
Offfinc	0.006791	0.0042	0.105	0.015939	0.0097	0.102
Own	0.042285	0.3350	0.900	0.099252	0.7862	0.900
Tech	-0.002106	0.0909	0.982	-0.004944	0.2135	0.982
Iroper	0.114819	0.2091	0.583	0.270687	0.4952	0.585
Constant	-0.133950	0.7853	0.865			

Negative Binomial Regression, Number of Statements Generated

Variable	Coefficient	Std. Error	P Value	Marg Effect	Std. Error	P-Value
age	-0.008567	0.0112	0.446	-0.014328	0.0187	0.445
degree	0.010238	0.2595	0.969	0.017156	0.4657	0.969
avgmc	0.001140	0.0024	0.636	0.001907	0.0040	0.636
divdum	0.072911	0.2746	0.791	0.122860	0.4660	0.792
famsuc	0.231785	0.2638	0.380	0.412228	0.4967	0.407
offfinc	0.001165	0.0049	0.813	0.001948	0.0082	0.813
own	0.142228	0.3832	0.711	0.237870	0.6402	0.710
tech	0.107117	0.1089	0.325	0.179149	0.1808	0.322
iroper	-0.518074	0.2445	0.034	-0.861181	0.3958	0.030
constant	0.552755	0.8398	0.510			

Table 4. Ordered Probit Models

	Ordered Probit Model, Frequency of Updating Records														
	Overall Model			Yearly			Monthly			Weekly			Daily		
Variable	Coefficient	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Valu
age	-0.012414	0.0165	0.451	0.002082	0.0028	0.462	0.002850	0.0039	0.464	-0.002845	0.0039	0.463	-0.002087	0.0028	0.46
degree	-0.676343	0.4004	0.091	0.133402	0.0939	0.156	0.125606	0.0735	0.088	-0.161125	0.1032	0.118	-0.097883	0.0575	0.08
avgmc	0.002671	0.0037	0.474	-0.000448	0.0006	0.483	-0.000613	0.0009	0.486	0.000612	0.0009	0.485	0.000449	0.0006	0.48
divdum	-0.757394	0.4388	0.084	0.140525	0.0956	0.141	0.151000	0.0886	0.088	-0.173070	0.1080	0.109	-0.118455	0.0709	0.09
famsuc	0.442608	0.4057	0.275	-0.064323	0.0544	0.237	-0.110788	0.1114	0.320	0.089281	0.0755	0.237	0.085830	0.0910	0.34
offfinc	-0.005639	0.0071	0.425	0.000946	0.0012	0.435	0.001295	0.0017	0.440	-0.001293	0.0017	0.438	-0.000948	0.0012	0.43
own	-0.600979	0.5507	0.275	0.100810	0.0955	0.291	0.137960	0.1349	0.306	-0.137754	0.1323	0.298	-0.101016	0.0969	0.29
tech	0.176462	0.1538	0.251	-0.029600	0.0266	0.266	-0.040508	0.0380	0.287	0.040448	0.0374	0.279	0.029661	0.0269	0.27
iroper	0.242384	0.3389	0.474	-0.040437	0.0573	0.481	-0.055675	0.0797	0.485	0.055044	0.0779	0.480	0.041108	0.0588	0.48

	Ordered Probit Model, Computer Usefulness														
	Overall Model			Not at all useful			Limited usefulness			Moderately useful			Very useful		
Variable	Coefficient	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Value	Marginal Effect	Std. Error	P Valu
age	0.049538	0.0214	0.021	-0.009352	0.0048	0.050	-0.010057	0.0060	0.095	0.000654	0.0021	0.759	0.018755	0.0082	0.02
degree	0.539153	0.4735	0.255	-0.095863	0.0854	0.262	-0.110565	0.1040	0.288	0.001321	0.0223	0.953	0.205108	0.1786	0.25
avgmc	0.004348	0.0047	0.356	-0.000802	0.0009	0.366	-0.000883	0.0010	0.391	0.000057	0.0002	0.767	0.001646	0.0018	0.35
divdum	-1.071023	0.5075	0.035	0.224261	0.1253	0.073	0.181061	0.0995	0.069	-0.026192	0.0439	0.550	-0.379131	0.1607	0.01
famsuc	-0.978252	0.5631	0.082	0.245708	0.1771	0.165	0.128555	0.0752	0.087	-0.054538	0.0611	0.372	-0.319725	0.1519	0.03
offfinc	0.003867	0.0077	0.617	-0.000730	0.0015	0.618	-0.000785	0.0016	0.626	0.000051	0.0002	0.794	0.001464	0.0029	0.61
own	0.916226	0.6458	0.156	-0.172976	0.1315	0.188	-0.186001	0.1505	0.217	0.012093	0.0399	0.762	0.346884	0.2453	0.15
tech	0.406277	0.1982	0.040	-0.076702	0.0422	0.069	-0.082478	0.0532	0.121	0.005362	0.0175	0.760	0.153817	0.0756	0.04
iroper	0.467691	0.4516	0.300	-0.089400	0.0917	0.330	-0.092467	0.0915	0.312	0.006609	0.0198	0.739	0.175258	0.1678	0.29
stmts	0.191681	0.1578	0.224	-0.036188	0.0318	0.255	-0.038913	0.0353	0.270	0.002530	0.0084	0.763	0.072571	0.0601	0.22

Table 5. Double Hurdle Models

Double Hurdle Model, Adoption and Intensity of DHIA Use

	Probit						Truncated Regression		
Variable	Coefficient	Std. Err	P-Value	Marg Effect	Std. Err	P-Value	Coefficient	Std. Err	P-Value
age	0.017727	0.0275	0.519	0.005724	0.0091	0.531	0.005824	0.0179	0.745
degree	-0.252765	0.6716	0.707	-0.078769	0.1999	0.694	-0.231465	0.3155	0.463
avgmc	0.011170	0.0065	0.086	0.003607	0.0021	0.088	0.003618	0.0025	0.151
Own	-0.950249	1.0008	0.342	-0.306829	0.3146	0.329	0.035778	0.3777	0.952
offfinc	-0.001924	0.0110	0.861	-0.000621	0.0035	0.860	-0.020243	0.0091	0.027
famsuc	-0.051951	0.7098	0.942	-0.0166368	0.2260	0.941	1.703634	0.4774	0.000
tech	0.937781	0.3232	0.004	0.302803	0.1031	0.003	-0.473994	0.1692	0.005
divdum	0.614931	0.5720	0.282	0.204162	0.1955	0.296	1.011180	0.5293	0.056
constant	-5.010449	2.1685	0.021				0.722831	0.3679	0.049

Double Hurdle Model, Adoption and Intensity of Computerized Record-Keeping Systems Use

	Probit						Truncated Regression		
Variable	Coefficient	Std. Err	P-Value	Marg Effect	Std. Err	P-Value	Coefficient	Std. Err	P-Value
age	0.029237	0.0226	0.195	0.010089	0.0078	0.193	0.034396	0.0401	0.391
degree	0.001114	0.5159	0.998	0.000384	0.1780	0.988	-1.125849	0.9877	0.254
avgmc	0.003267	0.0048	0.494	0.001127	0.0017	0.496	-0.002241	0.0094	0.812
own	0.298443	0.7717	0.699	0.102982	0.2654	0.698	-1.496191	1.3212	0.257
offfinc	0.004169	0.0090	0.643	0.001239	0.0031	0.644	-0.048369	0.0232	0.037
famsuc	-0.832491	0.6274	0.185	-0.247275	0.1461	0.091	0.893672	0.9349	0.339
tech	0.223167	0.2017	0.268	0.077007	0.0699	0.270	0.306523	0.3428	0.371
divdum	-0.383002	0.5839	0.512	-0.128841	0.1886	0.494	-1.029213	0.9809	0.294
stmts	0.481752	0.1766	0.006	0.166225	0.0602	0.006	-0.283824	0.2911	0.330
iroper	0.270954	0.4718	0.566	0.093742	0.1639	0.567	-1.723098	0.8225	0.036
constant	-4.012324	1.6803	0.017				2.489387	2.7624	0.367