Decomposition of Variability in Farm Household Assets and Debt

Ashok K. Mishra and Hisham S. El-Osta

Farm families often hold large quantities of wealth and, like any other family, assess their financial progress by reviewing their net worth (or wealth) position periodically. Wealth has an impact on many decisions such as production, retirement, and succession of the farm. Households, in general, seek stability growth in wealth and, ideally, income as well. In the case of wealth, farm households will be better equipped to handle variability once the contributing sources are identified. This study measures how much of the variability in farm household assets and debt is attributed to the variability in farm and nonfarm sources of assets and farm and nonfarm sources of debt. Using a normalized variance decomposition approach and data from the Agricultural Resource Management Survey (ARMS), results show that origin of asset and debt variability differs with farm size and location of the farm household.

Key Words: assets, debt, farm households, variability, variance decomposition

Policy analysts, farm investors, and lenders are among those interested in monitoring and forecasting the economic well-being of the farm sector and farm households. Historically, most attention has focused on farm incomes. Over the past six decades, a variety of agricultural programs, such as price supports and production controls, have been used to enhance farm income received by farm households. In fact, social fairness or economic equity was one of the arguments for these transfer payments (Halcrow, 1953; Robinson, 1989). However, examining a measure of wealth provides a complete evaluation of economic equity (Hill, 2000). Wealth is a difficult-to-measure but critical component among the factors that determine the economic position of the agricultural community (Mishra et al., 2002). Two individuals with low money incomes, one with substantial wealth (defined as farm household net worth measured as total assets minus total debt; see figure 1), and the other having little, would be economically dissimilar. Yet, in analyses of household well-being based only on income statistics, these two individuals would be treated comparably.

| **Farm Assets** |
| Land and buildings |
| Farm equipment |
| Financial assets |
| Other farm assets |

| **Nonfarm Assets** |
| Cash, checking, CDs, money market accounts |
| IRA, 401K, Keogh and other retirement accounts |
| Corporate stock, mutual funds, and cash value of life insurance |
| Other nonfarm assets |

Farm Net Worth
‖
Farm Assets *minus* **Farm Debt**

Nonfarm Net Worth
‖
Nonfarm assets *minus* **Nonfarm debt**

| **Farm Debt** |
| Real estate debt |
| Non-real estate debt |
| Short-term debt |
| Long-term debt |

| **Nonfarm Debt** |
| Nonfarm business debt |
| Car payments |
| Credit card debts |

Farm Household Net Worth
‖
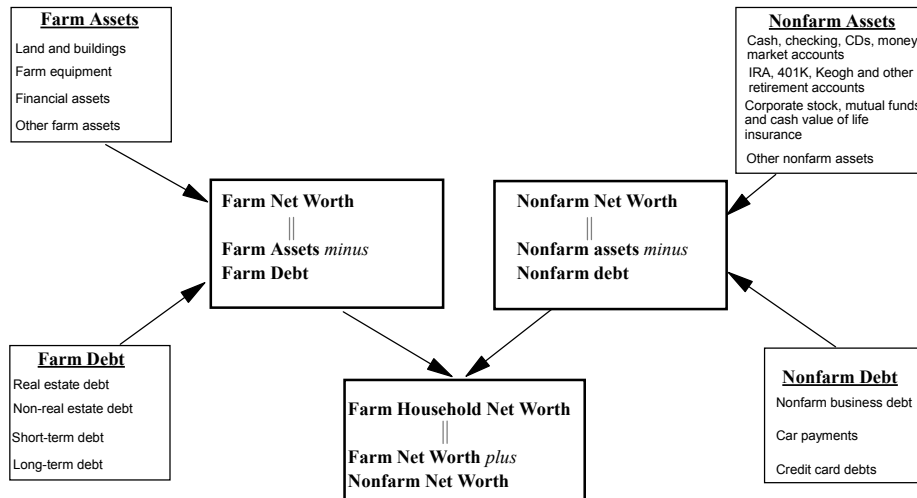**Farm Net Worth** *plus* **Nonfarm Net Worth**

Figure 1. Sources of household wealth

Farm households are different from all other households (and other entrepreneurial households) when it comes to income and wealth. The income and wealth of farm households originate from multiple sources. For example, farm household income is derived from farming as well as from working off the farm. Similarly, farm households have assets owned by the farm business as well as nonfarm investment assets. To put a perspective on farm household net worth, one must clearly define its composition. Figure 1 provides a detailed description of the components that are needed to calculate farm household net worth. Farm household net worth is the sum of farm net worth (defined as the value of farm assets minus the value of farm debt) and nonfarm net worth (defined as the value of all nonfarm assets minus the value of all nonfarm debt). Nonfarm debt includes all debt that is not related to the farm business, such as credit card debt and mortgages on private houses and property not related to the farm business.

Since farm families derive income from various sources, farm income may be a poor indicator of the economic well-being of particular farm households. Farm households often have large asset holdings. Farm households' wealth, measured as proprietors' equity (current market value of assets minus debt) amounted to nearly one trillion dollars in 1999 (table 1). The vast majority of this wealth (87%) is controlled by farm households organized as sole proprietorships, which also manage 93% of farming units. The average net worth of farm families in the United States in 1998 was about twice that of all U.S. families and related individuals. Specifically, the average net worth of all U.S. families and related individuals in 1998 (most recent data) was $282,500 (Kennickell, Starr-McCluer, and Surette, 2000), whereas the average net worth of U.S. farm families was $492,195 (USDA, Agricultural Resource Management Survey, 1998, table 1).

Table 1. Sector- and Farm Household-Level Balance Sheet, Nominal Values for 1996, 1998, and 1999 (dollars)

Unit	1996	1998	1999
Sector Level:			
Farm Assets	1,002,916,227	1,083,137,617	1,138,826,915
Farm Debt	148,572,756	164,626,313	167,696,144
Equity	854,343,471	918,511,314	971,130,770
Farm Household Level:			
Farm Net Worth	332,861	408,377	389,498
Nonfarm Net Worth	71,587	83,818	174,064
Total Household Net Worth	404,448	492,195	563,562

Sources: Sector-level financial assets, debt, and equity are obtained online from: http://www.ers.usda.gov/data/FarmBalanceSheet/Fbsdmu.htm. Farm household balance sheet data are from Agricultural Resource Management Surveys (ARMS), 1996, 1998, and 1999.

The objective of this study is to measure how much of the variability in total farm household assets and debts (farm and nonfarm) is due to each of its components for 1996 and 1999. The analysis is conducted by size (farm typology) and location of the farming operation (farming region). Farm assets include land and buildings, farm equipment, and other farm assets, whereas nonfarm assets include savings and 401K accounts, retirement, SEP and Keogh plans, stocks and bonds, and other off-farm investments.[1] This objective will be accomplished using the method of normalized variance decomposition.

Given the importance of assets and debt, determining sources of variability in assets and debt of farm households will contribute to an improved understanding of: (*a*) policies that influence income and underpin farm real estate values, (*b*) the vulnerability of farm businesses and farm households to changes in the general economy versus changes in agricultural prices (both inputs and outputs) that will be influenced by the degree to which the farm business and farm household are diversified, (*c*) the impact of off-farm investment on the financial success of the farm business and household income, and (*d*) the issues involved with retirement planning and the life-cycle behavior of farmers.

Review of Previous Studies

The literature on distribution of wealth in agriculture appears to be limited (Ahearn, Johnson, and Strickland, 1985; Ahearn, Perry, and El-Osta, 1993; Weldon, Moss, and Erickson, 1993; El-Osta and Morehart, 2002). Ahearn, Perry, and El-Osta (1993), using data from the 1988 Farm Costs and Returns Survey (FCRS) in conjunction

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[1] The 1996 Agricultural Resource Management Survey (ARMS) does not contain detailed nonfarm assets information like that provided in the 1999 ARMS. Therefore, nonfarm assets are all lumped together.

with published 1988 data from the U.S. Department of Commerce, compared the wealth distribution of U.S. farm businesses to that of all U.S. households. As shown by their results, not only was wealth greater for farm businesses (on average), it was also more equally distributed than among nonfarm U.S. households. Weldon, Moss, and Erickson (1993) investigated wealth inequality with national- and state-level data using Theil's entropy measure of inequality in wealth. Their findings point to the importance of factors such as farm income, government payments, and increased off-farm income in generating a more equitable wealth distribution. Although these studies did not examine the issue of decomposition of household wealth into its two components (farm and nonfarm assets), they nonetheless provide substantive discussion on the subject of the origins of farm wealth and of corresponding implications for public policy.

El-Osta and Morehart (2002) used data from the 1996 and 1999 ARMS surveys to examine the distribution of wealth among farm households. Their findings showed that the distribution of wealth (farm and nonfarm equity as two components of household wealth) in 1999 was slightly more equal than in 1996, with the farm wealth component contributing significantly more toward measured inequality in both years than the nonfarm wealth component. However, the El-Osta and Morehart study did not disaggregate farm wealth and nonfarm wealth into individual sources.

In another study, Hepp (1996) provides a comparison of returns from investing in Michigan farmland to a wide range of nonfarm investments. His findings point to the superiority of land investments over a long period of time compared to the nonfarm alternatives considered. Wunderlich (1984) offers an intriguing portrayal of the notion of fairness in landownership and distributive justice as they relate to measurement of income and wealth.

Various studies have examined the contribution of income from off-farm sources to the distribution of total personal income of farm operator households (Bryant and Zick, 1985; Ahearn, Johnson, and Strickland, 1985; Findeis and Reddy, 1987; Reddy, Findeis, and Hallberg, 1988; El-Osta, Bernat, and Ahearn, 1995). Mishra and El-Osta (2001) reported the results from one of the first studies investigating the sources of variability in total farm household income (farm and off-farm income). They concluded that the greater source of variability in total household income depended on the major source of income. For example, if the household derived the majority of its income from farming, then a larger portion of variability originated from farm income. Likewise, if the household derived the majority of its household income from off-farm sources, then a larger portion of variability originated from off-farm income.

Most of the above studies focused on the distribution of income or variability in total household income; those that considered wealth did not examine the relative contribution of components to the variability in farm household assets and debts. The study by Weldon, Moss, and Erickson (1993) examined inequality in farm sector wealth and discussed possible reasons for the observed inequality. The authors used Theil's measure of inequality (entropy) to measure inequality at the sector, region, and within-region levels of wealth. Further, they decomposed the

inequality into between- and within-region inequalities and found that inequality in farm wealth at the sector level decreased during the 1960–75 period. Moreover, farm wealth distribution by state was found to be more consistent with the distribution of farms by state.

This study differs from earlier efforts in several ways. First, farm household-level data are used. Second, the variability in household assets and debts is decomposed into its components. Third, the database includes more information, i.e., information on farm and nonfarm assets and debts, than any other studies have previously reported. Finally, two different years, 1996 and 1999, are used to compare the sources of variability in farm household assets and debts. The amount of assets and debt held by households and the rates at which they accumulate it are important indicators of family economic well-being and financial progress. Furthermore, the form in which wealth is held provides a good measure of how effectively farm households are able to respond to financial crises.

Decomposing Household Assets and Debt

Farm household wealth is derived from a variety of sources. It ranges from physical assets of both the business and household to various types of financial assets, all differing in degree of liquidity. For example, wealth held in a bank account is highly liquid and visible. In contrast, wealth held in real estate is illiquid, or not readily available on demand. Wealth not only reflects the collective value of assets, but also considers the business and consumer debt of households. Distinguishing among the various sources of farm household wealth allows a more comprehensive assessment of household well-being.

Household wealth may be acquired through savings, inheritance, or appreciation of household assets. Farm household wealth combines farm assets (minus farm debt) and nonfarm assets (minus nonfarm debt). In 1996, the total net worth (measure of wealth in nominal terms) of an average farm household was $404,448, with farm net worth comprising 82% (table 1). By 1999, a farm household averaged $563,562 in total net worth, with farm net worth contributing 69%. The dramatic increase in the share of nonfarm wealth, which is partly attributed to a strong economy, may also indicate that farm households are becoming more astute at recognizing the opportunity for higher returns from their stock of wealth by investing off-farm. The low interest rates and rapid economic growth of the 1990s was especially favorable to wealth accumulation.

Farm household wealth is dominated by farm real estate (76%), while physical assets (e.g., nonfarm real estate, off-farm houses, recreational vehicles, etc.) constitute the biggest share of nonfarm wealth (31%). Farm assets include land and buildings, farm equipment, and other farm assets. Nonfarm assets (for 1999) include savings accounts (checking, money market, and savings bond), retirement accounts (IRA, SEP, 401K, and Keogh plans), corporate stocks, mutual funds, and other off-farm investments.

To minimize the variability in farm household assets and debts in each of the subgroups (farm typology and region), the factors are identified that contribute most to the variance of total assets and debt. Let total assets[2] of the ith farm household ($TASST_i$) be described as:

$$(1) \qquad TASST_i = \sum_{g=1}^{k} X_{g,i}, \quad (i = 1, ..., n),$$

where $X_1, ..., X_k$ are real estate, farm equipment and other farm financial assets, and other farm and nonfarm assets including savings accounts (checking, money market, and savings bond), retirement accounts (IRA, SEP, 401K, and Keogh plans), corporate stocks, mutual funds, and other off-farm investments. The number of asset components (k) is five in 1996 and eight in 1999. Finally, n represents sample size (number of farms = 6,491 for 1996, and 5,481 for 1999). The variability in $TASST$ is measured as:

$$(2) \qquad \sigma_{TASST} = \begin{bmatrix} \sigma_{11} + \sigma_{12} + \sigma_{13} + ... + \sigma_{1k} + \\ \sigma_{21} + \sigma_{22} + \sigma_{23} + ... + \sigma_{2k} + \\ \sigma_{31} + \sigma_{32} + \sigma_{33} + ... + \sigma_{3k} + \\ \vdots \qquad\qquad ... \\ \sigma_{k1} + \sigma_{k2} + \sigma_{k3} + ... + \sigma_{kk} \end{bmatrix},$$

where σ_{TASST} is the weighted[3] variance of $TASST$, σ_{gg} and σ_{gh} ($g \ne h$) are the weighted variance of component X_g ($g = 1, ..., k$) and the weighted covariance of components X_g and X_h, respectively. The variability of $TASST$ as described in equation (2) is approximated by the sum of variance-covariance effects attributed to the components of $TASST$. The relative importance of the additive components of $TASST$ to the variability in $TASST$ is measured by:

$$(3) \qquad \begin{cases} C_1 = \left[\left(\sigma_{11} + \sigma_{12} + \sigma_{13} + ... + \sigma_{1k}\right)\big/ \sigma_{TASST}\right](100 \\ C_2 = \left[\left(\sigma_{21} + \sigma_{22} + \sigma_{23} + ... + \sigma_{2k}\right)\big/ \sigma_{TASST}\right](100 \\ \vdots = \qquad\qquad (...) \\ \vdots = \qquad\qquad (...) \\ C_k = \left[\left(\sigma_{k1} + \sigma_{k2} + \sigma_{k3} + ... + \sigma_{kk}\right)\big/ \sigma_{TASST}\right](100 \end{cases},$$

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[2] A similar analytical framework is constructed for the debt side of the household. We will present the asset side of the household balance sheet.

[3] Because the Agricultural Resource Management Survey (ARMS) is a probability weighted random survey, the weighted least squares method of estimation was used in order for the estimated parameters to be reflective of the population of farm households rather than just of households in the sample.

where $C_1, \ldots, C_k$ are relative percentage measures of the contribution of household asset components to the normalized variance of *TASST* (Φ_{TASST}), respectively. The summation of these relative measures yields unity as in:[4]

$$(4) \qquad\qquad \Phi_{TASST} = \sum_{g=1}^{8} C_g = 100.$$

Because any particular asset component X_g ($g = 1, \ldots, k$) may be negatively correlated with some or all of the other asset components, it is possible that some of the C_g's will be negative. This can occur when the value reflecting the sum of the correlations σ_{gh} ($g \ldots h$) is negative and its absolute value is larger than σ_{gg}.

Data Description

The financial accounting concept defines the elements of financial statements for business enterprises and households.[5] Based on Farm Financial Standards Task Force recommendations, the sources of farm assets include: (*a*) real estate; (*b*) farm equipment; (*c*) other financial assets (such as investment in cooperatives, prepaid insurance, etc.); and (*d*) other assets (such as breeding stock, crop and livestock inventory, purchased inputs, etc.). Nonfarm assets include savings, money market accounts, stocks and bonds, etc. Sources of farm debt include: (*a*) real estate; (*b*) non-real estate; (*c*) short-term debt (i.e., loans less than one year, accrued interest, accounts payable, and the current portion of term debt); (*d*) long-term debt (i.e., non-current real and non-real estate debt). Nonfarm debt includes all debt incurred by the farm household not related to the farm business.

The 1996 and 1999 Agricultural Resource Management Surveys provide the database for this analysis. The 1996 ARMS was chosen because that year marks the beginning of the Freedom to Farm Act. The 1999 ARMS is the only survey available that contains information on the components of nonfarm assets such as monies invested in different savings accounts, retirement plans, and stocks and bonds. The ARMS, conducted annually by the Economic Research Service and the National Agricultural Statistics Service, uses a multi-phase sampling design and allows each sampled farm to represent a number of farms that are similar. This number is known as the survey expansion factor (see Kott, 1997; Dubman, 2001, for more technical detail). The expansion factor, in turn, is defined as the inverse of the probability of the surveyed farm being selected. The expansion factor can also be referred to as the observation's weight. Each version of the ARMS has a unique expansion factor that expands to the target population. The ARMS collects data to measure the financial conditions (farm income and expenses) and operating characteristics of farm businesses, the cost of producing agricultural commodities, and the well-being of farm operator households.

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[4] The method described here is an adaptation of the method of coefficient of separate determination (see Ezekiel and Fox, 1959; Burt and Finley, 1968).

[5] In its recommendations published in *Financial Guidelines for Agricultural Producers* (Forbes, 1991), the Farm Financial Standards Task Force (FFSTF) sets forth a minimum set of requirements for a financial statement that should include balance sheet and income statement information and use financial accounting concepts.

Defining the Farm Typology

**Small Family Farms
(sales less than $250,000)**

Other Farms

- *Limited-Resource Farms.* Small farms with sales less than $100,000, farm assets less than $150,000, and total operator household income less than $20,000. Operators may report any major occupation, except hired manager.

- *Retirement Farms.* Small farms whose operators report they are retired.*

- *Residential/Lifestyle Farms.* Small farms whose operators report a major occupation other than farming.*

- *Farming Occupation Farms.* Small farms whose operators report farming as their major occupation:*
  - < *Lower Sales.* Sales less than $100,000.
  - < *Higher Sales.* Sales between $100,000 and $249,999.

- *Large Family Farms.* Farms with sales between $250,000 and $499,999.

- *Very Large Family Farms.* Farms with sales of $500,000 or more.

- *Nonfamily Farms.* Farms organized as nonfamily corporations or cooperatives, as well as farms operated by hired managers.

*Excludes limited-resource farms whose operators report this occupation.

Figure 2. Economic Research Service farm typology

The U.S. farm sector consists of a highly diverse set of businesses and farm households committed to living in rural areas and engaging in farm economic activities. Since the early 1900s, USDA analysts have sought to identify patterns in U.S. farming that might further the understanding of differences in financial performance of farms and the economic well-being of farm households. In 1998, the Economic Research Service (ERS) developed a farm typology (figure 2), categorizing farms into more homogeneous groups—i.e., based primarily on annual sales of the farms and the occupation of their farm operators—than a classification based on sales volume alone. Compared with classification by sales alone, the ERS typology group reflects operators' expectations from farming, position in the life-cycle, and dependence on agriculture. Using more homogeneous categories based on a few key characteristics can help decision makers target policy measures more appropriately, including policy measures seeking to support income, stabilize commodity supplies, and protect natural resources.

The climatic, soil, water, and topographical characteristics of geographic areas tend to constrain the number and types of crops and livestock that can be grown or raised. County clusters, based on types of commodity produced, have shown a tendency for a select few commodities to dominate the production landscape of geographic areas that cut across traditional political boundaries. The regions used in this study merge information about characteristics of land areas with information about types of
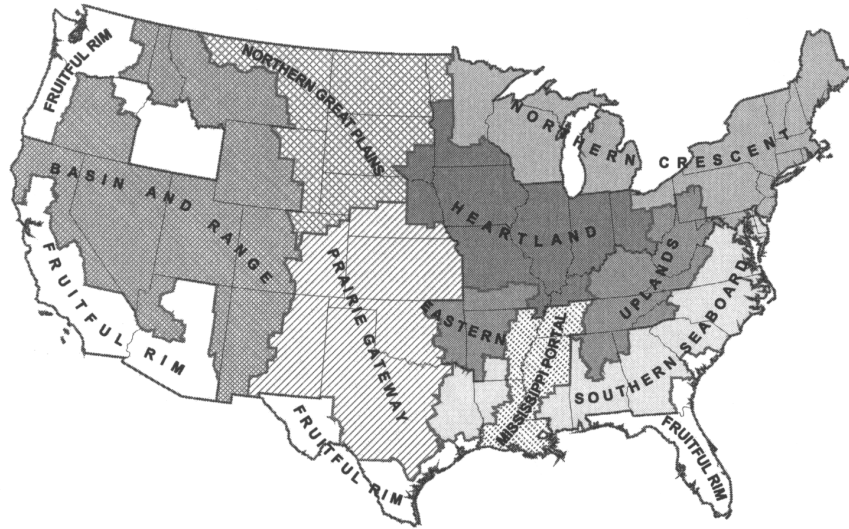
Figure 3. U.S. farm resource regions

commodities produced to delineate geographic areas that, while cutting across state boundaries, are more homogeneous with regard to both resource and production activities. Based on this classification, there are nine U.S. farm regions (figure 3).

Results

Tables 2–5 present the decomposition of variance in farm household assets and debt for 1996. In general, the majority of the variability (almost 80%) in farm household assets originates from real estate (table 2). However, the source of variability changes once farm size is taken into consideration. For example, in the case of limited-resource and retirement farm households, variability in nonfarm assets plays an important role in asset variability. This is not surprising since off-farm income contributes significantly more to the total household income for these households. The results are consistent with the findings of Mishra, El-Osta, and Steele (1999), and show that among farm households having farming as their main occupation (farming occupation/higher sales, large, and very large farms), variability in real estate is the major contributor to variability in household assets. These households are actively engaged in farming and have significant investment, such as land and farm equipment, tied to the farm. A case in point is the group of farm operator households identified as very large farms (annual farm sales over $500,000). While these households represent less than 3% of farms, they account for half of all farm output. As a share of household wealth (between farm and nonfarm sources), their farming component was highest among all groups, at 86%. In comparison, limited-

Table 2. Normalized Variance Decomposition of Farm Operator Household Assets (Farm and Nonfarm) by Farm Typology, 1996 (percent)

Sources of Assets	Limited-Resource Farms	Retire-ment Farms	Residential/ Lifestyle Farms	Farming Occupation/ Lower Sales	Farming Occupation/ Higher Sales	Large Farms	Very Large Farms	All Farms
				— FARM ASSETS —				
Real Estate[a]	23.50	37.12	70.02	69.30	79.40	67.02	87.84	79.64
Farm Equipment[b]	2.07	2.41	1.70	3.05	4.33	8.04	4.44	5.48
Other Finan. Assets[c]	1.80	22.63	1.04	10.07	5.17	8.48	1.23	3.13
Other Assets[d]	2.75	2.06	1.91	4.35	3.66	8.07	6.59	7.02
				— NONFARM ASSETS —				
Nonfarm Assets[e]	69.87	35.75	25.32	13.23	7.43	8.38	0.47	4.72
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1996.

[a] Includes land and buildings.
[b] Tractors, trucks, implements, and other equipment.
[c] Other current assets, prepaid insurance, and investment in cooperatives.
[d] Includes current assets such as livestock for breeding, livestock and crop inventory, purchased inputs, and inputs for crops planted but not harvested.
[e] Includes investments in CDs, savings, and money market accounts, stocks, household cars and trucks, and other financial assets.

Table 3. Normalized Variance Decomposition of Farm Operator Household Debt (Farm and Nonfarm) by Farm Typology, 1996 (percent)

Sources of Debt	Limited-Resource Farms	Retire-ment Farms	Residential/ Lifestyle Farms	Farming Occupation/ Lower Sales	Farming Occupation/ Higher Sales	Large Farms	Very Large Farms	All Farms
				— FARM DEBT —				
Real Estate[a]	24.45	32.99	22.41	31.71	38.06	31.74	39.61	34.69
Non-Real Estate	2.26	2.35	3.95	3.56	7.95	4.61	8.72	7.60
Short-Term Debt[b]	3.44	4.12	2.43	7.63	7.68	24.08	7.28	9.98
Long-Term Debt[c]	24.30	32.26	23.68	31.98	41.17	32.83	43.25	37.79
				— NONFARM DEBT —				
Nonfarm Debt[d]	45.56	28.27	47.52	25.11	5.14	6.72	1.15	9.93
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1996.

[a] Debt on land and buildings.
[b] Loans less than one year, accrued interest, accounts payable, and current portion of term debt.
[c] Non-current real and non-real estate debt.
[d] Nonfarm debt of the farm household.

resource farms represent about 6% of U.S. farms, produce less than 1% of output, and have just 58% of household wealth in farming assets. This demonstrates why the farming component contributed nearly 88% to variation in wealth for very large farms and just 23% for households operating limited-resource farms.

On the debt side, table 3 shows that for primary farm households, such as farming occupation/higher sales, large farms, and very large farms, real estate debt (value of land and buildings) and long-term debt (non-current real and non-real estate debt) contribute most to the variability in farm household debt. However, for limited-resource and residential farm households, nonfarm debt (46% and 48%, respectively) is the major contributor to the variability in total debt. The results are consistent with expectations—i.e., because farming is not their main occupation, nonfarm debt is the major source of debt for limited-resource and residential farm households. Further, nonfarm debt plays an important role in the variability of total debt for the retirement (28%) and farming occupation/lower sales (25%) households.

A similar analysis was conducted for farm households located in nine different regions of the United States. As shown by the results reported in table 4, in the Heartland region, considered as the major farming region, a large proportion (50%) of the variability in household assets originates from real estate (value of land and buildings). Further, nonfarm assets contribute about 16% to Heartland region household asset variability. Results are similar for the Mississippi Portal region. However, farm households located in the Eastern Uplands and Southern Seaboard have one-fourth of the variability in total assets originating from nonfarm assets. On the debt side, table 5 shows that in the Heartland, Northern Crescent, Northern Great Plains, Prairie Gateway, Fruitful Rim, and Basin and Range regions, a larger portion of debt variability originates from real estate and long-term debt. However, nonfarm debt contributes one-third (30%) to the farm household debt variability in the Eastern Uplands and Southern Seaboard regions.

The results from the analysis of the 1999 ARMS data are different from those of the 1996 ARMS data in two ways (tables 6–9). First, more information is available on the types of nonfarm assets held by farm households. Second, a small change is observed in the variability originating from farm assets (real estate, farm equipment, other financial assets, and other assets). In general, we conclude that all farm households regardless of size have invested in and taken advantage of the booming nonfarm economy. Variability in household assets originating from nonfarm assets nearly tripled, increasing from approximately 5% in 1996 to almost 14% in 1999. Results from 1999 for all farms indicate that variability in assets originated primarily from the value of land and buildings (at 71%), followed by the value of other farm assets (6%), and finally through roughly equal changes in the value of farm equipment and other farm financial assets.

Nonfarm assets such as stocks and mutual funds, CDs, IRAs, and other nonfarm financial assets are equally important. However, the origin of variability in farm household assets differs by farm size. For example, variability in assets of limited-resource farms is much more affected by variability in nonfarm assets (more than 85%, consisting of other nonfarm assets = 59%, stocks and mutual funds = 10%, followed by money market and cash accounts and retirement accounts = 8% each) than variability in the value of land and buildings. However, variability in the value of land and buildings is the major factor affecting variability in the assets of large (75%) and very large family farms (84%), while variability in nonfarm assets accounts for 10% and 1%, respectively.

Table 4. Normalized Variance Decomposition of Farm Operator Household Assets (Farm and Nonfarm) by Farming Region, 1996 (percent)

Sources of Assets	Heartland	Northern Crescent	Northern Great Plains	Prairie Gateway	Eastern Uplands	Southern Seaboard	Fruitful Rim	Basin and Range	Mississippi Portal	All Farms
					— FARM ASSETS —					
Real Estate [a]	49.58	70.64	57.19	70.85	57.28	52.59	87.50	70.52	42.67	79.64
Farm Equipment [b]	10.79	7.10	9.80	5.47	5.93	7.63	4.42	7.38	11.27	5.48
Other Finan. Assets [c]	13.99	5.97	7.92	4.80	2.01	5.77	1.33	3.95	8.43	3.13
Other Assets [d]	9.85	5.86	16.41	11.16	9.11	8.12	5.58	9.23	24.18	7.02
					— NONFARM ASSETS —					
Nonfarm Assets [e]	15.78	10.42	8.66	7.73	25.65	25.88	1.15	8.92	13.44	4.72
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1996.

[a] Includes land and buildings.

[b] Tractors, trucks, implements, and other equipment.

[c] Other current assets, prepaid insurance, and investment in cooperatives.

[d] Includes current assets such as livestock for breeding, livestock and crop inventory, purchased inputs, and inputs for crops planted but not harvested.

[e] Includes investments in CDs, savings, and money market accounts, stocks, household cars and trucks, and other financial assets.

Table 5. Normalized Variance Decomposition of Farm Operator Household Debt (Farm and Nonfarm) by Farming Region, 1996 (percent)

Sources of Assets	Heartland	Northern Crescent	Northern Great Plains	Prairie Gateway	Eastern Uplands	Southern Seaboard	Fruitful Rim	Basin and Range	Mississippi Portal	All Farms
					— FARM DEBT —					
Real Estate [a]	36.12	30.73	35.29	33.53	31.07	24.58	37.44	35.75	22.84	34.69
Non-Real Estate	6.45	9.14	6.48	9.02	1.53	8.55	7.29	4.51	22.86	7.60
Short-Term Debt [b]	11.19	9.15	15.13	12.38	7.52	7.48	9.05	13.84	10.07	9.98
Long-Term Debt [c]	38.23	35.28	37.50	37.80	29.87	29.16	40.12	36.44	38.35	37.79
					— NONFARM DEBT —					
Nonfarm Debt [d]	8.02	15.70	5.59	7.26	30.00	30.22	6.08	9.46	5.88	9.93
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1996.

[a] Debt on land and buildings.

[b] Loans less than one year, accrued interest, accounts payable, and current portion of term debt.

[c] Non-current real and non-real estate debt.

[d] Nonfarm debt of the farm household.

Table 6. Normalized Variance Decomposition of Farm Operator Household Assets (Farm and Nonfarm) by Farm Typology, 1999 (percent)

Sources of Assets	Limited-Resource Farms	Retire-ment Farms	Residential/ Lifestyle Farms	Farming Occupation/ Lower Sales	Farming Occupation/ Higher Sales	Large Farms	Very Large Farms	All Farms
				— FARM ASSETS —				
Real Estate [a]	12.18	44.16	42.21	67.74	72.21	74.65	83.74	71.03
Farm Equipment [b]	1.73	1.46	2.13	2.64	5.11	3.24	4.53	4.97
Other Finan. Assets [c]	! 0.01	4.65	2.79	5.98	3.76	4.46	3.90	4.28
Other Assets [d]	0.43	1.08	1.83	2.05	4.40	5.97	6.45	6.10
				— NONFARM ASSETS —				
Nonfarm Assets$1 [e]	8.29	10.44	8.96	6.27	3.78	2.62	0.31	2.83
Nonfarm Assets$2 [f]	8.67	10.35	12.05	5.00	2.47	2.31	0.18	2.89
Nonfarm Assets$3 [g]	10.16	12.77	11.65	5.40	5.27	3.90	0.46	3.56
Nonfarm Assets$4 [h]	58.61	15.08	18.40	4.92	3.00	2.85	0.42	4.32
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1999.

[a] Includes land and buildings.

[b] Tractors, trucks, implements, and other equipment.

[c] Other current assets, prepaid insurance, and investment in cooperatives.

[d] Includes current assets such as livestock for breeding, livestock and crop inventory, purchased inputs, and inputs for crops planted but not harvested.

[e] Cash, checking, money market, and CD accounts, savings bonds and other bonds.

[f] Retirement accounts such as IRA, Keogh, 401K, and SEP plans.

[g] Corporate stocks, mutual funds, and cash value of life insurance.

[h] Other nonfarm assets such as off-farm houses, real estate and businesses not part of the farm, recreational vehicles, and others.

In the case of small farm households (limited-resource, retirement, residential, farming occupation/lower sales, and farming occupation/higher sales), a larger proportion of the variability in total household assets originated from nonfarm assets (table 6). For example, in the case of limited-resource farms, variability in nonfarm assets from nonfarm sources increased from 70% in 1996 to 85% in 1999. Similarly, for residential farms, the variability from nonfarm assets almost doubled during 1996–1999 (25% in 1996 to 51% in 1999). On the other hand, the portion of variability in total household debt originating from nonfarm debt, for all farms, decreased from approximately 10% in 1996 (table 3) to approximately 2% in 1999, an 80% decrease (table 7). A similar pattern emerges across the farm typology. For instance, the portion of variability in total household debt for residential farm households originating from nonfarm debt, for all farms, decreased from approximately 48% in 1996 to approximately 8% in 1999. Across all farm households, the major portion of variability in total household debt originates from real estate (value of land and buildings) and long-term debt.

When decomposing sources of variability in farm household assets and debts by region for 1999, results show a similar pattern for the farm typology (table 8). In the case of farm household assets, the contribution of nonfarm assets to the overall

Table 7. Normalized Variance Decomposition of Farm Operator Household Debt (Farm and Nonfarm) by Farm Typology, 1999 (percent)

Sources of Debt	Limited-Resource Farms	Retire-ment Farms	Residential/ Lifestyle Farms	Farming Occupation/ Lower Sales	Farming Occupation/ Higher Sales	Large Farms	Very Large Farms	All Farms
			— FARM DEBT —					
Real Estate[a]	39.68	31.05	40.12	41.25	45.94	39.32	40.69	39.87
Non-Real Estate	5.43	10.79	6.50	5.33	4.16	7.66	3.20	5.19
Short-Term Debt[b]	4.74	3.70	2.83	5.32	3.66	10.42	15.67	12.29
Long-Term Debt[c]	40.76	36.83	42.06	42.14	45.59	42.09	40.24	40.74
			— NONFARM DEBT —					
Nonfarm Debt[d]	9.38	17.62	8.39	5.94	0.63	0.51	0.19	1.91
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1999.

[a] Debt on land and buildings.
[b] Loans less than one year, accrued interest, accounts payable, and current portion of term debt.
[c] Non-current real and non-real estate debt.
[d] Nonfarm debt of the farm household.

variation in farm household assets rose from approximately 5% in 1996 to 14% in 1999. The contribution of nonfarm assets to variability in total assets more than doubled for farm households located in the Northern Crescent, Northern Great Plains, Prairie Gateway, Fruitful Rim, Basin and Range, and Mississippi Portal. Further, farm households located in the Eastern Uplands and Southern Seaboard observed an increased variability in their assets due to increased variability in nonfarm assets (40% and 38%, respectively). On the other hand, results show a general decrease in the portion of variability in household assets originating from real estate and other assets when compared to 1996 levels.

In the case of farm household debts (table 9), results show that a very small portion of the variability in farm household debt originates from nonfarm debt and its share decreased considerably from 1996 levels (table 5). Results show that variability in farm household debts, in all regions, increased as a result of increased variability in real estate and long-term debt when compared to 1996 levels.

An important finding reveals that the major factor contributing to variability in farm household assets and debt in 1996 and 1999 is real estate. In the case of farm assets, real estate was the major source of variability in farm household assets in both years. However, the magnitude of the impact was reduced between the two years, from 80% in 1996 (table 2) to 70% in 1999 (table 6). These results are not sur-prising, as real estate accounted for 82% of farm net worth in 1996 and a little over 70% in 1999 (tables 2 and 6, last column "all farms"), whereas variability attributed to nonfarm assets tripled from about 5% in 1996 to about 16% in 1999. On the other hand, real estate and long-term debt (both sources of farm debt) are major sources of variability in farm household debt. Further, variability arising from nonfarm debt decreased from approximately 10% in 1996 to almost 2% in 1999 (tables 3 and 7,

Table 8. Normalized Variance Decomposition of Farm Operator Household Assets (Farm and Nonfarm) by Farming Region, 1999 (percent)

Sources of Assets	Heartland	Northern Crescent	Northern Great Plains	Prairie Gateway	Eastern Uplands	Southern Seaboard	Fruitful Rim	Basin and Range	Mississippi Portal	All Farms
					— FARM ASSETS —					
Real Estate [a]	58.10	62.48	55.88	62.19	48.66	51.04	81.27	69.35	58.28	71.03
Farm Equipment [b]	8.47	5.20	8.42	4.64	3.55	4.00	4.50	4.46	8.84	4.97
Other Finan. Assets [c]	5.18	4.70	4.77	6.05	4.20	2.90	4.00	2.05	5.45	4.28
Other Assets [d]	7.93	5.94	10.34	8.79	3.59	4.21	5.54	6.53	7.17	6.10
					— NONFARM ASSETS —					
Nonfarm Assets_1 [e]	4.80	3.17	3.39	5.03	7.31	9.60	0.95	3.06	4.55	2.83
Nonfarm Assets_2 [f]	4.44	4.96	2.92	4.44	7.49	7.25	1.16	1.98	4.57	2.89
Nonfarm Assets_3 [g]	4.84	5.59	6.23	4.85	10.11	11.94	1.26	2.94	5.89	3.56
Nonfarm Assets_4 [h]	6.25	7.98	8.04	3.95	15.09	9.08	1.33	9.62	4.25	4.32
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1999.

[a] Includes land and buildings.

[b] Tractors, trucks, implements, and other equipment.

[c] Other current assets, prepaid insurance, and investment in cooperatives.

[d] Includes current assets such as livestock for breeding, livestock and crop inventory, purchased inputs, and inputs for crops planted but not harvested.

[e] Cash, checking, money market, and CD accounts, savings bonds and other bonds.

[f] Retirement accounts such as IRA, Keogh, 401K, and SEP plans.

[g] Corporate stocks, mutual funds, and cash value of life insurance.

[h] Other nonfarm assets such as off-farm houses, real estate and businesses not part of the farm, recreational vehicles, and others.

Table 9. Normalized Variance Decomposition of Farm Operator Household Debt (Farm and Nonfarm) by Farming Region, 1999 (percent)

Sources of Assets	Heartland	Northern Crescent	Northern Great Plains	Prairie Gateway	Eastern Uplands	Southern Seaboard	Fruitful Rim	Basin and Range	Mississippi Portal	All Farms
					— FARM DEBT —					
Real Estate [a]	40.16	42.90	36.96	37.56	45.55	38.88	39.61	42.75	38.75	39.87
Non-Real Estate	6.66	5.99	9.98	4.53	3.49	10.34	2.85	4.44	6.96	5.19
Short-Term Debt [b]	9.56	4.78	10.16	16.64	3.53	3.09	17.78	8.67	11.06	12.29
Long-Term Debt [c]	42.15	44.16	41.69	38.11	44.72	43.74	38.81	42.84	41.07	40.74
					— NONFARM DEBT —					
Nonfarm Debt [d]	1.47	2.17	1.21	3.16	2.71	3.94	0.95	1.29	2.15	1.91
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Resource Management Survey (ARMS), USDA/Economic Research Service, 1999.

[a] Debt on land and buildings.

[b] Loans less than one year, accrued interest, accounts payable, and current portion of term debt.

[c] Non-current real and non-real estate debt.

[d] Nonfarm debt of the farm household.

last column "all farms"). One possible explanation is that the economy in general was doing well and many farmers were retiring their nonfarm debt and investing in the financial market.

Regardless of the classification used (typology or farming regions), the emerging pattern shows that farm assets are strongly and positively associated with total farm household wealth. It appears that the higher the households' commitment to farming and the higher the proportion of farm assets to total assets, the higher is the contribution of the farming component of assets to the overall variation of total farm household assets.

Summary and Conclusions

The purpose of this study was to measure variability in farm operator household assets and debt related to each of its components by farm typology and farming region. The analysis used cross-sectional data from the 1996 and 1999 ARMS surveys and employed the method of normalized variance decomposition. The results show that farm operator households are heterogeneous with respect to their reliance on and distribution of farm and nonfarm assets and debt. The results highlight how the source of variability in farm household assets and debt varies across farm typology and farming region. Additionally, recent data (ARMS, 1999) show that farm households have broadened their portfolios to include a variety of off-farm assets.

Despite having low farm income, many farm families have a substantial amount of wealth or net worth (when assets from farm and nonfarm sources are included) compared with average nonfarm household wealth of $359,369. The average value of total assets (farm and nonfarm)[6] held by farm households rose from $473,166 in 1996 to $633,524 in 1999, a 34% increase. On the other hand, total debt (farm and nonfarm) increased by only 2% over this same period, from $68,718 to $69,962. The portfolio of assets held by farm households is heavily weighted toward farm assets relative to housing and other nonfarm assets. In contrast, the average nonfarm household asset portfolio is most influenced by home values. The diversity in sources of farm household wealth suggests households will respond differently to policy measures.

An improved understanding of how each component of assets and debt contributes to the variability in total assets and total debts of farm households is a relevant issue for policy makers concerned about the well-being of farm families. Results from this study also point to the complexity of any policy action aimed at minimizing the variability in farm household assets and debt. In other words, because farm households are so diverse in their resource base, it is clear that no one policy action focused on the economic well-being of farm households will affect all households in the same way.

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[6] On average, the value of nonfarm assets alone increased 113% during 1996–1999, from $92,738 in 1996 to $198,087 in 1999.

The impact of real estate on farm household assets was sizable, particularly in 1996, where it accounted for 80% of the measured variability. However, due to increasing diversification, the variability attributed to household assets from real estate decreased to 70% in 1999. On the other hand, variability associated with nonfarm assets increased from about 5% in 1996 to 16% in 1999. Much of this change is due to the allocation of assets in different markets. Farmers almost doubled the share of nonfarm assets among their total assets during the 1996–1999 period. This study points out that farm households' well-being is affected by changes in real estate values and long-term debt. Any changes in the amount and prices of land, and in the interest rate on long-term debt, will affect the economic well-being of farm households. This study also suggests that farmers are allocating assets between farm and nonfarm sources depending on the performance of the nonfarm economy. The findings highlight the role of a stable agricultural economy through its accompanying influence on farm real estate (land and farm buildings) and the subsequent influence on farm households' wealth position.

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