Chapter 5

Decoupled Payments to Farmers, Capital Markets, and Supply Effects

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Are there distortions in farm capital markets that prevent U.S. farmers from making profitable investments? In other words, is U.S. farm production constrained by imperfect access to capital? If so, decoupled payments could mitigate these capital market imperfections both by increasing internal funds and by expanding access to market credit. This, in turn, could induce more onfarm investment and production. On the other hand, if farmers are not forgoing profitable capital investments, then decoupled payments will not substantially change production through this mechanism.

Capital Markets' Role in Agricultural Production

Understanding the linkages between capital markets and agricultural production is essential to understanding whether decoupled payments are likely to induce increases in farm investment and production. However, before considering the relationship between capital markets and production, it is useful to distinguish between real and financial capital. Real farm capital consists of physical assets such as buildings, machinery/equipment, and breeding stock. The term "real" capital is usually reserved for assets whose usefulness extends over several production cycles. (Although land—see chapter 6—is a physical asset used over multiple production cycles, by convention it is excluded from real capital.) Financial capital represents the means by which ownership or control of real assets is acquired, and ownership can be financed in two ways. Equity capital represents a direct ownership claim financed through the assets of the owner, while debt capital represents an ownership claim financed by a lender. Leases are another important source of financial capital in U.S. agriculture. Leases and contract production arrangements do not represent an ownership claim but a right to use assets under specified conditions.

The importance and composition of physical assets vary substantially across farm types and regions, as shown by the 2000 ARMS data (table 5-1). Physical assets make up 80 percent of the value of total assets on commercial farms, versus 95 percent for rural residence farms.[24] Land is usually the dominant physical asset, except for poultry where farm buildings account for 41 percent of total assets. Farm equipment is a strong contributor to total assets for cash grain and hog operations. The composition of assets also varies greatly by region. Land ranges from 40 percent of total assets in the Northern Crescent to 60 percent in the Basin and Range region.[25]

[24] The farm typology groups farms into three groups: commercial farms (all farms with greater than $250,000 in sales), intermediate farms (operator's primary occupation is farming, with sales less than $250,000 per year) and rural residence farms (operator is retired, their main occupation is not farming, or has limited economic resources).

[25] Definitions of ERS regions are described at: http://www.ers.usda.gov/publications/aib760.

Table 5-1—Importance and composition of physical assets in total farm business assets by farm type and region

Item	Share of phsical assets total farm business assets					
	Land	Operator's dwelling	Other buildings	Farm equipment	Breeding animals	Total physical assets
				Percent		
All farms	48	13	13	11	4	89
Commodity program participants	49	9	10	15	5	88
Nonparticipants	47	17	15	8	4	91
Farm typology (collapsed):						
Commercial farms	43	3	16	13	5	80
Intermediate farms	49	13	11	12	4	89
Rural residence farms	50	22	11	9	3	95
Production specialty:						
Cash grain	50	9	7	18	1	85
General field crops	53	15	10	11	1	90
Fruits, vegetables, and nursery crops	39	7	26	8	0	80
Beef cattle	54	15	9	8	6	92
Hogs	34	11	22	14	3	84
Poultry	25	13	41	12	2	93
Dairy	35	6	17	13	18	89
General livestock	42	27	12	8	4	93
Resource region:						
Heartland	48	12	10	14	2	86
Northern Crescent	40	18	17	12	5	92
Northern Great Plains	50	6	7	13	8	84
Prairie Gateway	51	12	9	12	5	89
Eastern Uplands	48	18	12	11	5	94
Southern Seaboard	50	15	13	10	3	91
Fruitful Rim	44	12	18	7	3	84
Basin and Range	60	9	9	7	5	90
Mississippi Portal	50	15	7	18	3	93

Source: 2000 Agricultural Resource Management Survey, USDA.

Farmers' aggregate access to real capital can influence the supply of agricultural products to the market. Special-purpose buildings, breeding stock, and machinery and equipment are all costly and critical to agricultural production. Such physical assets may enable farmers to adopt new production technologies that further enhance productivity.

Farmers' access to financial capital can directly affect their access to real capital. Without efficient financial capital markets, farmers might delay adopting more efficient technologies as they become available. Agricultural capital markets also allow farmers to pursue profitable investment opportunities without having to save the necessary funds or sacrifice their own current standard of living. As such, financial markets enable the movement of purchasing power and productive assets to those who can use them most profitably. This accelerates efficiency gains in agricultural production and farm management, and thus improves overall agricultural productivity.

Decoupled Payments in an Imperfect Capital Market

Most farmers do not have access to outside equity investors, and so must rely on their own financial resources or on leases, contract arrangements, or borrowed funds for liquidity and capital investment. This reliance is essential to any potential link between decoupled payments and increased production through imperfect capital markets.

If farmers are operating to maximize profits and face efficient capital markets, farm investment decisions are based on a comparison of the expected rates of return from onfarm and off-farm investments. Farm investment occurs until expected returns on additional investments are no longer as great as those available from off-farm opportunities. Lump-sum decoupled payments do not directly affect either onfarm or off-farm rates of return. Instead, they provide farm households with increased purchasing power to allocate among a variety of uses, including both investment and consumption. In this case, decoupled payments would not affect onfarm investment or production levels through capital market channels.

However, financial capital markets are generally characterized by imperfections including asymmetric information and adverse incentives. (Transactions costs and imperfect competition can also cause capital market imperfections, but they are outside the scope of this chapter.) Asymmetric information is when outside sources of capital (lenders, partners, and shareholders) have less information than farm managers about how the capital will be used. In turn, asymmetric information enables farm managers to understate the riskiness and overstate the expected profitability of their investment opportunities to outside investors in order to reduce financing costs and increase profits. This combination of incomplete, asymmetric information and adverse incentives can induce outside investors and creditors to ration capital or credit and impose monitoring costs on a farm.

Credit rationing occurs when lenders refuse to fully fund loans to borrowers who meet their credit standards, even if borrowers offer to pay higher interest rates. Credit rationing occurs because lenders know that the higher the interest rate, the more likely that willing borrowers will be to undertake riskier investments and to understate investment risks, increasing the probability of default and lowering the expected return on the loan. That is, increasing interest rates are associated with greater adverse selection problems for lenders. *Redlining* is an extreme form of credit rationing that entails refusing to lend in certain areas or to certain types of businesses, and may affect farmers during periods of low income, falling land values, or restrictive monetary policy. Restrictive monetary policy may lead to *credit crunches,* wherein lenders have insufficient reserves to expand or even maintain their credit portfolios.

As a result of such lender responses, some agricultural producers may face credit constraints that prevent them from maximizing their profits from farming in a given production period. In other words, a *credit constraint* exists when the farm qualifies for credit under conventional underwriting standards but is unable to find a willing lender.

Capital market imperfections may result in a variety of constraints on farm production. A *liquidity constraint* exists when a farm is unable to pursue its most profitable production plan because it lacks the shortrun ability to pay for inputs such as seed, fertilizer, or animal feed. A *capital constraint* exists when a farm is unable to pursue the most profitable production plan because it lacks access to sufficient physical capital. By this definition, a farm facing a capital constraint could pay the competitive market price for additional capital with the returns it would earn from additional capital investment.

If farmers are unable to maximize profits because of capital market imperfections, decoupled payments could mitigate this problem and lead to increases in investment and production. Because the initial state was distorted by market imperfections, these increases will tend to move the sector toward greater economic efficiency.

Beyond the immediate addition to purchasing power provided by decoupled payments, two other payment-related effects can increase farm creditworthiness and reduce the likelihood of lenders rationing credit to farmers. First, decoupled payments improve access to credit by increasing the value of farmers' most important source of collateral, land (Barnard, 2001). Since the 1996 FAIR Act, decoupled payments have been linked to ownership of specific cropland and do not require current production. The direct link between base acres and known program benefits allows sellers, purchasers, and lenders to calculate payments' value through capitalization—the same process used to calculate the value of a bond, mortgage, or any other known payment stream over time. The capitalization of decoupled payments adds to the value of land. Second, to the extent that the payment stream can be anticipated, lenders may allow farmers to pledge them as a source of repayment capacity. Both of these effects are important only with credit market imperfections; if markets were perfect, lenders would readily fund all profitable farm investments.

Farm Household Objectives Can Alter the Effect of Decoupled Payments

In addition to improving creditworthiness, decoupled payments may allow marginally viable farm operations to remain in production and even to increase the capital invested in their farms. Farmers operating unprofitable farms may have better off-farm investment opportunities with higher financial returns, but may accrue more personal rewards (both financial and nonfinancial) by devoting the funds to farming.

To the extent that decoupled payments allow these farmers to cover their costs of production and family living expenses, they may reduce the aggregate efficiency of production in the farm sector. However, the effect on overall farm production is ambiguous because some of the resources controlled by these farmers would remain in the agricultural sector and be used more efficiently (if such farms exited), while other resources would exit the sector. If farmland values increase because of decoupled payments, farmers may be less likely to consider alternative uses of the land. The magnitude of any effect on production depends on the willingness of marginally viable farmers to increase their investment in farming, how

responsive farm production is to new investment, and how fast farmers invest in new real capital as their liquidity improves. Aggregate effects for each of these channels will also depend on the distribution of production and productive assets across farmers with varying costs of capital, tax liabilities, risk attitudes, and profit constraints.

Decoupled Payments and Capital Markets: The Literature

The potential linkages from farm program payments through capital markets to farm production are indirect and complex, making them difficult to measure empirically. Analyzing the relationships in a computable general equilibrium model of the U.S. economy, Roe et al. (chapter 2), find that in the case of segmented or inefficient capital markets, direct payments have limited shortrun and almost no longrun impacts on farm production relative to a baseline case with no program payments. An increase in land values and rental rates were the main longrun impacts found.

Other economic studies shed light on parts of this payments-capital-production linkage, but were not designed to illuminate the entire chain of causation or to address the equilibrium impact of capital market imperfections on the level of U.S. farm production or trade. In general, each study illuminates one of the following issues: how capital market imperfections affect farm investment (Hubbard and Kashyap, 1992; Bierlen and Featherstone, 1998; Barry et al., 2000), the responsiveness of agricultural production to new investment (Saha et al., 1994), or the speed with which farmers adjust their stock of real productive capital as risk and other business conditions change (Vasavada and Chambers, 1986; Halvorsen, 1991). These studies demonstrate how farm investment behavior has been dependent on farm cash flows, but do not address decoupled payments since they predate the program. USDA's ARMS data indicate little potential for decoupled payments to affect agricultural production through increased investment levels on farms that receive payments but are not currently cost-efficient producers of program commodities.

Studies linking capital market imperfections to farm investment

Studies have investigated the relationship between capital market imperfections and farm investment both for the sector in aggregate (Hubbard and Kashyap) and for farms in particular States (Bierlen and Featherstone for Kansas farms; Barry et al. for Illinois farms). Using farm sector data from 1914 through 1987, Hubbard and Kashyap find that the rate of farm investment can be explained by rates of return during periods of high net worth. But the level of internal reserves held by farmers determines the rate of investment agriculture when the sector experiences declining net worth. Their empirical tests indicate that a change in the value of collateral (primarily farmland) is an important determinant of investment spending. Thus, the impact of capital market imperfections on aggregate investment patterns in the U.S. agricultural sector has been statistically significant only during periods of negative shocks to farm sector net worth, namely the sector recessions of 1921-33 and 1981-86.

Similarly, Bierlen and Featherstone tested for financial constraints in farm machinery investment among commercial farms in Kansas from 1976 to 1992. They find no evidence of financial constraints during the boom period of the late 1970s, but some evidence of constraints during the 1980s recession and the recovery of the 1990s. The effect of cash flow on investment of those farmers most likely to be credit constrained – those with high debt-to-asset ratios and younger operators – varied particularly with the stage of the business cycle. Thus, during the agricultural recession of the 1980s, the investment behavior of these farmers depended heavily on their ability to generate internal funds. Barry et al. also find that younger farmers and those with lower credit scores in Illinois (1987-94) were more likely to be affected by capital market imperfections. That is, they relied more heavily on current cash flows to fund investment.

So, during some farm recession periods, capital market imperfections are associated with inefficiently low investment for some farms and for the sector as a whole. On the other hand, these studies do not find evidence that investment is inefficiently high for farms with strong cash flow or for the sector as a whole during periods of strong cash flow or high asset values. These observations, in turn, imply decoupled payments may move farm sector investment to more efficient levels in recession periods.

Studies of capital stock adjustment rate, and links between investment and production.

Other studies address the linkage between investment and production. Saha et al. found that production increases by 0.2 to 0.25 percent for each 1-percent increase in investment, depending on whether risk attitudes are taken into account in modeling. That is, production changes at one-fifth to one-fourth the percentage rate that investment changes. In addition, empirical studies suggest that the rate of adjustment in capital stocks to economic shocks is quite slow. Halvorsen finds that capital inputs adjust to new equilibrium values at rates ranging from a little over 1 year for durables to about 3 years for structures. In contrast, Vasavada and Chambers find that aggregate farm capital stock takes about 10 years to adjust. Thus, investment would have to increase by 4 to 5 percent to have a 1-percent impact on sector output, and perhaps only if conditions prevailed for several years. However, financial constraints are unlikely to have long-lasting effects on sectoral investment and production since competitive pressures will, over time, force financially constrained farms to sell assets to those who can achieve higher returns.

Evidence from 2000 ARMS data

If capital market imperfections exist, decoupled payments could affect the investment decisions of participants. Imperfections, such as a binding credit constraint, would force farmers to deviate from their optimal financial structure by considering internal sources of funds or choosing to lease instead of financing capital purchases with debt. Additions to income from government programs provide liquidity that can relax constraints associated with imperfect capital markets.

Data correlating program participation, capital investment decisions, and farm efficiency can illustrate how much capital market imperfections impair agricultural investment. Whittaker and Morehart (1991) found that one in five Midwestern cash grain farms was unable to operate at minimum cost during the 1980s due to debt and/or collateral constraints. Nasr et al. (1998) showed that more efficient Illinois grain farms were more highly leveraged. The cause is ambiguous. Lenders may expect grain farms with greater leverage to "work harder" to meet debt repayment obligations, or more efficient farmers may be viewed as more creditworthy and find leverage more profitable.

If farmers faced substantial capital or credit constraints, one would expect that higher cost farmers would be forced to invest less in machinery and equipment over time. However, recent ARMS survey data for commodity program participants fail to support the existence of a capital constraint related to cost structure. While high-cost soybean producers carry, on average, a significantly lower debt-to-assets ratio than do other soybean producers, this is not true for high-cost corn, cotton, or wheat producers (fig. 5-1).[26] Relative to low-cost producers, high-cost producers of soybeans, corn, cotton, and wheat have, on average, equal or greater farm assets, land, or buildings per acre farmed and investments in machinery/equipment per acre farmed (fig. 5-2). In addition, capital expenditures per acre on high-cost farms, on average, equal or exceed those in low cost farms (fig. 5-3). Thus, there is little evidence that inefficient producers of program commodities are inefficient because they lack physical capital. This observation, in light of Saha et al., suggests that increasing the capital investment of inefficient producers would not significantly increase their production of program commodities. Moreover, high-cost producers account for much less production than their one-third population share—ranging from 10 percent of total production for high-cost soybean producers to 21 percent for high-cost wheat farms—so the modest potential effect of decoupled payments on capital-induced production becomes even more so.

[26] We define high- (low-) cost farms as the third of each farm type with the highest (lowest) unit costs.

Figure 5-1

Except for soybean farms, high-cost farms, on average, have debt/asset ratios that equal or exceed those of other farms

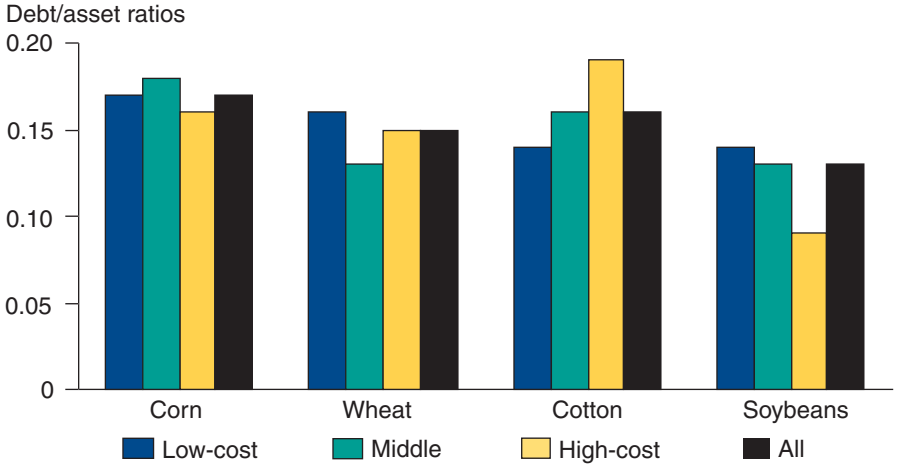


Figure 5-2

On average, high-cost farms invest at least as much as low-cost farms in machinery per acre farmed

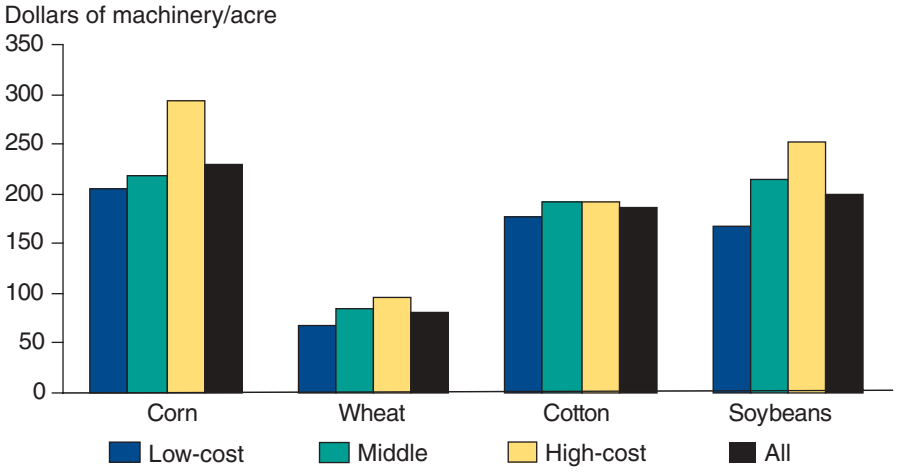
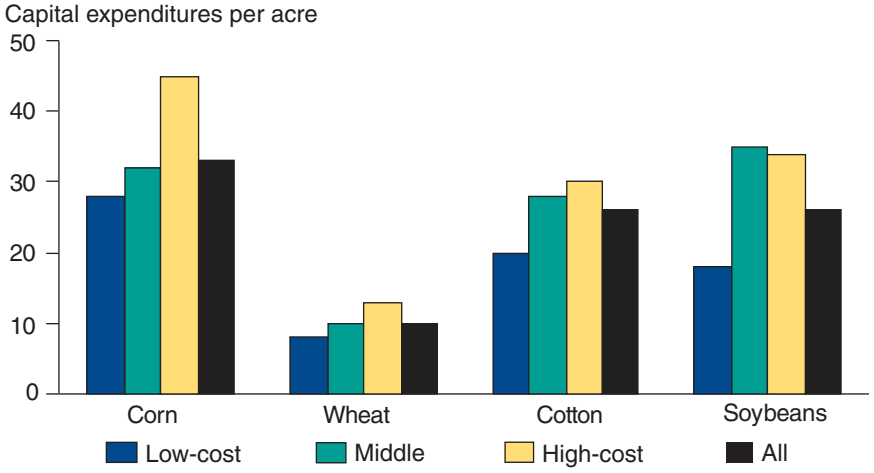


Figure 5-3

Capital expenditures per acre of high-cost farms exceed that of all farms, on average



Conclusions

The Federal Government has been experimenting with payments to farmers that are decoupled from current farm production in an attempt to reduce the distortions in trade and resource allocation associated with coupled payments. This intended effect may be offset, however, if imperfections in capital markets bind decoupled payments to farm production decisions. Financial capital markets in agriculture are characterized by imperfections relative to "efficient" markets, because lenders and borrowers have asymmetric information.

Though imperfections exist, they do not appear to influence aggregate investment. Data do not indicate differences in capital investment or credit use that would be likely if significant capital or credit constraints existed among commodity program participants. Investment per acre farmed is no less for high-cost program participants than for low-cost participants and, except for soybean growers, high-cost participants carry no less debt relative to their assets.

The data are, however, limited. Farms and farmers vary considerably by region, farm type, resource base, productivity, and the goals of their owners. Some farmers may well face sufficient credit constraints (for liquidity or for capital) so that receipt of decoupled payments allows them to continue or expand production. However, empirical studies indicate that any increased investment enabled under these circumstances would move the sector toward greater rather than less efficiency. In addition, in a capital-rich economy where few farmers are likely to be capital constrained, any impact of decoupled payments would be transitory. Farmers unable to afford efficient levels of investment in productive capital would soon be induced by competitive forces to relinquish control of their assets to unconstrained farm owners or managers.