The Farm Diversification Discount

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Abstract

This paper examines the effect of diversification on farm value by comparing values of diversified farms to a portfolio of comparable specialized farms. Using data from the Agricultural Resource Management Study, this study finds a diversification discount in agriculture similar to the discount found for corporate firms. The results show that diversified crop/livestock farms have a value loss of 5.8% in comparison with specialized crop or livestock farms for 1999-2001. Farms with commodity diversification have a value loss of 9.4% in comparison with commodity specialized farms. The results also show that the value loss due to diversification is larger for leveraged farms.

Key words: diversification, diversification discount, farm value, leverage.

The Farm Diversification Discount

Corporate firm diversification has received a lot of attention during the last decade (for a survey of recent literature see Martin and Sayrak). Numerous finance studies have argued that the level of corporate diversification has been trending downward and that diversification is related to a lower value for the firm and losses to the shareholders. Lang and Stulz, Berger and Ofek, and Servaes show unambiguously that diversified firms trade at a discount relative to specialized firms in their industries. These results seem to be robust for different time periods and different countries. Recent finance studies showing diversification discounts have used the Berger and Ofek models which compare the value of a diversified firm with the value of a portfolio of similar specialized firms. Several finance studies offer alternative explanations for the diversification discount (Shin and Stulz; Rajan, Servaes, and Zingales; and Lamont). The poor performance of diversified firms is usually attributed to a misallocation of internally generated funds because of inefficiency or agency problems. This misallocation problem results in cross-subsidization, where investments in the firm's poor-performing segments are made with cash flows generated from well-performing segments.

Unlike the corporate sector, the agricultural sector has become more diversified over the last two decades (Popp and Rudstrom). Farm diversification is a frequently used risk management strategy and plays an important role in agriculture (Harwood et al.). However, there are only a few studies on farm diversification and none examining the consequent gains or losses due to diversification. Previous studies have focused on the factors influencing farm diversification (Kurosaki; Mishra and El-Osta; Pope and Prescott), on the risk-reduction associated with diversification (Schoney, Taylor, and

Hayward; Nartea and Barry), and on the effect of diversification on farm returns, farm income, and farm size (Purdy, Langemeier, and Featherstone; Mishra, El-Osta, and Johnson; Sumner and Wolf). These studies generally find evidence that diversification reduces risk but the results for the effect of diversification on farm returns, farm income, and farm size are mixed. Furthermore, the overall effect of diversification on farm value is not known. The goal of this paper is to apply the Berger and Ofek methods to examine the effect of diversification on farm values and to measure diversification gains or losses to farmers.

Agriculture is an interesting application for the methods applied to the corporate sector. Unlike corporate firms, farms are usually small in size, capital-intensive, with low debt-to-asset ratios, and are not organized as corporations (Barry and Robison). Perhaps the most important difference from the corporate sector is that there is no market to trade equity shares in agriculture. Equity investors can diversify away idiosyncratic firm risk by investing in a well-diversified portfolio of firms and therefore diversification at the firm level is not necessary to reduce risk. Diversification at the farm level through different crop and/or livestock enterprises is often needed to mitigate risk for farm asset owners. A potential benefit from diversification comes from combining enterprises with imperfectly correlated revenues. This coinsurance effect gives diversified farms a greater debt capacity than specialized farms (Lewellen). Another benefit associated with diversification is the complementary use of equipment and activities on the farm (economies of scope). The costs associated with enterprise diversification may be the need for specialized equipment and broader managerial experience and forgoing

economies of scale. Farmers consider these tradeoffs when making diversification and specialization decisions for their farms.

This paper examines whether the diversification discount documented for corporate firms is also found in agriculture. The study applies the innovative Berger and Ofek methods to compare the value of a diversified farm with the value of a portfolio of similar specialized farms and determine the gains or losses associated with diversification. The risk effects of diversification are also explored in terms of gains or losses in value to farms with different capital structures.

The Excess Value Model

This section outlines the Berger and Ofek excess value model which is used to determine whether diversification enhances or decreases farm value.[1] The excess value model compares asset values of diversified farms with asset values of specialized farms where these values are normalized or weighted by the value of farm production to correct for differences in farm size. For example, suppose that a "representative" specialized crop farm produces $80,000 in crop value and has assets worth $800,000 and a "representative" specialized livestock farm produces $100,000 in livestock value and has assets worth $700,000. The excess value model states that a diversified crop/livestock farm producing $80,000 in crop value and $100,000 in livestock value should, on average, have assets worth $1,500,000. If the actual value of assets for the diversified farm is lower than the imputed value when compared with specialized farms then this

[1] This approach has the advantage of being neutral to agricultural and time shocks that affect all farms in a similar way (Campa and Kedia).

farm would have a negative "excess" value which is associated with a diversification discount.

The excess value model is generalized as follows. Consistently with finance studies using the Berger and Ofek model, farm value is measured by farm total assets. Farms are classified as specialized (or single-enterprise) farms and diversified farms. For each group of single-enterprise farms specialized in an enterprise j, the median for the ratio of farm value to value of farm production is calculated as

$$(1) \qquad \frac{V_{mj}}{w_{mj}} = \text{median}\left\{\frac{V_{1j}}{w_{1j}}, \frac{V_{2j}}{w_{2j}}, ..., \frac{V_{Nj}}{w_{Nj}}\right\},$$

where V_{ij} is the farm value and w_{ij} is the value of production for farm i specialized in an enterprise j, N is the number of farms specialized in an enterprise j, and m denotes the farm with the median ratio of farm value to value of farm production.[2]

The excess value model imputes a theoretical value for the assets attributed to an enterprise j as the value of enterprise j production times the above calculated median ratio. The imputed value for farm i is calculated as the sum of the imputed values for all enterprises normalized by the value of enterprise production:

$$(2) \qquad IV_i = \sum_{j=1}^{n} w_{ij} * \left(\frac{V_{mj}}{w_{mj}}\right).$$

The excess value for farm i is calculated as the natural logarithm of the actual farm value V_i to the imputed farm value

$$(3) \qquad EV_i = \ln\left(\frac{V_i}{IV_i}\right).$$

[2] Due to skewness of distributions and for consistency with other studies, the median ratio rather than the mean ratio is used in the analysis. Using the mean ratio produces similar results.

Negative excess values would indicate that diversification is associated with a lower farm value.[3,4] A diversification dummy variable d_i is defined as 1 if farm i is diversified and 0 if it is specialized. A regression model is estimated to find the relationship between farm diversification and excess values after controlling for other variables that might affect farm excess values:

(4) $EV_i = \beta_0 + \beta_1(d_i) + \beta_2(\text{farm size}_i) + \beta_3(\text{leverage}_i) + \beta_4(\text{government payments}_i) + \beta_5(\text{farmer age}_i) + \beta_6(\text{farmer education}_i) + \beta_7(\text{household size}_i) + \beta_8(\text{off-farm income}_i) + e_i$.

The coefficient β_1 on the diversification dummy variable captures the percentage difference in average excess values between specialized and diversified farms, i.e. the farm diversification discount/ premium.[5]

Alternative Definitions

The excess value model requires that diversified and specialized farms are matched based on every enterprise i in order to impute values. For corporate firms, firm segments are matched based on the same two-digit, three-digit, and four-digit Standard Industry Classification (SIC) code. A growing concern in the finance field is the measurement error associated with firms self-reporting segments that sometime combine unrelated activities (Martin and Sayrak). An advantage of this study is that it is possible to clearly identify enterprises based on the production of a single commodity. In this study, farm

[3] The excess value is measured in logarithmic percentages for consistency with finance studies using the Berger and Ofek methods. When an alternative measure was considered, $EXVAL1=[V-I(V)]/I(V)$, the results were qualitatively similar.

[4] Instead of comparing farm asset values with imputed farm asset values, one could compare return on equity with imputed return on equity. An imputed return on equity for each enterprise of a diversified farm can be obtained after matching with specialized farms. When summing the imputed return on equity for all enterprises in a diversified farm, it is not clear what the weights for each enterprise should be. The weights could be the proportion of the value of production or sales of an enterprise as is the case here, however, a consistency of measures similar to the asset value calculations cannot be obtained.

[5] The rationale for choosing these control variables is discussed in the results section.

enterprises are matched using two alternative criteria: whether farm enterprises produce crops or livestock and whether farm enterprises produce the same commodity. Consequently, two alternative diversification criteria are considered: crop/livestock diversification and commodity diversification. Crop/livestock diversification occurs when a farm has both crop and livestock enterprises. Commodity diversification occurs when a farm produces different commodities.[6] The two alternative diversification criteria may reflect different reasons for diversification. For example, a corn-soybean diversification may spread out labor and machine use over critical times at planting or harvest (Harwood et. al.) whereas a corn-hog diversification may utilize corn as feed for the hogs.

When estimating the excess value model with different measures available at the firm segment level (assets, sales, or earnings), previous finance studies found similar results. For the farm data used in this study, sales (open-market sales and contract sales) and value of production are measured for each enterprise whereas assets and earnings are measured at the farm level. The value of production includes sales as well as the value of production that is produced but not sold.[7] Using value of production to measure losses or gains in value due to diversification is appropriate when a crop is fed to the livestock and when commodity storage is utilized. For example, in the case of vertical integration when the produced crop is used for livestock feed then using the value of crop production (but not crop sales) will reflect the existing crop-livestock diversification. Therefore, the

[6] For example, a corn-soybean farm is classified as a specialized farm using the crop/livestock diversification criteria and as a diversified farm using the commodity diversification criteria.
[7] The Farm Business Summary Program developed by the Economic Research Service, USDA calculates the value of production that is produced but not sold as the difference between the quantity produced and quantity sold times the state-level commodity price.

value of production for each enterprise is used to measure the value of gains or losses due to diversification, although using enterprise sales gives similar results.

Value Losses for Equity and Leveraged Farms

Enterprise diversification is associated with lower farm risk due to the existence of several enterprises with imperfectly correlated returns. Such reduction in farm risk is beneficial for farm lenders and leads to an increase in debtholder value. A contingent claims theory suggests that equity represents a call option on the value of farm assets exercised when the value of farm assets is greater than the value of farm debt. Reducing the riskiness of the farm also reduces the value of the call option and therefore decreases the equityholder (farmer) value and increases the debtholder (lender) value. A lower level of debt is associated with a deeper-in-the-money option, and therefore, a lower impact of risk on the value of the call option. Therefore, an all equity farm is not expected to have significant losses due to the reduction of risk (Mansi and Reeb). On the other hand, a leveraged farm is expected to have a lower value to the farmers (equityholders) and a higher value to the debtholders due to the reduction of risk. The risk-based hypothesis indicates that diversification lowers equityholder value with the shareholder loss being an increasing function of farm leverage. The risk-based hypothesis is tested by measuring the value losses for equity and leveraged farms.

Data

The data for this study were obtained from the 1999, 2000, and 2001 Agricultural Resource Management Study (ARMS) conducted by the National Agricultural Statistics

Service of the U.S. Department of Agriculture.[8] The ARMS data are very appropriate for studying farm diversification because the data include farms with diverse typologies and different locations. Farmers identified commodities produced, commodity sales, leverage ratios, and total assets. Data are obtained for all farms with total assets of at least $40,000 and value of total production of at least $10,000. This screening is done to avoid distorted ratios in the calculation of excess values, with similar results when using different cut-off points. Consistent with other finance studies, farms with extreme excess values (defined as the actual values being either more than four times the imputed values or less than one-fourth of the imputed values) are excluded from the analysis. These elimination procedures result in a sample of 15,030 farm observations for 1999-2001. This sample includes 9,088 specialized crop or livestock farms and 5,942 crop/livestock diversified farms, and is used in the crop/livestock diversification models.

Twelve commodities considered in the commodity diversification models include wheat, corn, soybeans, rice, tobacco, cotton, fruit, vegetables, nursery, cattle, hogs, and poultry. Other commodities are not considered because the ARMS data include fewer than 30 specialized farms producing a specific commodity (such as sorghum) or because some commodities are lumped into a diverse aggregate category (such as other grains or other livestock). Farms are included in the commodity diversification models when the sum of the value of production for the above 12 commodities is within 1% of the total value of farm production. These additional elimination procedures based on available commodity data result in a sample of 8,634 farm observations for 1999-2001. This

[8] Each farm in the ARMS data has been assigned a weight that reflects the number of U.S. farms that this farm represents. All descriptive statistics and regression estimation use these weights (utilizing the delete-a-group jackknife procedure) to ensure that the results are representative of U.S. farms. For more information on the delete-a-group jackknife procedure see Dubman.

sample includes 3,385 commodity-specialized farms and 5,249 commodity-diversified farms and is used in the commodity diversification models. Finance studies report that there are two times more specialized corporate firms than diversified firms (Berger and Ofek; Mansi and Reeb).

Table 1 shows descriptive statistics for specialized and diversified farms using the crop/livestock and commodity diversification criteria. The median number of commodity produced by diversified farms is two, similar to Dodson's findings. Crop/livestock diversified farms have on average $792,108 in total assets and a debt-to-asset ratio of 13%, while commodity diversified farms have on average $859,134 in total assets and a debt-to-asset ratio of 13.4%. Both crop/livestock and commodity diversified farms tend to have a slightly higher value of total assets and debt-to-asset ratios than specialized farms, and a larger proportion of the diversified farms are leveraged.[9] Berger and Ofek found that, at the median, corporate multi-segment firms have three segments, roughly three times the total capital of single-segment firms ($316 million versus $116 million), and slightly higher debt-to-asset ratios (0.29 versus 0.257). An important difference between corporate firms and agricultural farms is that, on average, while diversified corporate firms increase assets in proportion to firm segments, diversified farms spread the same assets onto more commodities rather than become larger. Also, on average, the debt-to-asset ratios for corporate firms are twice as high as the debt-to-asset ratios for farms.

Table 1 also reports the excess values of specialized and diversified farms calculated using equation (3). The excess values for the specialized farms are positively

[9] Similar to Mansi and Reeb, equity farms are defined as those with debt-to-asset ratios less than 1% and leveraged farms are defined as those with debt-to-asset ratios of at least 1%.

skewed with medians of 6.7% for specialized crop or livestock farms and 2% for specialized commodity farms. On the other hand, the excess values for the diversified farms are negatively skewed with medians of -5.4% for crop/livestock diversified farms and -23.8% for commodity diversified farms. The negative differences in mean and median excess values between specialized and diversified farms indicate that diversification reduces value. Berger and Ofek, and Mansi and Reeb found similar results for corporate firms.

Regression Results

The relationship between value loss and diversification is further explored by regressing the excess values on various control variables and a diversification dummy variable which equals one if the farm is diversified. The coefficient on the diversification dummy variable captures the percentage difference in average excess values between specialized and diversified farms. Table 2 shows that the coefficients on the diversification dummy variable are negative and significant, showing a value loss from diversification ranging from 5.8% in the crop/livestock diversification model to 9.4% in the commodity diversification model. In other words, crop/livestock diversified farms have a 5.8% discount in value when compared with similar crop or livestock specialized farms and commodity diversified farms have a 9.4% discount in value when compared with similar commodity specialized farms. A similar diversification discount is found for corporate firms: Berger and Ofek found that diversified corporate firms trade at a 13-15% discount using Compustat Industry Segment data for 1986-1991 and Mansi and Reed found a 4.5% discount using Disclosure WorldScope data for 1988-1999.

Since these losses are based on the value of assets which represents total capital, the value loss to farmers (who are the equity holders) is even larger than these discount measures suggest. Assuming no effect on debt value, the value loss to equity is calculated as the diversification discount times the average asset-to-equity ratio for diversified farms (Berger and Ofek). Using the average debt-to-asset ratio of 13% for diversified farms, the value loss to equity is 6.7% using the crop/livestock diversification model and 10.8% using the commodity diversification model.

The regressions also include control variables that could affect excess values and whose effects are not determined by whether the farm is diversified. Government payments are included as a control variable because they are often considered a risk-reducing mechanism (Mishra and El-Osta). Receiving government payments has a significantly negative but relatively small impact on farm excess values. Government payments in the amount of $10,000 are associated with a 0.03% decrease in farm value. These results may indicate that government payments may be invested inefficiently in poorly performing enterprises.

Household size is included as a control variable because the need to create employment for family members can be associated with increased diversification (Mishra and El-Osta). The results from this study suggest that household size has a negative and significant impact on farm values when crop/livestock diversification is considered. Similarly, off-farm employment as an alternative risk management strategy can reduce the need for diversification. The results show that total off-farm income has a positive and significant effect on farm excess values. Therefore, additional household members are associated with a farm diversification discount unless they are employed off the farm.

These results are consistent with the hypothesis that diversification causes resources to flow to inefficient investments (Rajan, Servaes, and Zingales; Lamont; Whited). The results also indicate that for older farmers, diversification is associated with an increase in farm value. More educated farmers also earn a farm diversification premium when they diversify across crops and livestock. For older or more educated farmers, diversification may also be implemented as a value-enhancement rather than a risk-reduction strategy.

The positive and significant coefficient on total assets indicates that larger farms are associated with an increase in farm value due to diversification or alternatively that the greatest value loss occurs in small farms. For corporate firms, Berger and Ofek, and Campa and Kedia report similar results and Mansi and Reeb report opposite results. The evidence for the effect of farm size on diversification activities is also mixed. Pope and Prescott find that larger farms are more diversified and Mishra and El-Osta find that larger farms are more specialized. Our results are consistent with the economies of scale hypothesis.

The analysis presented in table 2 is extended by estimating the excess value models for crop farms and livestock farms separately. Commodity diversified farms are further divided into crop farms producing more than one crop and livestock farms producing more than one type of livestock. The results in table 3 show that commodity diversification for crop farms is associated with a reduction in farm value of 12.6%, whereas commodity diversification for livestock farms is not associated with a value loss.

To test the robustness of the results, an alternative measure of diversification is used as suggested in Berger and Ofek. The third model in table 3 estimates the relationship between the value loss of diversified farms and the number of commodities

they produce.[10] The results show that the diversification discount increases as the number of commodities increase, with a value loss of 7.4% for each additional commodity produced. Therefore, producing more commodities leads to a reduction in farm value.

The results in table 2 indicated that leverage has a negative and significant effect on farm excess values, in other words, more leveraged farms have larger value losses due to diversification. Consistent with the risk-reduction hypothesis, more leveraged farms may need to diversify in order to make debt payments with greater certainty. To further explain the interaction between leverage and diversification, the sample is divided into equity farms (with debt-to-asset ratios of less than 1%) and leveraged farms. Table 4 shows the crop/livestock and commodity diversification models for equity and leveraged farms. The risk-based hypothesis suggests that the diversification discount should be insignificant for the sample of equity farms. Consistent with the risk-based hypothesis, the coefficient on the diversification dummy variable is insignificant for all equity farms. These results indicate that there is no evidence of a diversification discount for all equity farms. On the other hand, leveraged farms have a value loss of 8.4% if they are crop/livestock diversified and a value loss of 14.9% if they are commodity diversified. Mansi and Reeb find similar results for equity and leveraged corporate firms.

Although commodities grown in the U.S. are very diverse, weather and soil conditions within a region are usually suitable for growing only a few crop and livestock commodities. Therefore, the region is implicitly taken into account when specialized and diversified farms are matched based on the same commodities.

[10] This approach is not applicable for the crop/livestock diversification model.

Summary and Conclusions

This study applied the Berger and Ofek methods to consider the effect of diversification on farm value by estimating the value of diversified farm enterprises as if they were operated as separate specialized farms. The results show that farms have a diversification discount similar to corporate firms. In comparison to specialized farms, crop/livestock diversified farms have a value loss of 5.8% and commodity diversified farms have a value loss of 9.4% for 1999-2001. Commodity diversification for crop farms is associated with a 12.6% diversification discount, however, commodity diversification for livestock farms does not lead to a loss in farm value. These value losses are increasing with leverage, consistent with the risk-reducing effects of diversification. Leveraged farms have a value loss of 8.4% to 14.9% due to diversification.

Consistent with the findings that diversified corporate firms trade at a discount, firm diversification has decreased in the corporate world (Comment and Jarrell). Individual investors may not be willing to accept lower values for the lower risk associated with diversified firms because these investors can diversify their portfolios of specialized companies through mutual funds and thus reduce risk themselves. In agriculture, however, farms are not traded and farmers usually do not hold diversified portfolios of assets. Therefore, the trend toward more diversification in agriculture is not surprising. Nevertheless, this study documents a diversification discount in agriculture that is similar to the diversification discount found in the corporate world. As residual risk-bearers, farmers may have to accept lower farm values for the risk-reduction associated with diversification.

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Table 1. Descriptive Statistics for Specialized and Diversified Farms

	Crop/Livestock Diversification			Commodity Diversification		
Variables	Mean	Median	St. Dev.	Mean	Median	St. Dev.
Number of Enterprises						
Specialized Farms	1	1	0	1	1	0
Diversified Farms	2	2	0	2.43	2	0.017
Total Assets (in dollars)						
Specialized Farms	791,485	451,815	18,291	830,976	428,755	27,367
Diversified Farms	792,108	521,071	17,851	859,134	586,301	15,906
Value of Production (in dollars)						
Specialized Farms	116,421		2,845	138,899		11,550
Diversified Farms	113,583		2,481	165,391		5,581
Debt-to-Asset Ratio						
Specialized Farms	0.124	0.031	0.005	0.101	0.005	0.006
Diversified Farms	0.130	0.055	0.005	0.134	0.060	0.004
Proportion of Leveraged Farms						
Specialized Farms	0.571	-	0.010	0.435	-	0.015
Diversified Farms	0.626	-	0.012	0.640	-	0.012
Excess Value						
Specialized Farms	0.035	0.067	0.012	-0.015	0.020	0.024
Diversified Farms	-0.053	-0.054	0.018	-0.207	-0.238	0.017
Number of Farms	15,030			8,634		
Specialized Farms	9,088			3,385		
Diversified Farms	5,942			5,249		

Table 2. Regressions of Excess Value on a Diversification Dummy Variable and Other Control Variables[a]

	Crop/Livestock Diversification		Commodity Diversification	
Intercept	-0.624	**	-0.594	**
	(-9.74)		(-6.48)	
Crop/livestock Diversification Dummy[b]	-0.058	**		
	(-2.84)			
Commodity Diversification Dummy[c]			-0.094	**
			(-3.67)	
Total Assets	1.65E-08	**	1.71E-08	**
	(3.36)		(3.46)	
Debt to Asset Ratio	-0.677	**	-0.588	**
	(-8.29)		(-5.98)	
Government Payments	-3.15E-06	**	-2.49E-06	**
	(-6.01)		(-3.74)	
Operator Age	0.013	**	0.010	**
	(13.79)		(7.66)	
Operator Education	0.030	**	0.010	
	(2.91)		(0.73)	
Household Size	-0.013	*	0.008	
	(-2.41)		(0.72)	
Total Off-farm Income	1.02E-06	**	6.50E-07	**
	(4.18)		(3.54)	
Adjusted R^2	0.16		0.13	
Number of Observations	15,030		8,634	

[a]The dependent variable is farm excess value calculated as the natural logarithm of the ratio of a actual farm value to imputed farm value.

[b] The crop/livestock diversification dummy variable equals 1 if a farm produces both crops and livestock, and zero if a farm produces only crops or livestock.

[c] The commodity diversification dummy variable equals 1 if a farm produces two or more commodities, and 0 if a farm produces only one commodity.

Table 3. Commodity Diversification Models[a]

	Commodity Diversification		
	Crop Farms	Livestock Farms	All Farms
Intercept	-0.759 **	-0.334	-0.507 **
	(-4.36)	(-1.56)	(-5.19)
Commodity Diversification Dummy[b]	-0.126 **	0.031	
	(-2.33)	(0.36)	
Number of Commodities			-0.074 **
			(-5.73)
Total Assets	7.94E-09	2.31E-08	1.72E-08 **
	(1.59)	(0.88)	(3.53)
Debt to Asset Ratio	-0.477 **	-0.666 **	-0.593 **
	(-3.63)	(-4.92)	(-6.14)
Government Payments	-1.75E-06 **	2.19E-06	-2.29E-06 **
	(-2.56)	(0.12)	(-3.73)
Operator Age	0.014 **	0.004	0.010 **
	(6.80)	(1.43)	(7.51)
Operator Education	-0.011	0.021	0.009
	(-0.46)	(0.87)	(0.62)
Household Size	0.009	0.029 *	0.009
	(0.53)	(1.66)	(0.82)
Total Off-farm Income	9.30E-07 **	3.42E-07 *	6.39E-07 **
	(3.15)	(1.75)	(3.52)
Adjusted R^2	0.15	0.06	0.13
Number of Observations	3,632	2,537	8,634

[a] The dependent variable is farm excess value calculated as the natural logarithm of the ratio of the farm actual value to the farm imputed value.
[b] The commodity diversification variable equals 1 if a farm produces two or more commodities, and 0 if a farm produces only one commodity.

Table 4. The Farm Diversification Discount for Equity and Leveraged Farms [a,b]

	Crop/Livestock Diversification		Commodity Diversification	
Variables	Equity Farms	Leveraged Farms	Equity Farms	Leveraged Farms
Intercept	-0.336 ** (-2.78)	-0.949 ** (-12.78)	-0.474 ** (-2.65)	-0.908 ** (-6.00)
Crop/livestock Diversification Dummy	0.010 (0.28)	-0.084 ** (-3.09)		
Commodity Diversification Dummy			0.0376 (0.89)	-0.149 ** (-3.43)
Total Assets	2.04E-08 * (1.89)	1.70E-08 ** (3.27)	2.25E-08 ** (1.65)	1.40E-08 ** (2.52)
Government Payments	-4.59E-06 ** (-9.84)	-2.74E-06 ** (-4.61)	-3.51E-06 ** (-4.04)	-2.10E-06 ** (-3.14)
Operator Age	0.010 ** (5.81)	0.014 ** (15.82)	0.007 ** (3.14)	0.013 ** (8.54)
Operator Education	0.017 (1.27)	0.041 ** (3.40)	0.004 (0.15)	0.020 (1.26)
Household Size	-0.018 * (-1.66)	-0.007 (-1.01)	0.033 * (1.87)	0.003 (0.17)
Total Off-Farm Income	8.16E-07 ** (4.07)	1.11E-06 ** (2.99)	7.99E-07 ** (2.53)	4.21E-07 * (1.86)
Adjusted R^2	0.07	0.11	0.04	0.09
Number of Observations	4,546	10,484	2,892	5,742

[a]The dependent variable is excess value calculated as the natural logarithm of the ratio of a farm actual value to farm imputed value.

[b] Equity farms are defined as farms with debt-to-asset ratios less than 1% and leveraged farms are defined as farms with debt-to-asset ratios of at least 1%.