Agricultural Household Hedging With Off-Farm Income

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Introduction

Off-farm income (OFI) represents a high and generally increasing percentage of average farm operator household income in the United States (Mishra et al.). As shown in Table 1, OFI accounted for about 95% of total farm household income in 2002 whereas it represented only 88% in 1998. This trend has been in place for decades (OFI represented about half of farmers' income in 1964, Mishra et al.), but has been more noticeable since the 1980s because real farm income has been trending downward since the 1970s. A long-used explanation for the increase in OFI of farm households is that rural economies have developed, thus making off-farm employment more available to farm families. Certainly, *availability* is a necessary condition, but it is not sufficient to explain why some farmers pursue OFI and others do not. A second explanation sometimes suggested is that farmers pursue OFI to replace lost income from farming operations, thus implying that farmers focus on farm profit levels, possibly in a safety-first context, when making decisions about OFI. A third explanation has been proposed recently: that off-farm income represents a vehicle with which farm households can hedge against the variability in farm income. This view implies that risk (expressed as farm income variability) and farmers' risk attitudes are the factors driving the decision of whether or not to hedge. OFI is viewed as the obvious vehicle for hedging because labor is more flexible than land and physical capital, which are quasi-fixed in the short run. However, what has been overlooked in previous research on this topic is the effect of farm size on the decision to hedge with OFI.

Table 1. U.S. Farm Income, 1998-2004.

	1998	1999	2000	2001	2002	2003	2004
				$ Billion			
Total cash receipts	195.8	187.5	192.1	200.1	195.0	216.6	241.2
Net farm income	42.9	46.8	47.9	50.6	36.6	59.5	82.5
Direct government payments	12.4	21.5	22.9	20.7	11.2	17.2	13.3
Adjusted production income*	30.5	25.3	25.0	29.9	25.4	42.3	69.2
				$ Per Farm Operator Household			
Net cash farm income	14,357	13,194	11,175	14,311	11,336	14,979	20,638
Earnings from farming	7,106	6,359	2,598	5,539	3,477	7,884	14,201
Off-farm earnings	52,628	57,988	59,349	58,578	62,284	60,173	67,279
Avg. farm household income**	59,734	64,347	61,947	64,117	65,761	68,597	81,480

Source: USDA (2006 and earlier issues)
* This is calculated as net farm income minus direct government payments.
** This is the sum of "earnings from farming" and "off-farm earnings."

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Farm size must be considered to provide a more-complete understanding of the decision-making process of farm households that are allocating some of their labor to off-farm employment. Both the absolute *level* and *variability* of farm incomes are expected to increase with the size of farm. That means different production and investment decisions may be made by producers who are identical in all respects except for the size of their farming operations. For example, very small-scale farms may not be capable of generating sufficient income to support a household, even if all household labor is allocated to farming, whereas large-scale farms may easily support families that have allocated most household labor off-farm. This issue has regional implications because the West has many more large-scale operations than other parts of the country (USDA 2004), thus we may see different hedging patterns.

The objective of this study is to evaluate the effects of off-farm income on the labor-allocation and cropping decisions of households across farm sizes in a hedging context. A simple portfolio model is developed that identifies the optimal hedging position for farm households. Then, the effects of off-farm income opportunities are evaluated across farm sizes using the theoretical model. Next, regression analysis is used to test hypotheses about the effects of farm size, a variable neglected in the literature. Finally, results are presented by region to enable comparisons between the West and other parts of the country.

A Portfolio Model of Off-Farm Income Effects

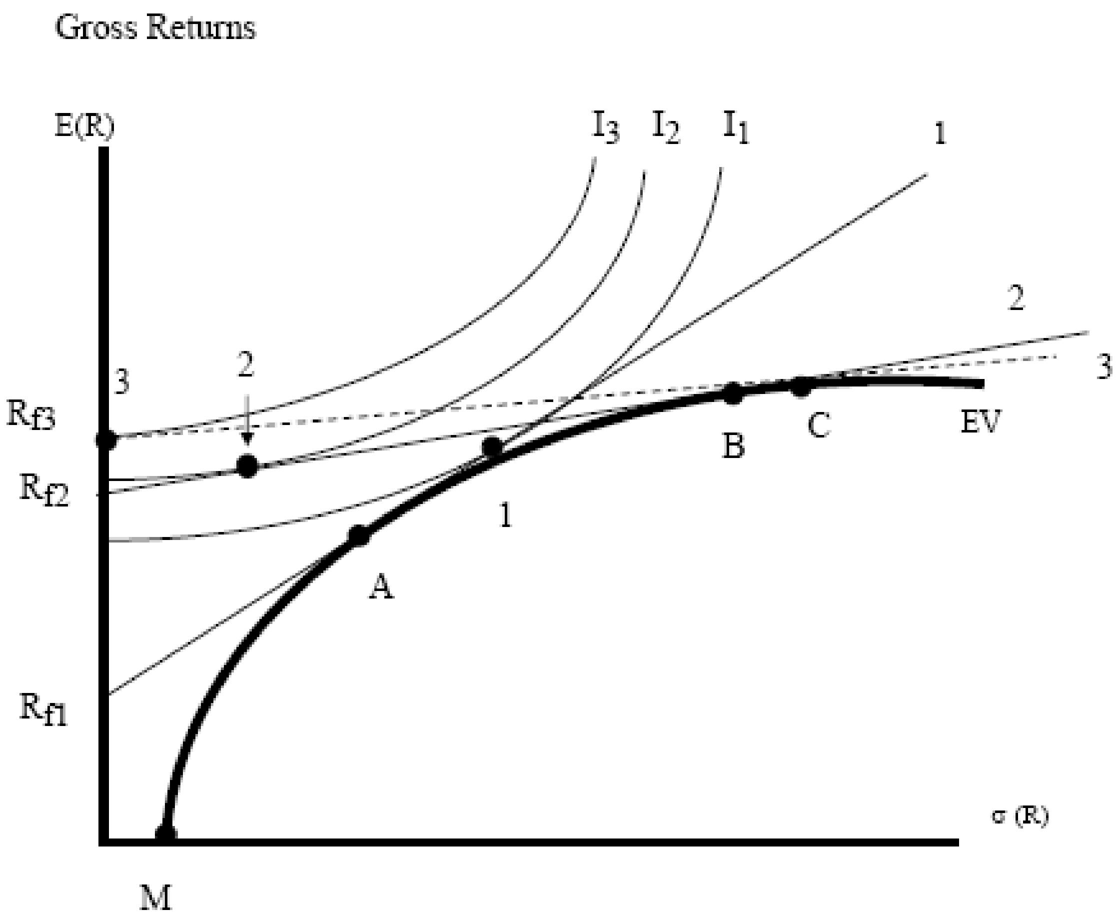
Crop market opportunities available to farmers vary over time and space. It is possible that a farmer's financial obligations and/or risk preference may not be satisfied by any of the returns currently expected from producing specific enterprises. In this case the farmer may consider "selling" some of the household's labor in some local market, rather than allocating it all to farming operations. The off-farm sales price of farm labor (i.e., the wage rate) was shown by El-Osta and Ahearn to depend on the current labor supply in the local market, local demand for particular skills, and the level of skills possessed by the individual job seeker (i.e., the human capital). Thus, the decision of whether to allocate some household labor to off-farm employment involves a comparison of the expected income from farming operations and the cost of foregoing off-farm opportunities.

A person deciding whether to produce crop and/or livestock enterprises in a particular market must first identify the opportunities available in that market. Those opportunities can be plotted on an expected return-variance (EV) graph to facilitate analysis. This is done for a hypothetical market in Figure 1. The curve is plotted with expected gross returns on the vertical axis and risk (in this case measured as the standard deviation of expected returns) on the horizontal axis. Each point on the EV curve is an enterprise or portfolio of enterprises that is efficient in terms of its return/risk relationship, meaning that points on the EV curve have the highest available returns for the associated level of risk. Thus, the EV curve is the collection of all efficient production choices available to the decision-maker. The location and shape of the EV is determined by the data used to calculate expected returns for all portfolios. Therefore, each person may have a unique EV curve because of differences in production capabilities and expectations between people.

If no off-farm employment is available, for whatever reason, farmers can invest household labor only in the production of crops and/or livestock. Each person would choose to produce the portfolio represented by the point on the EV that is tangent to one of his or her indifference curves. This leads to different enterprise portfolios being produced by farmers with different risk attitudes.

If off-farm income is available, the opportunity set available to farmers is altered. In this study, a risk-free return (R_f) to labor is defined as the highest amount of money a farmer could earn (after related costs) from working off-farm. That amount is the product of the (net) hourly wage rate offered and the number of hours that can be worked (usually assumed to be "full-time," but could be less). Working only off-farm is analogous to investing entirely in a risk-free asset, which has a return of R_f, and is plotted as a point on the vertical axis of an EV graph.

Figure 1. Farm Labor Allocation and Production Decisions.



When off-farm income is available, and under the assumption of efficient markets, the separation theorem indicates that all farmers who have the same returns expectations (represented by a single EV curve) and OFI opportunities will produce the same crops, although the composition of their selected portfolios (which includes the OFI component as well as farm efforts) will still vary with their risk attitudes (Johnson). Using the risk-free return, a single optimal risky portfolio and a farmer's opportunity line (OL) can be identified. The OL represents the opportunity set available to farmers in a market (given some returns expectations). It is plotted as a straight line that passes through the point representing the risk-free return and is tangent to the EV. The OL dominates the EV at all points except where the two frontiers are tangent. The point of tangency represents the market's "optimal" portfolio, which has expected returns of $E(R_m)$. The particular portfolio selected by each farmer is found at the point of tangency between this linear OL and an indifference curve for that person. The selected portfolio in this case is a mix of the market portfolio of enterprises produced with the portion of labor allocated on-farm, and the risk free asset amount earned as OFI, and has total expected returns of $E(R_i)$.

For example, in Figure 1 the OL existing for farmers when OFI opportunities have the value R_{f1} is the line labeled "1", which is tangent to the EV at point A. If a farmer's indifference curve is tangent to line 1 at point A, all of that household's labor should be "invested" in producing the crops comprising the optimal portfolio represented by that point. If the indifference curve is tangent at some point to the left of A, the household will invest some labor in producing portfolio A (the specific combination of crops in the optimal portfolio) and will invest the remaining labor in the risk-free asset by working off the farm. Points on the OL to the right of A require an investment in portfolio A involving all of a household's labor and some additional hired labor. Thus, all labor used for crop production by farmers sharing the expectations represented by the EV will be used to produce the same portfolio of enterprises in the same relative proportions. The only difference in composition of selected portfolios between farmers will be the relative proportions of available labor each chooses to use on- or off-farm (and the resulting difference in total agricultural output due to different input levels). This result comes from the separation theorem that suggests that the selection of the crop mix does not depend upon the decision maker's risk preferences, since it is constant along the OL. Instead, the amount of labor allocated on- or off-farm is the variable affected by risk preferences.

A farmer's profit function for holding his or her selected portfolio over some future period can be specified as

$$E(R_i) = E(GR_m)X_m + R_fX_f - K \tag{1}$$

where R_i is net profit (returns) from selected enterprise portfolio i, E is the farmer's expectations operator, GR_m is gross returns from the market's optimal enterprise portfolio, R_f is the risk-free return from off-farm employment, X_m is the proportion (or total number of units) of labor used to produce the market portfolio, X_f is the proportion (or total number of units) of labor sold (or hired if negative) off the farm, and K is the total fixed costs incurred in owning a farm (including mortgage, property taxes, insurance, investments in improvements, etc.), expressed in per acre (or total dollar) terms. If X_m and X_f are expressed in terms of proportions (hours), they must sum to one (the total hours available for the entire household).

In portfolio theory, utility maximization is assumed to be the objective. Therefore, the focus of decision making is the certainty equivalent of $E(R_i)$, which is

$$E(U_i) = E(R_i) - (\gamma/2)(\sigma^2_i) \tag{2}$$

where U is utility, γ is a risk-aversion parameter (equaling the slope of the indifference curve at the tangency point) which is positive for risk-averse hedgers, and σ^2 is the variance of expected returns. The first-order conditions for equation 2 give the utility-maximizing portfolio composition,

(3)
$$X_m = \frac{E(GR_m) - R_f}{\gamma \sigma^2{}_m}$$

subject to the constraint $X_m \geq 0$, and remembering that the proportion of labor sold or hired (X_f in equation 1) is 100%-X_m. Thus, equation 3 is analogous to the "optimal hedge ratio" for a household allocating its labor to farm and off-farm activities.

Effects of Off-Farm Income Levels

Comparing OFI opportunities to expected production returns leads to implications concerning the decision whether or not to produce and, if so, what crop/livestock enterprises to produce. In general, if the situation facing some farmers is $E(R_m) < R_f$, those households would want to work "full-time" off-farm but may choose to continue farming as a "leisure" activity (Blank). On the other hand, if $E(R_m) > R_f$, some rational farmers may work full-time on-farm because higher returns are expected from production of efficient agricultural enterprise portfolios. However, most American farmers now allocate some household labor to both farm and off-farm employment activities.

Different cropping possibilities across time and spatial markets generate different levels of expected income that, in turn, help explain labor allocation differences between dates and locations. For farmers, returns from agricultural production are the alternative to working off the farm and earning the risk-free return. The higher the value of agricultural returns, the more incentive there is for farmers to produce crops rather than to work for others. The reverse is also true. It is hypothesized that OFI affects cropping decisions both directly and indirectly through other factors, as described in the following subsections.

Direct Effects of Off-Farm Income Changes

What direct effects do changes in off-farm income levels have on farmers' cropping decisions? To begin, it is assumed that a farmer has the OFI opportunities reflected by R_{f1}, making line 1 the relevant OL in Figure 1. The indifference curve I_1 reflects the farmer's risk attitude. Since I_1 is tangent to line 1 at point 1, the farmer would select portfolio 1. Portfolio 1 requires that the farmer use all household labor and some additional hired labor for production of the crops in portfolio A (the optimal portfolio). Thus, X_m in equation 3 is greater than one (or 100%) in this case.

If OFI opportunities increase to R_{f2}, cropping decisions of the farmer change significantly. Line 2 in Figure 1 becomes the relevant OL and it is tangent to the EV at point B. The farmer's utility is increased, as indicated by the move from indifference curve I_1 to I_2. The farmer's new selected portfolio is at point 2. Portfolio 2 requires that the farmer use only part of household labor for production of the crops in portfolio B (the new optimal portfolio), with the remaining labor being allocated off-farm ($1 > X_m > 0$). The composition of portfolio B is clearly more risky than that of portfolio A. Hence, theoretically farmers respond to increases in off-farm income levels by producing more-risky crops, but they produce using lower labor inputs (and probably fewer acres). This means, for example, that a wheat farmer in Washington State may be more willing over the long-run to shift some acreage into production of a specialty crop (such as a tree crop – e.g., apples, cherries) if some member of the household gains off-farm employment.

If available OFI levels increase further to R_{f3}, the farmer's cropping decisions change again. Line 3 in Figure 1 becomes the relevant OL and it is tangent to the EV at point C. The farmer's utility is increased further, as indicated by the move from indifference curve I_2 to I_3. The new selected portfolio is at point 3. Portfolio 3 requires that the farmer allocate all household labor off-farm ($X_m = 0$). The composition of the new optimal portfolio, C, is more risky than that of portfolio B and, considering the farmer's risk preferences, C is too risky to produce given current OFI opportunities (thus line 3 is dashed).

In sum, higher OFI opportunities lead to the production of more-risky crops and a "hedge ratio" involving more household labor being allocated off-farm. This can be seen by substituting higher values for R_f into equation 3.

Effects of Farm Size

Two of the variables on the right side of equation 3, GR_m and σ^2_m, are both functions of farm size. A farmer's gross revenues from producing the optimal enterprise portfolio obviously are expected to increase when that portfolio is produced on more acres. The variance of those returns is also expected to increase as farm size increases. It is easily seen that higher values of GR_m in equation 3 result in more labor being allocated on-farm, while higher values for σ^2_m encourage more labor to be allocated off-farm. Thus, in the simplest case, larger farm sizes can have either more or less household labor allocated off-farm, compared to decisions made by the same person when operating a smaller farm.

However, the simple case ignores economies of scale. One of the incentives for farmers to expand the size of their operations is the increased production and management efficiencies that lower production costs per unit, thus increasing profit margins. In other words, it is expected that economies of scale improve the return-risk tradeoff facing operators of increasingly larger farms. That means the value of X_m in equation 3 is expected to grow as farm size grows. This theoretical result is consistent with observed behavior of American farmers: a smaller portion of household labor is allocated off-farm by farms of increasingly larger size (Lee and Blank; Yee, Ahearn and Huffman).

This is illustrated graphically in Figure 2. There are three EV curves in the figure to represent three farms of different sizes, EV_1 being the smallest and EV_3 being the largest. The three curves are drawn so as to illustrate the two ideas mentioned above. First, the fact that returns and risk are positively correlated is shown by the position of each successive EV, from 1 to 3, being drawn above and to the right of previous curves. Second, the efficiency gain from larger sized farms is shown by having larger farms able to earn higher returns at the same levels of risk as available to smaller farms. In other words, a vertical line from the x-axis that intersects two or three of the EVs identifies portfolios (at the points of intersection with each of the EVs) that have identical levels of risk exposure, but have higher returns for larger farms. The effects of farm size on farm labor allocations are illustrated with three OLs drawn from a single off-farm income opportunity, R_1, tangent to the EVs to identify the optimal portfolio for each farm size at the points labeled A, B and C. This shows how a single farmer would react if he or she were operating farms of different sizes.

Figure 2. Off-Farm Income and Farm Size Effects.

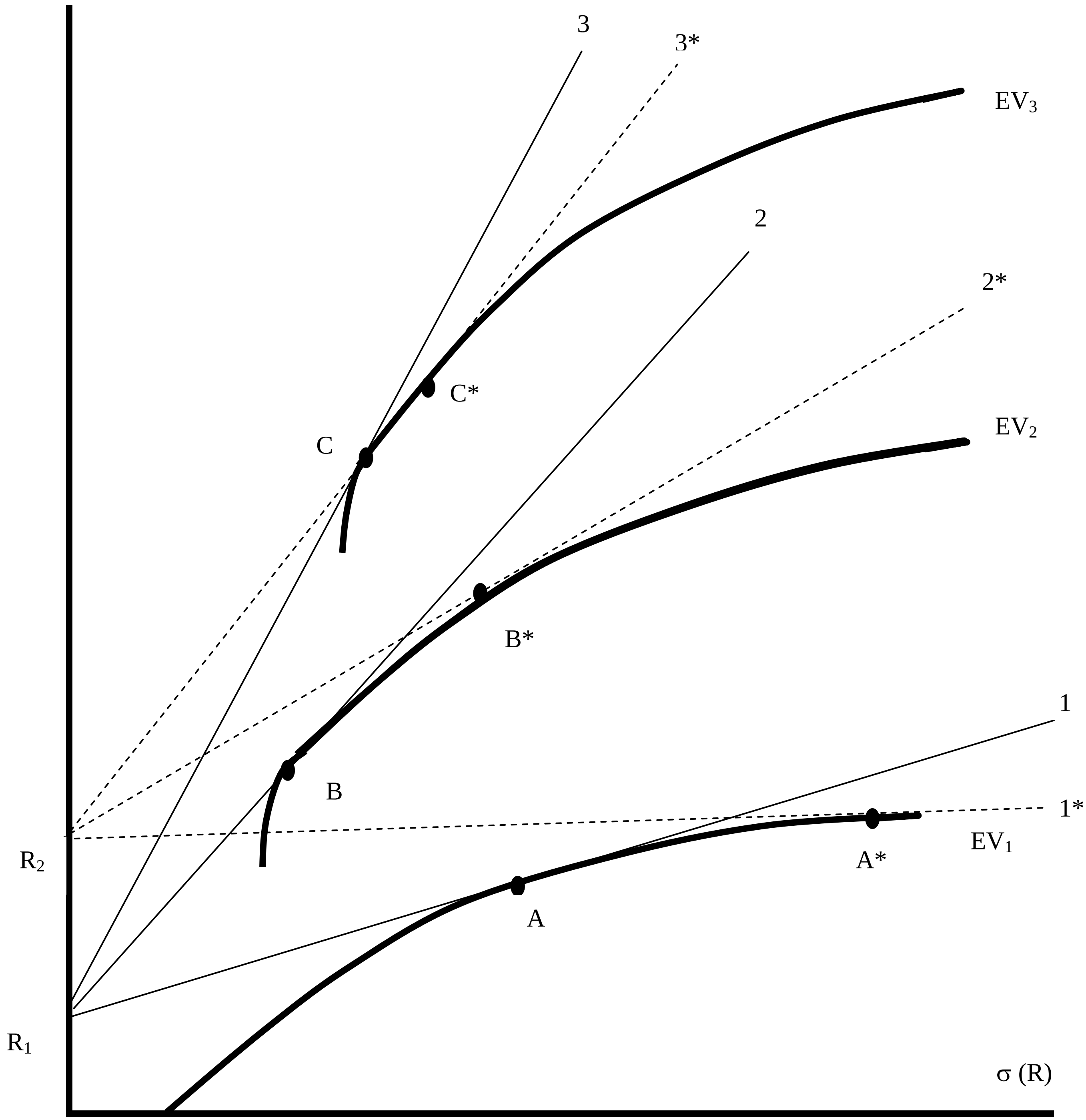


Figure 2 also illustrates the theoretical result that increases in OFI opportunities cause farmers in the aggregate to produce more-risky crops (as shown in Figure 1), but the scale of changes in production risk exposure and a farmer's reaction to it vary across farm sizes. For example, a change in OFI opportunities from R_1 to R_2 shifts the optimal portfolio from points A, B and C to points A*, B* and C*, respectively. It is clear in Figure 2 that the new optimal portfolios are each more risky than the original portfolios, but the amount of increase in production risk exposure between the pairs of points (measured by the horizontal distance between the points, e.g., between A and A*) is smaller with larger farm sizes. As a result, the points of tangency between the new opportunity lines (1*, 2* and 3*) and the farmer's indifference curves indicate much different hedge ratios across the farm sizes. If it is assumed that the tangency point for OL 1* is at R_2 on the vertical axis, all labor would be allocated off-farm by the farmer. That same person, however, would not allocate all labor off-farm if he or she was operating the farm represented by OL 2*. Finally, even less labor would go off-farm if the person was operating the largest farm.

Empirical Analysis

The main hypothesis raised in the discussion above was tested empirically with farm household survey data. Specifically, the significance of OFI to household wealth was assessed across farm sizes.

Off-farm income is expected to be important to a farm household because it is a source of wealth (Koenigstein and Lins). Wealth changes (measured by changes in a farmer's total equity) during a period of time ending at t are expected to consist of some function (j) of farm income (FInc) plus off-farm income (OFInc) plus capital gains (ΔK) minus consumption (C). Thus, at the time that production and investment decisions must be made, t, the resulting expectations for changes in wealth are

$$(4) \qquad E_t(\Delta W_{t+1}) = f_j(FInc_t + OFInc_t + \Delta K_t - C_t).$$

The components on the right-hand side of equation 4 are themselves functions of other factors. For example, the capital variable (K) is a function of many other factors, including farm size. It can be expressed as the sum of the market values for all assets (farm real estate, nonreal estate, and non-farm assets) held by a person at time t. Those assets, such as farm real estate, may have market values based on factors such as expected farm income. Thus, a reduced form of equation 4 can be estimated over time for farms of different sizes to determine whether OFI does, in fact, play a significant role.

Equation 4 was estimated using farm-level data from the U.S. Department of Agriculture's Agricultural Resource Management Survey (ARMS). It was estimated using repeated cross-sectional data from annual surveys for 1996-2004 over the ten production regions making up the 48 contiguous states: the Northeast, Lake States, Corn Belt, Appalachia, Southeast, Delta, Southern Plains, Northern Plains, Mountain, and Pacific (the last four of those regions are "the West").[2] Then, factors affecting the change in wealth were examined, given farm size and time effects. A total of 95,517 observations were used following the jackknifing procedure described in Kott.

The farm-level data were assigned to three size categories, based on the USDA's farm typology groups (Hoppe and MacDonald). Farm size 1 includes "limited resource," "retirement," and "residential" farms. These farms all have total sales of less than $250,000 per year (most have

[2] The ARMS data, as a whole, are designed to give a representative "snap shot" of American agriculture each year, not a detailed assessment of any particular crop, state, or production region. Hence, this study is general in its focus and does not try to assess any particular group of households.

less than $100,000 per year) and the operators may report farming, a non-farm occupation, or retirement as their major occupation. Farm size 2 includes typologies “farm/lower sales” and “farm/higher sales.” Their total annual sales are less than $100,000 or less than $250,000, respectively, but farming is the operator’s primary occupation. Farm size 3 covers the typologies “large family farms” and “very large farms” that have annual sales of $250,000 and more.

The nominal values of the monetary variables were deflated by the GDP implicit price deflator using the year 1996 as the base. Variables presented in Table 2 are in year 1996 dollars.

It is clear from the results in Table 2 that Size 1 households have focused some of their investment activities off the farm. Farm and non-farm capital gains were both significant sources of wealth for small-sized farms. Medium- and large-sized farms derive wealth only from gains on their farm capital, which is most likely their land. Equation 4 was estimated with variables representing capital gains coming from both farm and non-farm capital, although about 75% of farm household wealth is held in the form of farmland. Both capital components were highly significant when examining changes in farm wealth for farm size 1 (Table 2).

Medium- and large-sized farms both derive wealth from gains on their farm capital only, which indicates that larger farms cannot afford to invest much money off-farm. Neither farm nor off-farm income were significant for any farm size, thus indicating that capital gains dwarf earned income. Therefore, wealth comes from capital, not income, for all farms. This result partially explains why farms that lose money each year on their production stay in agriculture: if their capital gains exceed their operating losses, the farm is increasing the wealth of its owners.

Table 2. Change in Wealth Estimation Results by Farm Size (1996-2004).

	Farm Size 1		**Farm Size 2**		**Farm Size 3**	
Variable	**Estimate**	**t statistic**	**Estimate**	**t statistic**	**Estimate**	**t statistic**
FarmInc	-0.653	-0.92	-0.039	-1.31	-0.149	-1.08
NonFarmInc	0.009	0.11	0.077	1.54	-0.111	-0.72
ChngFarmCap	1.113	10.09***	1.018	40.74***	1.100	86.85***
ChngNFarmCap	0.318	20.09***	0.100	1.09	0.299	1.64
Consumption	0.516	1.01	-0.089	-1.21	0.313	0.89

***, **, and * denote statistical significance at the 0.01, 0.05, and 0.10 confidence levels. NS denotes “not significant.”
Farm Size 1 corresponds to limited resource, retirement, and residential farms. Farm Size 2 corresponds to farm/lower sales and farm/higher sales. Farm Size 3 includes large family farms and very large farms.

The 2002 Census of Agriculture (USDA 2004) reports that 53.3% of all farms generated a net loss for the year, although the average household earnings from farming activities for that year were $3,477 (Table 1). Mid-sized farms are likely to fall in the middle of the farm income distribution, which offers insufficient income to support a family, but those farms are not big enough to substitute much skilled hired-labor for family labor that might work off the farm (as large-sized farms can do). This leads to the ironic conclusion that the households that need the income-risk-reducing effects of OFI the most (operators of mid-sized farms), are generally the least able to pursue OFI. The resulting higher risk exposure of mid-sized farms would make them more likely to be forced out of business over time, even compared to small-sized farms.[3]

Economies of Scale and Household Off-Farm Income

The model presented in this paper implies that there may be a negative relationship between economies of scale and the portion of a household's total income coming from off-farm sources. In other words, larger farms are expected to achieve economies of scale in agricultural production that improve profit margins, thus creating an incentive to allocate more household labor on-farm than would be allocated by a smaller farm producing the same commodities. This hypothesis was evaluated using 2003 ARMS data, shown in Table 3. Average values for each region in the United States were calculated by farm size for two factors. The first factor is the average income per acre coming from agricultural production. The second factor is the average percentage of total household income coming from off-farm sources. It is clear that the data support the hypothesis; the correlation between the two factors is -0.83. The farm profit per acre increases with farm size across all regions, while larger farms earn a smaller portion of total household income from off-farm sources. Apparently, the West is no different than other parts of the country in this regard.

Table 3. Regional Averages by Farm Size, 2003.

	Farm Income per acre ($)			OFI as % of Total Household Income		
REGION	**Farm Size 1**	**Size 2**	**Size 3**	**Farm Size 1**	**Size 2**	**Size 3**
Northeast	-97.59	8.55	117.29	112	97	36
Lake States	-20.22	44.46	74.26	104	74	31
Corn Belt	-9.69	34.42	68.52	102	74	30
Appalachia	-28.39	30.18	166.97	105	88	25
Southeast	-26.15	42.73	184.33	105	86	30
Delta	-28.92	19.02	118.36	106	85	24
Southern Plains	-26.11	1.17	54.71	110	98	32
Northern Plains	1.40	12.48	35.56	99	71	22
Mountain States	-9.35	5.58	22.41	107	76	24
Pacific	-62.62	25.31	115.10	109	81	21

Source: Calculated from USDA ARMS data

This simple assessment is not a complete test of the hypothesis, but it does make sense. Small farms have more incentive to invest household labor off-farm than do larger farms. This result is also consistent with the safety-first hypothesis of household labor allocation: labor is allocated first to the least risky source of income until sufficient income has been earned, and thereafter labor is allocated so as to maximize household utility. This means that until total income is

[3] Many owners of financially stressed mid-sized farms may opt to reduce their scale of operations to "small-sized" farms, enabling them to shift some household labor off the farm, rather than leaving farming entirely. Ironically, this shift may lead to much higher household income because of the significant contributions available from OFI, as indicated in Table 1. However, in regions with few opportunities for OFI, households unable to maintain their mid-sized farms may have no choice but to exit agriculture entirely.

sufficient to assure that the bills are paid, a household allocates its labor to the activity most likely to provide a positive return to labor. In most cases, the least risky income source is off-farm employment (assuming it is available). After the bills are paid, household labor is allocated to the activities that bring the most utility, adjusted for risk. Thus, for a person who wants to live and work in agriculture, the marginal return to (presumably less-desirable) off-farm employment goes down as total household income increases above the amount needed to pay the bills, enabling the person to allocate more time to his/her preferred vocation in agriculture. Therefore, OFI truly serves as a hedging tool in a safety-first context with generally smaller optimal hedge ratios expected for larger sized farms.

Summary and Policy Implications

This study uses portfolio theory to evaluate the effects of off-farm income levels on farmers' production and investment decisions. An "optimal hedge ratio" of farm household labor allocated on- and off-farm is derived from a simple model of hedging with off-farm income. It is found that off-farm income opportunities have direct and indirect effects on cropping decisions and farm household wealth.

Farm size is shown to have significant effects on production and investment decisions through the improved return-risk tradeoff coming from economies of scale. As a result, large farm operators are expected to pursue fewer OFI opportunities than are small farm operators.

The results from the simple model presented here have some significant theoretical implications for both American agriculture and policy. First, hedging with OFI makes agriculture more risky in that the composition of enterprise portfolios produced by individuals with off-farm income is more risky than the portfolios of enterprises those people would produce if they did not have OFI. In other words, total output of "risky" enterprises increases with OFI. Second, hedging with OFI enables many risk-averse farmers to remain in agriculture longer than they would without OFI. Third, as OFI increases as a proportion of total household income, it facilitates hysteresis in that farmers become less likely to diversify or to use other risk-reducing strategies (Mishra and El-Osta). This, in turn, makes markets less responsive and agricultural policies aimed at market operations less effective.

The empirical results provide evidence that OFI appears to affect farm household wealth, but possibly not in the way expected. The data in Table 1 show that OFI amounts are far larger, on average, than are annual farm income amounts. However, the results in Table 2 show that farms are not significantly aided by OFI, on average, in building wealth. This means income, in absolute amounts, was small compared to capital gains. Therefore, the contribution of OFI to farm household efforts to build wealth may be indirect, rather than direct. OFI enables farm households to "pay the bills" while capital gains accumulate over time through the appreciation of farm capital – mostly farmland.

In summary, hedging with off-farm income is effective in reducing farm households' level of risk exposure, but the increase in its use makes clear there is a need for a new agricultural policy perspective. When a majority of farmers voluntarily stay in agriculture despite low or negative profits, production or investment policies based on profit-maximizing behavior by all farmers are obviously inappropriate. New policies must incorporate the wealth- and utility-maximizing perspectives of today's American farmers.[4] For example, policies intending to stimulate investments in small "hobby" farms will be ineffective for the nation because there is little incentive for most of those households to expand their agricultural operations. However, policies that direct resources to mid- and large-sized farms and their potential for farm capital gains may generate the best production and investment results for American agriculture.

References

Blank, Steven C. Summer 2002. Is Agriculture a 'Way of Life' or a Business? Choices 17(3):26-30.

El-Osta, H. and M. Ahearn. March 1996. Estimating the Opportunity Cost of Unpaid Farm Labor for U.S. Farm Operators. USDA Economic Research Service, Technical Bulletin No. 1848.

Hoppe, R. and J. MacDonald. May 2001. America's Diverse Family Farms: Assorted Sizes, Types, and Situations, ERS Agriculture Information Bulletin No. 769. Available online: http://www.ers.usda.gov/publications/aib769/.

Johnson, S. 1967. A Re-Examination of the Farm Diversification Problem. Journal of Farm Economics 49(3):610-621.

Koenigstein, K. and D. Lins. 1990. Measuring Farm Sector Wealth and Income: Data Comparisons for Illinois Farms. North Central Journal of Agricultural Economics 12 (2):305-318.

Kott, P.S. 2005. Using the Delete-A-Group Jackknife Variance Estimator in NASS Surveys. U.S. Department of Agriculture, National Agricultural Statistics Service, NASS Research Report, RD-98-01 Washington DC.

Lee, H. and S. Blank. July 2004. A Statistical Profile of Horticultural Crop Farm Industries in California. Giannini Foundation Research Report 348, University of California.

Mishra, A. and H. El-Osta. 2004. Factors Affecting Farm Enterprise Diversification. Agricultural Finance Review 64(2):155-166.

Mishra, A., H. El-Osta, M. Morehart, J. Johnson and J. Hopkins. July 2002. Income, Wealth, and the Economic Well-Being of Farm Households. USDA Economic Research Service, Agricultural Economic Report Number 812.

U.S. Department of Agriculture. August 2006. Farm Income and Costs: Farm Income Forecasts. Economic Research Service Briefing Room. Available online: http://www.ers.usda.gov/Briefing/FarmIncome/data/Hh_t5.htm.

_____. June 2004. 2002 Census of Agriculture, Volume 1, Geographic Area Series Part 51, AC-02-A-51, National Agricultural Statistical Service.

[4] As a reviewer pointed out, "tax policies are also a major influence on farmer behavior, especially in [the] first category. In fact, tax policy could dominate agricultural policy in many producers' decision-making."

U.S. Department of Agriculture, Economic Research Service (USDA/ERS), Agricultural Resource Management Survey, Phase III and Farm Costs and Returns Surveys for 1996 through 2004.

Yee, J., M. Ahearn and W. Huffman. 2004. Links Among Farm Productivity, Off-Farm Work, and Farm Size in the Southeast. Journal of Agricultural and Applied Economics 36(3):591-603.