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Decoupled Payments in a Changing Policy Setting

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Decoupled Payments in a Changing Policy Setting

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Abstract

The studies in this report analyze the effects of decoupled payments in the Federal Agriculture Improvement and Reform (FAIR) Act on recipient households, and assess land, labor, risk management, and capital market conditions that can lead to links between decoupled payments and production choices. Each study contributes a different perspective to understanding the response of U.S. farm households and production to decoupled income transfers. Some use new microdata on farm households collected through USDA's Agricultural Resource Management Survey (ARMS), initiated in 1996, and its predecessor survey. These data are used to compare household and producer behavior and outcomes before and after the FAIR Act. Other studies use applied or conceptual models to characterize the impact of introducing decoupled payments. Collectively, the chapters represent an early stage in the empirical analysis of decoupled payments. The studies address many aspects of the payments' household impacts but remaining issues call for additional analysis. As the analytical paradigm changes with the evolution of farm programs, the development of appropriate data and models will improve our understanding of farm program impacts on the behavior and well-being of U.S. farm households, and the agricultural sector.

* Xinshen Diao is with the International Food Policy Research Institute. Shiva S. Makki is with Ohio State University and the World Bank. Terry Roe is with the University of Minnesota.

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Introduction

Mary E. Burfisher and Jeffrey Hopkins

For decades, economists have proposed decoupling farm subsidies from production choices in order to support agricultural producers without distorting commodity markets and trade. Decoupled payments provide income transfers of a fixed amount to producers while allowing them to make market-based decisions about which commodities to produce. The program design of decoupled payments breaks the link between a producer's actions and eligibility for or level of payment. In contrast, "coupled" farm support, which is based on current prices and production of specific crops, distorts production incentives. This can lead to overproduction, lower market prices, higher program costs, and an inefficient allocation of national resources, often with spillover effects on world markets.

In the 1996 Federal Agriculture Improvement and Reform (FAIR) Act, the United States revamped its farm subsidies with the introduction of a decoupled payment program. "Production Flexibility Contracts" (PFC) provided annual lump-sum cash payments to farm operators based on their historical program crop production.[1] PFCs were fixed payments announced in advance for the duration of the FAIR Act (1996-2002) and transferred a total of $36 billion to eligible producers, with an average payment per eligible household in 2001 of about $9,000. The FAIR Act also provided greater flexibility in planting decisions and terminated acreage reduction programs. Decoupled farm payments—now called "direct payments" under the 2002 Farm Security and Rural Investment (FSRI) Act—amount to about $5 billion annually.

Has the introduction of decoupled farm payments in the FAIR Act helped improve the well-being of farm households—defined broadly to include their income, wealth, and their work choices? Have they increased the market orientation of U.S. agriculture, or do they distort production and trade as do coupled farm programs? The challenge in studying decoupled payments is that it calls for a broader analytical paradigm than that used for more traditional U.S. farm programs. For coupled programs, the main impacts can be observed in commodity markets. By changing the returns to production of specific commodities or to input uses, coupled payments create incentives that directly influence production decisions. Producer response to coupled programs can be mostly captured in a commodity or farm enterprise framework that focuses on these relative price changes. The main impact of decoupled payments, in contrast, is their effect on the income and wealth of recipient households. To assess the possible impacts of decoupled payments on U.S. agriculture, we need to know about recipient households' spending, saving, and working decisions—in agricultural and nonagricultural activities—and how these decisions may have changed with increased income and wealth. In addition, we can consider indirect links between decoupled payments and production choices that may exist due to risk preferences and market conditions.

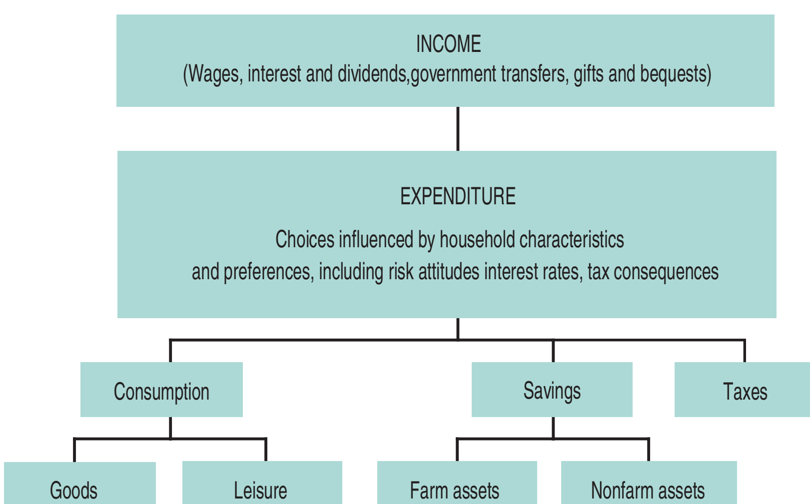
[1] For more information on farm and commodity programs covered by the 1996 farm act as amended, see http://www.ers.usda.gov/briefing/FarmPolicy/19962001commodity.htm. For information on farm policy terms, see the glossary at http://www.ers.usda.gov/features/farmbill/2002glossary.htm.

Effects of Decoupled Payments on the Household

Decoupled payments' effects on a household can be traced through the flow of its income and expenditure (fig. 1) (USDA, 2003). Payments contribute to total household income, along with other income sources that include nonfarm wages, interest, and dividends. Households decide whether to allocate income to current consumption or to savings. Age, preferences, wealth, and tax implications typically influence this decision. Income increases the ability to currently consume. Market expectations about future decoupled payments may be reflected in the household's land asset values, and thus in increased wealth. So both current and expected future payments affect the household's consumption decisions. Consumption of goods and leisure is often overlooked when assessing decoupled payments, but a household's allocation of payments to current consumption is an important consideration that competes with the use of the subsidy in the farm operation. Furthermore, a change in consumption — such as food/household supplies, rent, mortgage, or leisure time – captures part of the subsidy's effect on farm household well-being.

Savings represent, in part, a plan to pay for consumption in the future. And when a household's income is variable year to year, precautionary savings can help smooth short-term consumption, allowing the household to maintain some threshold consumption when income is low. Households typically invest their savings across a portfolio. In general, households allocate investments based on a comparison of expected rates of return. Farm households can be expected to increase onfarm investment until its expected returns are no longer as great as those available from off-farm opportunities. Since lump-sum decoupled payments do not directly affect either onfarm or off-farm rates of return, they theoretically would not affect onfarm investment or production levels through capital market channels as long as these markets are efficient.

Figure 1
Flow of household income and expenditure



Increases in income and wealth may also change a household's tolerance for risk. Much attention has been given to how risk affects agricultural production, with mixed findings.[2] However, a household can also adjust its savings and investment portfolio or its work choices, to suit its new risk tolerance, perhaps in lieu of changes in farm production.

Decoupled payments are more likely to influence production decisions when "market failures" exist. These include inefficiencies, rigidities, or incomplete information in factor (labor, capital, and land), insurance, or commodity markets in agriculture. Market failures may lead to links between decoupled payments to the household and its farm production decisions. For example, credit constraints are a market failure that prevents producers from making profitable investments in the farm. Decoupled payments may alleviate this constraint and enable the household to allocate the additional liquidity to the farm. Testing for the presence of market failures, such as credit constraints, is an indirect way to determine whether changes in household income and wealth from payments could influence production.

Analyzing PFC Payments, 1996-2001

The studies in this report analyze the direct effects of decoupled payments in the FAIR Act on household behavior, and assess land, labor, risk management, and capital market conditions that can lead to links between decoupled payments and production choices. Each study contributes a different perspective to understanding the response of U.S. farm households and production to decoupled income transfers. Some use new microdata on farm households collected through USDA's Agricultural Resource Management Survey (ARMS), initiated in 1996, and its predecessor survey. These data are used to compare household and producer behavior and outcomes before and after the FAIR Act. In this approach, attributing causation to program changes is difficult because it requires controlling for other factors that may also have affected the outcomes. Other studies use applied or conceptual models to characterize the impact of introducing decoupled payments relative to no payment, based on a stylized set of assumptions about economic behavior.

Westcott and Young (chapter 1) provide a conceptual introduction for the chapters that follow, describing and comparing the production incentives of coupled and decoupled payments. They consider policy and market conditions that could lead to links between decoupled payments and production, discussing four avenues through which effects could occur. Westcott and Young conclude that effects of decoupled programs on planted acreage are smaller than acreage effects of price- and production-linked coupled programs, which are typically not very large relative to total acreage because of the inelasticity of U.S. supply response. Thus, although no program appears to be completely without potential effects on agricultural production, they argue that effects of decoupled programs are likely to be small.

Full planting flexibility under the FAIR Act allowed producers to grow any crop or fallow land without affecting the size of or eligibility for decoupled payments. Westcott and Young provide evidence pointing to the increased

[2] See for example, Roberts, et al. (2004).

market orientation of U.S. agricultural production. They compare 2001 actual plantings with PFC acreage, finding that farmers exercised significant flexibility in acreage allocations compared to their historically based PFC acreage.

Roe, Somwaru, and Diao (chapter 2) use a stylized model to simulate the longterm path of consumption, savings, and investment behavior of U.S. farm households receiving decoupled payments. They consider two scenarios regarding capital markets: one in which farm households are unconstrained in their ability to allocate the saved portion of their payment across an investment portfolio, and a second in which farm households are assumed to invest only onfarm, either due to preferences, liquidity constraints, or segmented capital markets. All other markets are assumed to be efficient. Because the payments do not increase returns to farm assets, the results for the first scenario shows no increase in onfarm investment or production. The results for the second scenario show a shortrun increase in agricultural capital stock of 0.3 percent. But in the long run, the payments are found to have almost no effect on farm investment or production, even with imperfect capital markets. This is because excess investment on the farm is self-correcting: increased onfarm investment drives down the returns to farm capital, reducing farm households' incentive to save and increasing their rate of consumption out of the payment until returns are equalized across all investments.

Households consume leisure as well as goods. Decoupled payments make leisure, like other goods, more affordable. They increase the value of leisure relative to the cost of leisure – the marginal value of additional wage earnings, which in theory may lead to a reduction in hours worked both on- and off-farm. **Ahearn, Harrington, Hoppe, and Korb** (chapter 3) estimate the impacts of decoupled payments on participating households' labor allocations on and off the farm. After controlling for various factors that may influence labor allocation, they report that decoupled PFC payments decreased the number of off-farm hours worked and on-farm work hours rose modestly. These results imply that farm households respond the same way to decoupled payments as they do to coupled payments. These findings call for further study of farm labor markets, particularly of the ways they may differ from nonfarm labor markets in, for example, their provision of nonmonetary benefits.

Changes in a household's income and wealth can also change its tolerance for risk. Farmers' risk aversion may affect production decisions because wealth-induced changes in their risk tolerance due to decoupled payments could influence production levels, input use, or crop mix. **Makki, Somwaru, and Vandeveer** (chapter 4) review empirical studies of risk aversion of U.S. farmers. These studies have generally found evidence of risk aversion for most U.S. farmers, but with a wide range of risk attitudes. Thus, although farmers who receive PFC payments likely display varying attitudes toward risk, it is certainly plausible that some such farmers are willing to assume more risk. Yet, Makki et al. conclude that the resulting effects on production are likely to be small for several reasons. Payments are on average low (less than 3 percent) relative to the net worth of participants. Farm production is only one of many outlets farm households use to take on additional risk. Surveys find that producers use various tools—such as insurance, hedging, and management strategies—to mitigate risks. And, farm households can respond to changes in their risk attitudes with adjustments throughout their portfolio, such as off-farm employment and investing in nonfarm real estate or financial assets. Finally, they review the small empirical literature on risk-related production effects of decoupled payments, which finds minimal production impacts.

Financial capital markets are characterized by imperfections that can induce outside investors and creditors to ration capital or credit and impose other costs that could cause onfarm investment to be linked to farm household cash income. **Collender and Morehart** (chapter 5) examine empirical evidence of the extent to which these imperfections may affect farm investment and production. Previous research indicates that farm investment patterns do not rely on farm cash income except in relatively rare circumstances, both for the sector and for individual farms. In particular, during severe farm recessions, capital market imperfections are associated with inefficiently low investment, especially for farmers with limited credit histories or in weak financial positions. More recent data do not indicate patterns of capital investment or credit use that would be consistent with the presence of significant capital or credit constraints among commodity program participants. These observations, in turn, imply decoupled payments may move farm sector investment to more efficient levels during severe recessions in the farm economy.

Decoupled Payments, Land Values, and Land Rents

Land values and rents reflect expectations about future returns from both agricultural production and government payments. PFC payments were made on the basis of land enrolled in the program. PFC acreage was primarily land enrolled in supply management programs for wheat, rice, corn, barley, oats, sorghum and cotton at least once during 1991-95. PFCs were pre-determined lump-sum payments. In theory, the link between fixed and foreseeable program benefits and PFC acreage would allow the payments to be fully reflected in the market for PFC acreage (adjusting for tax considerations and the buyer's subjective discount rate on future benefits). In the case of land rental, the program-induced increase in profits-plus-payments will tend to be passed through to the land owner. If land rental markets are efficient, and if decoupled payments are completely nondistorting, one would expect rents to rise dollar for dollar with those payments. Some contend that higher land values and rents due to programs reduce the competitiveness of U.S. producers. However, these higher land-related costs simply reflect the capitalization of benefits into land values and the pass-through of benefits from tenants to landlords on leased acreage.

In a simulation of decoupled payments, **Roe et al**. (chapter 2) show a long-run increase in U.S. aggregate land values from PFC payments of 8 percent, under a scenario that assumes all markets operate efficiently. **Roberts** (chapter 6) examines the effects of government payments (excluding conservation) on 1997 cash-lease rental rates for base acres. He compares them to payments' effects on cash-lease rental rates prior to the FAIR Act, when payments were more closely tied to production levels. The effect of PFC payments on land rents is important to consider because it reflects the division of payment benefits between tenants and landowners, and most acreage enrolled in the PFC program was rented. Roberts finds that approximately one-third of each payment dollar on leased acreage in 1997 was passed through to landlords via higher land rents. Although this rate is somewhat higher than the 22-percent pass-through rate prior to the FAIR act, it is far less than the dollar-for-dollar increase of a full pass-through, indicating that program benefits are shared between tenants and landlords. The incomplete pass-through rate could indicate that decoupled payments distort production activities and profits or that the land markets operate imperfectly, and adjust slowly. Further study is needed to trace out the full implications of this finding.

Farm Households: Changing Directions for Policy and Analysis

U.S. farm programs are changing. Since the mid-1980s, U.S. farm commodity policy has evolved from a program of price supports and controlled supply to include multiple objectives (most notably to include environmental protection) and the facilitation of freer markets in agriculture. The introduction of PFC payments in 1996 further weakened the links between commodity programs and production decisions by basing these payments to farm households on historical criteria.

The studies in this report explore aspects of the microeconomic behavior of farm households as it relates to the impacts of income transfers. The studies describe recipient households' consumption, savings, and investment behavior as their income and wealth increase. The studies include analyses of market conditions, testing for the presence of inefficiencies or market failures that would link changes in household income to production decisions. Collectively, the chapters represent an early stage in the empirical analysis of decoupled payments. The studies address many aspects of the payments' household impacts but other issues call for additional analysis. As the analytical paradigm changes with the evolution of farm programs, the development of appropriate data and models will improve our understanding of farm program impacts on the behavior and well-being of U.S. farm households, and the agricultural sector.

Chapter 1

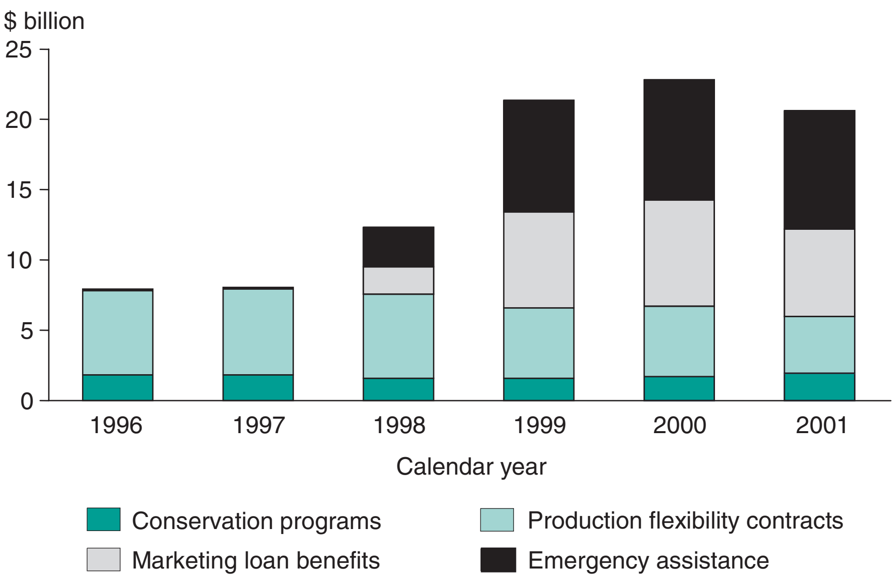
Farm Program Effects on Agricultural Production: Coupled and Decoupled Programs

Paul C. Westcott and C. Edwin Young

Direct government payments to the U.S. agricultural sector and other farm program benefits boosted farm income in 1999-2001, particularly during 1999-2001 when direct government payments exceeded $20 billion annually (fig. 1-1). More than a third of these direct payments were disbursed as emergency assistance, which augmented direct government payments from existing farm commodity programs, such as production flexibility contract (PFC) payments and marketing loan benefits (loan deficiency payments and marketing loan gains), as well as payments from conservation programs. Besides these direct government payments, other support to the sector included crop insurance premium subsidies and price supports for selected commodities, such as dairy, sugar, and tobacco.

This chapter describes and compares how different types of farm programs can create economic incentives that may affect production decisions. We focus on production incentives and supply response because, in general, additional outcomes (including prices, domestic use, and exports) reflect changes in the market equilibrium following the change in production.

Figure 1-1
Direct government payments



Source: Economic Research Service, USDA.

U.S. Farm Programs: Different Links to Production and Prices

Different types of government payments and other farm program benefits influence agricultural markets in different ways. A billion dollars in loan deficiency payments, for example, will affect production decisions and market outcomes differently than $1 billion in PFC payments. This variation in effects among different programs largely reflects how closely program benefits are linked with farmers' behavior and market outcomes.

Farm programs are coupled if there is a direct link between the determination of the program benefit and the farmer's production and market conditions (such as prices). In turn, the benefits of coupled programs affect per-unit net returns associated with specific production choices. That is, coupled programs may increase farmers' profit from growing crops such as corn or soybeans. As a result, these programs have the greatest potential to affect agricultural production and agricultural markets.

In contrast, decoupled payments are fixed income transfers that do not depend on the farmer's production choices, output levels, or market conditions. Decoupled program benefits do not subsidize production activities, inputs, or practices. These income transfers do not change per-unit net returns, so they have no direct effect on production decisions for specific commodities.

However, because decoupled payments raise the overall income and economic well-being of farm households, indirect influences on agricultural production can occur through wealth and other effects. Overall, effects of decoupled payments on production are likely to be small in aggregate because of the many different uses of the payments. This is particularly true when one considers the farm household, rather than only the farm operation, as the decisionmaking entity. A household has a wide array of consumption, savings, nonagricultural and agricultural investment, and off-farm and onfarm labor allocations that may adjust in response to decoupled payments.

U.S. agricultural commodity policy has been moving toward increasing market orientation with the introduction of programs that have reduced the degree of coupling of benefits to production (see box, "U.S. Agricultural Policy Evolution Toward Greater Market Orientation"). This trend reflects, in part, the related policy goals of reducing market distortions and fulfilling commitments to international trade agreements.

U.S. Agricultural Policy Evolution Toward Greater Market Orientation

Beginning in the mid-1980s and continuing through the 1990s, a series of important changes in U.S. farm commodity programs moved agriculture from the highly managed sector of the early 1980s toward one with greater market orientation, particularly with regard to programs affecting farmers' production decisions (Young and Westcott; Orden, Paarlberg and Roe; Westcott, Young, and Price).

Following the experience with high commodity loan rates of the early 1980s that supported market prices and led to large stocks of grains, farm legislation in 1985 lowered commodity loan rates for wheat, feed grains, soybeans, upland cotton, and rice. Additionally, the 1985 Act introduced marketing loans for rice and upland cotton, which effectively moved the loan program for those crops from providing price support to providing income support without supporting market prices (Westcott and Price). Target prices used for income-supporting deficiency payments also were reduced and program yields for these payments were frozen. Still, plantings of program crops remained constrained for program participants by provisions which combined to encourage farmers to plant the same program crops over time.

Farm legislation in 1990 furthered the move toward market orientation in supply response by introducing planting flexibility on a part of farmers' base acres. Producers could respond to market signals in planting choices on "normal flex acres," which represented 15 percent of a farmer's base acres. These acres were not eligible for income support payments and planting alternative crops on this land did not penalize the farmer through a loss of historical program base. Additional planting flexibility was permitted on "optional flex acres" (another 10 percent of base acres), although deficiency payments were forgone on any of this land that was planted to another crop. A further market-oriented change under this legislation was the extension of marketing loans to oilseeds in 1991 and to wheat and feed grains in 1993, moving loan programs for these crops to ones providing direct income support rather than price support.

The 1996 Farm Act fundamentally redesigned income support for major crops with the termination of acreage reduction programs and target-price-based deficiency payments and the introduction of decoupled production flexibility contract (PFC) payments, with almost total planting flexibility. Base acres for program crops, which had been a constraining aspect of annual supply management programs, were eliminated and replaced with PFC acreage that was used as the basis for making PFC payments. With only a few limitations, planting of most alternative crops was permitted on a farmer's entire acreage base. These policy changes provided greater freedom for farmers to make production decisions based on market signals.

During the latter years covered by the 1996 act, a series of supplemental emergency assistance packages provided market loss assistance (MLA) payments to farmers. As for PFC payments, most MLA payments were distributed to farmers based on enrolled PFC acreage and did not depend on current production.

The 2002 Farm Act extended many of the types of programs of the 1996 Farm Act and the ad hoc emergency spending bills of 1998-2001. Marketing assistance loans were continued, decoupled direct payments replaced PFC payments, and counter-cyclical payments were intended to institutionalize market loss assistance payments. Importantly, the 2002 act also retained nearly full planting flexibility without base acre constraints to allow farmers to continue to respond to market signals in their production choices. The legislation also allowed farmers to update base acres used for direct payments and counter-cyclical payments to reflect 1998-2001 plantings, although only 39 percent of base acres were updated.

Coupled Programs Affect Aggregate Land Use and Crop Mix

Coupled programs that are closely linked to the farmer's production of specific crops affect total land use and also distort the mix of crops planted. Program benefits that are linked to production of specific crops increase expected returns to those commodities. That is, an increase in production receives additional program benefits, which provide incentives to expand output. As a result, production decisions for those commodities are based on expected returns from both the marketplace and government payments. Cross-commodity effects may also occur because changes in expected returns for one crop affect relative net returns among cropping alternatives. Some farmers would likely respond to a coupled payment by increasing total planted area and/or shifting the mix of crops toward those with higher coupled payments.

Two economic studies analyzing coupled programs (crop insurance and marketing loans) demonstrate how their benefits directly augment market returns and thereby influence planting decisions. Crop insurance changes the distribution of expected income when yields are low. U.S. subsidies for crop insurance premiums are proportional to the premium. Since premiums are higher for crops that are riskier to insure, premium subsidies are higher for those crops, which encourages production of riskier crops and production in riskier regions. Young, Vandeveer, and Schnepf report that government crop insurance subsidies of about $1.5 billion a year would add about 960,000 acres (about 0.4 percent) to annual production of eight major field crops, with plantings of wheat and cotton expanding the most.

Marketing loans provide another type of coupled benefit by raising farmers' revenues for current production when market prices are low. When commodity prices are below commodity loan rates, program benefits augment market receipts and, thus, create an incentive to produce specific crops. Annual effects of marketing loans reported by Westcott and Price vary by year, depending on the absolute and relative magnitudes of the expected crop-specific marketing loan benefits. With marketing loan benefits ranging from around $5 billion to over $8 billion in 1999-2001, total acreage planted to eight major field crops was increased by an estimated 2 to 4 million acres (less than 2 percent) annually in those years. Acreage effects for individual crops reflect year-specific expected relative benefits among cropping alternatives each year. In some situations, marketing loan benefits can result in larger effects on individual crops than in aggregate.

The moderate effects of these coupled programs (less than 2 percent increases in acres) partly reflect an inelastic acreage response in the farm sector, where overall crop plantings change proportionally less than the economic incentives provided by prices and net returns. Despite recent increases in the responsiveness of plantings to price changes, facilitated by nearly full planting flexibility (Lin et al.), overall supply responsiveness remains inelastic.

Decoupled Payments Raise Household Well-Being, Potentially Production

Benefits of decoupled programs do not depend on current production or market prices. Production decisions for specific crops are not directly affected by these transfer payments because net returns per unit of production are not changed. Nonetheless, decoupled payments may have indirect effects on agricultural production and markets through:

- changes in producers' wealth, leading to higher farm investment and changing risk attitudes,
- effects on slowing or accelerating farm consolidation,
- expectations about future program eligibility and payment basis that influence current production decisions, and
- repeated ad hoc programs that change producer expectations over time.

The direct effect of decoupled payments is to raise the overall income and economic well-being of farm households. A farm household can decide to use these transfers in the farm operation or for nonfarm alternatives such as consumption, savings, and nonagricultural investments. Household work choices, both off-farm and onfarm, may also change. These resource allocation decisions of the household are important for determining the potential indirect effects of decoupled payments on production decisions.

Any indirect effects of decoupled payments on production would be more general than the commodity-specific effects of coupled programs, affecting total land use or overall productivity gains, for example. The choice to grow more of any crop would reflect expected market returns across competing uses rather than the decoupled payment (see box, "Production Flexibility Contract Acreage and 2001 Plantings"). As with coupled programs, lower prices resulting from any production increases can moderate subsequent production effects and other market impacts.

Farm programs typically encompass many features that can affect the market, and individual mechanisms can often overlap. Coupled programs can influence production through these same mechanisms (in addition to their more direct effects through raising net returns), and many farm programs have both coupled and decoupled properties.

Wealth Effects on Investment and Risk Attitudes

Mechanisms by which decoupled payments may potentially affect production decisions include: (1) a wealth-facilitated investment effect, reflecting reduced credit constraints and/or reduced costs of capital, and (2) a direct wealth effect that changes risk aversion.

Decoupled payments can affect agricultural production by increasing the wealth of farmers, typically through the capitalization of expected farm program benefits into the value of farmland.

Production Flexibility Contract Acreage and 2001 Plantings

National, State, and county data show many significant differences in 2001 plantings compared to Production Flexibility Contract (PFC) acreage under the 1996 Farm Act, largely due to shifts in acreage allocations as producers used planting flexibility provided in that legislation. These results suggest a lack of a strong link between program acreage and current planting decisions. Instead, production choices reflect the ability of farmers to respond to expected market returns among competing crops (augmented by expected marketing loan benefits when prices are low), as well as to agronomic and rotational considerations.

PFC payments under the 1996 Farm Act were allocated on a commodity basis, but were linked to historically based contract acreage that reflected past commodity program enrollment rather than being linked to current production. PFC payments were made for seven program crops: wheat, corn, sorghum, barley, oats, rice, and upland cotton. PFCs also gave producers nearly complete planting flexibility in their production decisions without loss of program acreage or program benefits. For example, land that had been enrolled in the wheat deficiency payments program for any of the crop years 1991-95 could be entered into a 7-year production flexibility contract with the government in 1996. PFC payments on this contract acreage were considered to be for wheat. The land was required to remain in an agricultural use and there were restrictions on planting most fruits and vegetables, but planting flexibility allowed producers to shift to other crops or leave the land idle.

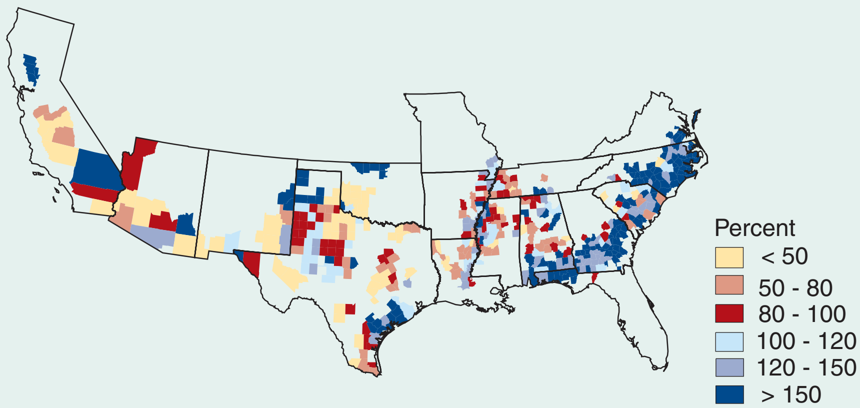
Nationally, 2001 plantings to the seven PFC program crops represented about 82 percent of total PFC acreage. On a crop-specific basis, shares ranged from a low of 45 percent of barley PFC acreage planted to barley to a high of about 96 percent of upland cotton PFC acreage planted to upland cotton. U.S. wheat plantings in 2001 represented about 76 percent of the level of wheat PFC acreage, and corn plantings represented about 93 percent of corn PFC acreage.

Looking more closely at data for upland cotton, the crop with 2001 national plantings relatively the closest to its crop-specific PFC acreage, significant variation in this share is shown by state-level and county-level data (box fig. 1). At the state level, upland cotton plantings were more than 20 percent below cotton PFC acreage in Arizona, New Mexico, California, and Oklahoma, but were more than 20 percent higher than cotton PFC acreage in Florida, Georgia, North Carolina, South Carolina, Virginia, and Kansas. Further disaggregation to the county level also indicates an absence of a strong link between cotton PFC acreage and 2001 upland cotton plantings (see cotton map). For example, cotton acres greatly expanded above historically based cotton PFC acreage in the Southeastern states of North Carolina, South Carolina, and Georgia as farmers used planting flexibility provided under the 1996 farm act, with no constraints related to PFC acreage or annual acreage reduction programs.

Similarly, variation in plantings relative to crop-specific PFC acreage is shown for wheat at the state level and the county level (box fig. 2). Of the 42 States with NASS-reported production data, 32 have wheat plantings more than 20 percent lower or 20 percent higher than the State-level wheat PFC acreage. County-level wheat plantings in 2001 also show no strong link to wheat PFC acreage (see wheat map), again reflecting the use of planting flexibility with no supply management program constraints, such as acreage reduction programs.

Box figure 1

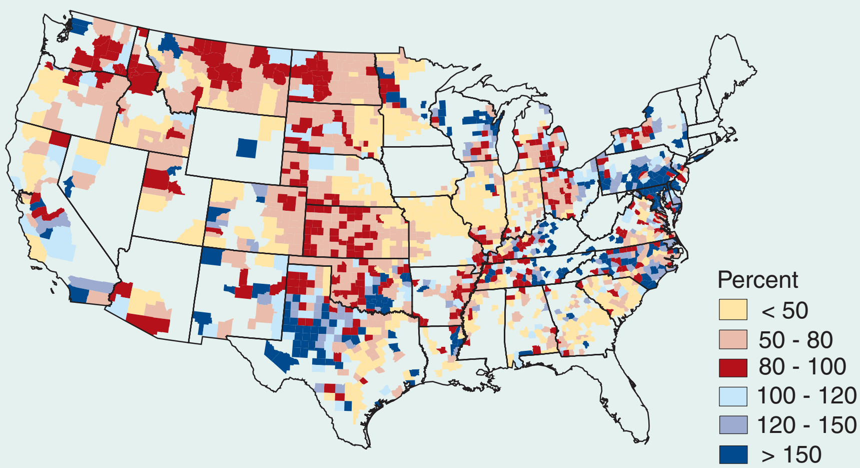
Cotton production flexibility contract acreage planted to cotton varied widely



Source: ERS, based on 2001 county-level data from NASS and FSA.
Data not available for all counties.

Box figure 2

Wheat production flexibility contract acreage planted to wheat varied widely



Source: ERS, based on 2001 county-level data from NASS and FSA.
Data not available for all counties.

Greater cash flow provided by decoupled payments and higher wealth may also facilitate more production through increases in agricultural investment if farmers otherwise face credit constraints or limited liquidity. Some of the payments are likely to go to consumption, savings, and nonagricultural investments, with the largest share typically going to consumption. But, agricultural investment could also rise. For credit-constrained farmers, lenders may be more willing to make loans to farmers with higher guaranteed incomes, higher farm equity, and lower risk of default. Great loan availability facilitates more production by allowing these farmers to more easily invest in profitable opportunities on their farm. Although Collender and Morehart (chapter 5) did not find evidence of significant credit constraints among program participants in the aggregate, they did indicate that some farmers are likely credit constrained and would alter their production with decoupled payments.

For some farmers, increased liquidity provided by decoupled payments may also reduce the need for loans to cover short-term operating costs or longer term farm-related investments.[3] While there are opportunity costs when self-financing the farm operation, they would be lower than expenses for commercial loans. In these situations, the lower cost of capital could increase the size of the farm operation or raise investment in the farm, either of which could increase farm output.

If changes in wealth due to decoupled payments influence producers' perception of or attitudes toward risk, they may take on more risk in their agricultural and nonagricultural portfolios. Such farmers may choose to adjust their overall production and/or may switch to riskier crops with higher average (but more variable) expected returns. Chavas and Holt (1990) found evidence of declining absolute risk aversion with higher wealth, implied by positive wealth effects on the plantings of corn and soybeans.[4] Makki, Somwaru, and Vandeveer (chapter 4) discuss in more detail the potential for risk-related production impacts of PFC payments, arguing that these effects are likely modest.

Farm Consolidation Effects

Consolidation in the agricultural sector has been a long-term trend, partly reflecting increased productivity. How decoupled payments may affect this ongoing trend is uncertain, but important.

Two competing arguments concern the potential effects of decoupled payments on consolidation. On the one hand, decoupled payments could slow sector consolidation if the payments allow marginally viable, smaller farms to remain in business longer. Such farms may be able to cover short-term variable expenses associated with the yearly decision to produce, but may not be able to cover longrun economic costs, remaining in the sector because of rising land values. Decoupled payments could help these farms by relieving a credit constraint or by providing lower cost funds.[5] In general, these farms tend to be less efficient. So, keeping them in operation would likely lower aggregate production if the land would have been used by more efficient, larger producers with higher yields.

In contrast, decoupled payments could accelerate sector consolidation if larger operations use the payments to buy smaller operations or to rent more acreage. This would occur especially if these large operations were previously credit constrained or if the lower opportunity cost of using these funds (relative to the costs of commercial loans) were sufficient to motivate expansion.[6] Any resulting increase in consolidation would be expected to raise aggregate production because larger operations typically are more efficient due to better management and other economies of size. Larger operations tend to more readily adopt new technology and use production practices that raise yields (Caswell et al.). Additional effects may reflect increased production incentives due to lower costs per unit of output. Caswell et al. report that larger farms tend to have higher application rates

[3] Again, use of the payments in the farm operation would be competing with alternative uses by the farm household, including consumption and nonagricultural investments.

[4] Chavas and Holt (1990) derived wealth effect elasticities of 0.087 for U.S. corn plantings and 0.27 for U.S. soybean plantings. Because much farmland is leased, many payments go directly or indirectly to nonoperator landlords rather than to farm operators; those payments would not be expected to have production effects. The Chavas and Holt model estimates reflect the implicit portion of payments captured by operators. In 1954 to 1985 (the estimation period used by Chavas and Holt), an average of about 37 percent of total farmland was leased, based on ERS calculations using Census data. This compares with about 41 percent of total farmland being leased in 1997, based on the same data source. Thus, any upward bias in the Chavas and Holt elasticities would be minimal because the increase in the share of farmland leased since their estimation period has not been very large.

[5] Credit constraints for small farms may not be significant in the aggregate because of off-farm income that is typical for these households.

[6] As earlier, use of the payments in the farm operation would be competing with alternative uses by the farm household, including consumption and nonagricultural investments.

for a number of inputs, consistent with their lower production costs resulting from higher efficiency.

Net effects on consolidation from these competing arguments are uncertain, but are not likely to be large (Yee et al., 2004). Relief of credit constraints is probably not a major factor. Although there are likely to be some credit-constrained U.S. farms, a number of empirical tests show no evidence of significant credit constraints in the sector in the aggregate (Collender and Morehart), suggesting minimal effects from the marginal change in credit constraints. Also, a large share of PFC acres is rented, about 60 percent in 1996 (USDA, 2003). As a result, a portion of program benefits are passed through to nonoperator landlords, limiting their effects on consolidation (see discussion of pass-through of PFC payments to landlords in Roberts, chapter 6).

Any effects on agricultural output that could result from a change in consolidation trends would apply only to land that moved into a larger operation through sale or rent or to land that was held back from sale on smaller operations. Additionally, the payments may simply shift the timing of land transfers with any resulting production effects being only temporary. Thus, any effects of decoupled payments on consolidation are likely to alter trends already underway only marginally, with little effect on aggregate yields and production.

Benefit Eligibility and Payment Basis

Some farm programs provide benefits that are not linked to current production decisions, input use, or market prices but are weakly coupled to production decisions through land use constraints. For example, PFCs under the 1996 Farm Act required land to remain in agricultural uses as a condition of eligibility for PFC payments.[7] Although this requirement permitted the land to be idled, such program provisions can affect overall crop production by providing incentives to prevent some land from leaving the sector. Once the decision is made to keep the land in agriculture and not to convert it to a permanent nonagricultural use, the farmer then may decide to produce on that land if expected revenues exceed production costs. Even if the land is permitted to be idled, it is more readily available to return to agricultural production if economic conditions warrant. Similarly, restrictions on the plantings of most fruits and vegetables on base acres under planting flexibility provisions could influence production if the land would otherwise have been planted to those crops.

The basis for the distribution of farm program benefits may also affect producers' expectations of how future benefits will be disbursed. Payments linked to past production may lead to expectations that future benefits will be linked to current production. Such expectations would affect expected net returns for program crops and could thereby affect current production decisions. For example, farmers may not fully use planting flexibility to move away from historically planted and supported crops if they expect future farm programs to permit an updating of their base acreage, which forms the foundation for many payments. Instead, farmers would have incentives to build and maintain a planting history for program crops,

[7] This requirement was continued under the 2002 Farm Act as a condition for receipt of direct payments and counter-cyclical payments.

perhaps limiting their response to current market signals. Similarly, use of nonland inputs that affect current yields may be influenced if farmers expect that future farm legislation will permit an updating of payment yields. Such updates may also reduce incentives to grow different varieties of program crops that have marketable characteristics but lower yields.

Overall effects of such expectations are likely to be small due to the uncertainty that future farm legislation would permit updating base acreage and program yields, the uncertainty of the provisions of any such legislation, as well as the discounting of benefits payable in the future. Nonetheless, if farmers expect to be able to update their farm-level program parameters, the economic efficiency of production could be reduced if producers do not fully respond to market signals. The importance and potential effects of these policy expectations also depend on expected market prices, which would affect the expected value of future program benefits. If expected market prices are low, the value of future benefits would be relatively high, so building or maintaining base acreage or program yields would be of value. However, if expected market prices are higher, future program benefits would be lower and the associated value of base acreage and program yields would be smaller.

Repeated Ad Hoc Programs Can Change Producer Expectations

Programs whose payments are announced and distributed after production decisions have been made (such as unanticipated ad hoc emergency assistance) can be argued to not distort production and thus may initially be decoupled. However, continued use of these programs when prices or production are low may change farmers' perceptions of the programs' design. These payments change producers' realized revenues and repeated payments may alter the distribution of future expected revenues by raising expectations that such payments will recur in similar market situations.[8] In so doing, farmers may perceive such programs as less ad hoc and more coupled to market conditions.[9]

As a consequence, these payments reduce potential downside revenue risks, which may affect production decisions for risk-averse producers, as expected payments become part of their risk management portfolio. The revenue stabilization consideration for risk-averse producers would supplement the typical profit maximization incentive underlying planting decisions. Thus, if risk-averse producers have probabilistic expectations of future assistance based on past government actions, particularly if there is a connection (or perception of a connection) between the probability of such payments and market conditions (low prices or production), then production choices may be influenced.

Programs that reduce the risk of low revenue outcomes when prices or production fall to low levels can lead to production effects by raising the lowest levels of expected revenues, thereby reducing financial risk associated with those market situations. The more these ad hoc benefits are viewed as linked to specific production activities, the greater their potential influence on production choices for those activities, as the expectation of

[8] For example, with emergency assistance packages enacted in the United States six times in 1998 to 2001, farmers may now expect this type of government assistance to be more likely when prices or production are low.

[9] See page 4 of USDA (2003) for an illustration of how the degree of coupling of farm programs changes, reflecting the links of the benefits to production and prices.

benefits becomes part of the farm household's risk management portfolio.[10] Expected assistance that addresses crop-specific production problems, such as droughts or floods, can be viewed as similar to fully subsidized crop insurance, affecting planting decisions by reducing risk, and potentially leading to increased production of those crops by risk-averse producers. In contrast, expectations of less specific assistance would likely affect aggregate production through a more general reduction of overall revenue risks.

[10] Note that the likelihood of ad hoc assistance is quite variable as it is subject to political and budgetary concerns. Farm households are likely to have better risk management instruments.

Conclusions

Different types of farm programs influence agricultural markets in different ways. Decoupled farm programs provide income transfers that raise the overall income and economic well-being of farm households. Decoupled payments do not have direct effects on production decisions or agricultural output because they do not change returns to production. However, decoupled programs can have indirect effects on farm production decisions and aggregate output. This contrasts with coupled farm programs, such as crop insurance and marketing loans, which create direct incentives to expand farm output of specific commodities by increasing expected returns per unit of production, in addition to their potential indirect effects.

Indirect influences of decoupled payments on production may result from the effects of increased wealth on risk attitudes or investment, farm consolidation, and expectations about program eligibility and payment basis, and repeated use of ad hoc programs. Despite a variety of potential indirect effects of decoupled programs on farmers' decisions, production effects are likely smaller than direct effects of price- and production-linked coupled programs such as marketing loans. This is particularly true when one considers the payments within a household framework, and that consumption, savings, nonagricultural and agricultural investment, and off-farm and on-farm labor allocations may adjust to changes in income and wealth. Further, overall planting effects of coupled programs are typically not very large compared with total acreage because of the inelasticity of supply response in the U.S. farm sector.

Thus, although no program appears to be completely without potential effects on agricultural production,[11] effects of decoupled programs are likely to be small. Further research is needed, however, to measure such effects empirically. A useful framework for such analysis is presented in OECD (2001), which discusses effects on agricultural policies of programs with different degrees of coupling to production decisions.

[11] A report by the Organization for Economic Cooperation and Development discusses the theoretical effects of decoupling and reaches a similar conclusion that "it seems difficult to contend that any policy measure can be entirely production or trade neutral."

To the extent that agricultural production is affected by decoupled payments, this supply response has additional market effects on prices, domestic use, and exports. For example, any increase in production resulting from programs would tend to lower market prices. These price declines, along with planting flexibility provided by the 1996 and 2002 Farm Acts, can moderate subsequent production effects.

Chapter 2

Decoupled Payments: A Dynamic, Economywide Perspective

Terry Roe, Agapi Somwaru, and Xinshen Diao

Decoupled payments, introduced in the 1996 Farm Act and renewed in 2002, are lump-sum income transfers to farm operators independent of their current production, factor use, or commodity prices. This chapter considers whether decoupled payments may alter producers' resource allocation over time and lead to effects on production. We use a dynamic, economywide applied general equilibrium (AGE) model to simulate the effects of annual decoupled payments in U.S. agriculture over time. The dynamic, intertemporal dimension is necessary because a stream of annual payments can be expected to influence recipients' decisions about how much to consume versus save over a long-term time horizon. An economywide approach is important because the payments redistribute income from urban to rural households, and may result in sectoral changes in resource allocation within the economy. The main link between decoupled payments and agricultural production in this framework is through recipient households' decisions to invest in agricultural assets.

Can Decoupled Payments Have Neutral Market Effects?

Decoupled payments increase the income and wealth of recipient households. In response, over time, these households are likely to consume more goods and to increase savings. However, whether these individual household decisions affect resource allocation and aggregate levels of agricultural production depends on the behavior of those that are taxed to provide the transfer. Effects on recipients can exactly offset the consumption and investment effects of those taxed such that, after the transfer, resource allocation and production at the market level are unaffected. Generally speaking, this result occurs when recipient households have consumption and savings patterns in proportion to their income that is identical to those paying for the subsidy. Under these circumstances, the wealth effect of a transfer on recipient behavior is offset by the negative wealth effect on those taxed to provide the transfer.[12] Of course, in real economies, identical taxed/recipient preferences are unlikely.

A neutral outcome depends on other conditions as well, including the availability of financial capital markets that work perfectly to allocate savings to investors in all sectors of the economy, the presence of opportunities to insure against future risks, and the absence of fixed costs. These conditions, too, are unlikely to prevail in real markets. For example, agricultural capital markets differ from nonfarm capital markets. Unlike corporations, farmers cannot issue securities or bonds to finance farm activities; instead, they must rely on land and other assets for collateral. Thus, segmented capital markets can lead to different capital effects on individuals outside agriculture, who

[12] Also, individual preferences can be identical but differ in the share of disposable income spent on goods and services at different income levels. In this case, the behavior of recipients can differ from that of taxed individuals, with the result that transfer payments can affect market allocations over time.

are taxed, than on recipients in agriculture. This effect might be greater if farmers face liquidity constraints or if they prefer to invest in agriculture that share of decoupled payments not allocated to consumption. The difference in these diverged capital markets does not imply that returns to capital in agriculture departs from returns in other sectors of the economy, at least in the long run, since farm households also invest in stocks, bonds, and other financial instruments (USDA, 2003). However, in the short run, an increase in agriculture's capital stock should lead to production effects — but to what extent?

Direct payments are targeted to land planted to program crops in the base period, and so lead to an increase in land asset values. A change in the price of land affects wealth. Consequently, payments can affect the investment and consumption behavior of those who own land, since landowners likely try to equate (risk and tax-adjusted) returns across all assets in their portfolio, including land. In addition, since land is used as collateral, payments might increase access to capital for those farmers who face credit constraints.

An Intertemporal, Economywide Model Analysis: Bracketing Two Outcomes

We use two versions of an intertemporal, economywide model of the U.S. economy to simulate decoupled payments in U.S. agriculture.[13] One version presumes that ideal conditions hold in capital markets: the markets in agriculture and the rest of the economy are perfectly integrated so that any differences in shortrun rates of return to capital and land are instantly arbitraged to zero. In the second version, we assume recipients' investment alternatives are strictly limited to agricultural assets. Credit constraints, investment preferences, or restricted investment opportunities could contribute to such segmentation. In fact, U.S. farm households hold diversified investment portfolios – evidence that agricultural capital markets are not fully segmented (USDA, 2003). The two scenarios we describe should be considered as bracketing the possible outcomes of the decoupled payments.

[13] See Roe et al. (2002) for details of the analysis and the underlying AGE model.

The models otherwise are identical in their specifications. Households are presumed to hold identical preferences at all income levels for consumption of goods and services. Household consumption and savings decisions respond to changes in prices and returns. Assets are aggregated into three broad categories—capital in agriculture, capital not in agriculture, and land. The model is calibrated to represent 1997, while rates of growth in total factor productivity, growth in the U.S. labor force, and selected other parameters are taken from other research for the baseline run. The model reproduces key outcomes observed for the actual economy in 1997-2001.

We assume that decoupled payments, equal to $6.112 billion in 1997, are made to farmers each year from 1997 on. Thus, our results suggest the directional effects of direct payments rather than the exact magnitude. All results are compared with the base, or the path of the economy without direct or other payments to farmers.

The Case of Integrated Capital Markets

This analysis presumes that investors allocate savings so as to arbitrage away any differences in returns to the three assets (land, agricultural capital, and capital in the manufacturing and service sectors). Effectively, the rate of return to agricultural capital is maintained at the same rate as returns to capital in the rest of the U.S. economy. Since household preferences are assumed to be identical, consumption and investment behavior of the recipients of decoupled payments are exactly counterbalanced. As a result, when the payments are not tied to production or prices, they have no effect on production levels, even over time.

However, since payments are linked to "program" acres, land values are affected. The $6.1-billion annual payment, in the short run, causes land values to exceed their base-level values by almost 9 percent (fig. 2-1). Land values then taper off to about 8.3 percent above their longrun base value. Many studies have documented that decoupled payments, even though they aim to benefit farm households, have an important side effect—to raise land values. For example, Goodwin et al. (2003a, 2003b) found that decoupled payments have had small effects on land values, ranging from 2 to 6 percent in the Northern Great Plains and Corn Belt regions. Bernard et al. (2001) found larger effects in a study that included both coupled and decoupled payments. Our analysis also finds higher land values.

These land value effects are due solely to decoupled payments. Competition for land (and a right to the payment) causes renters to pay higher rates to owners. If the land is sold, the buyer is willing to pay more if the payment remains tied to the land. Of course, decoupled payments and the rise in land values change recipients' consumption patterns and level of assets. In the short run, asset values of recipient households rise by about 2 percent above their base values, due mostly to the rise in land values. Most of the payments are spent on consumption; this proportion rises over time while the proportion saved falls. Total consumption expenditures are about 0.8

Figure 2-1

Decoupled payments' effects on land values are similar with segmented, nonsegmented capital markets

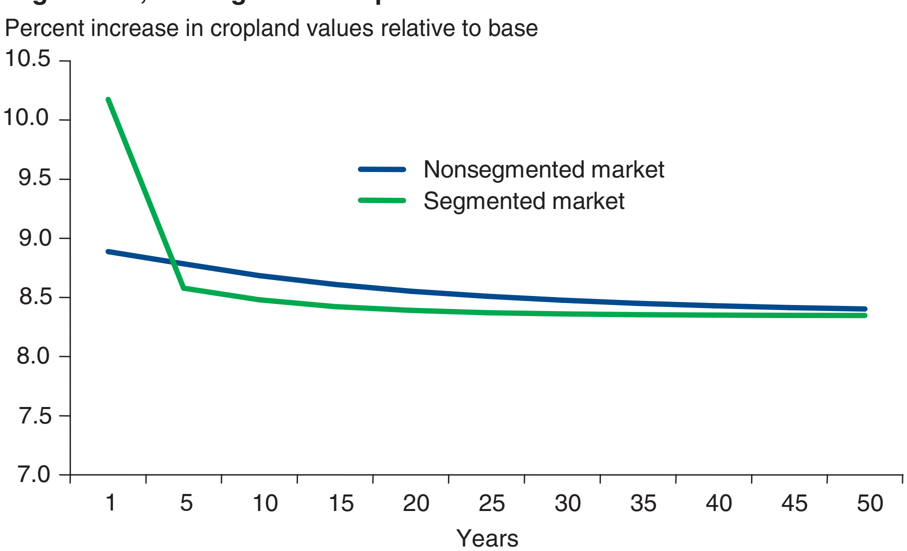
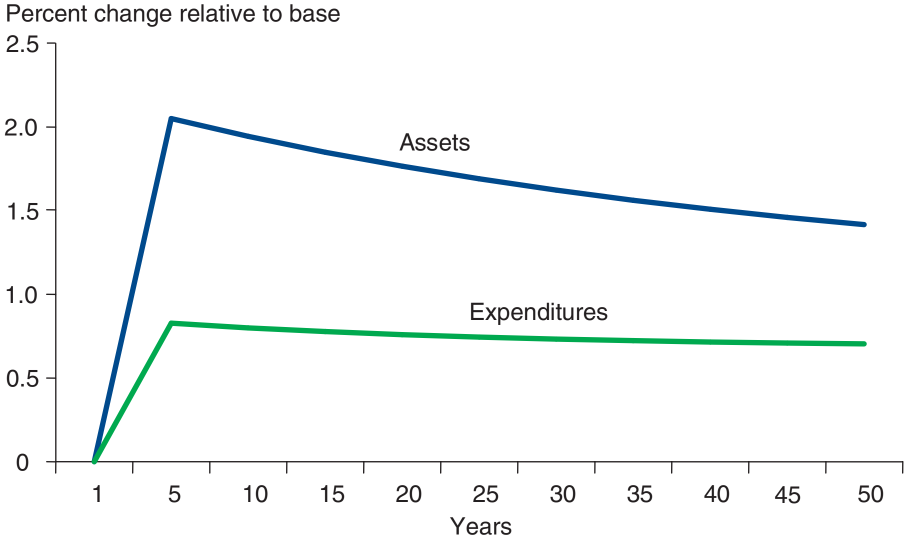


Figure 2-2
Decoupled payments increase assets and consumption expenditures: nonsegmented capital market



percent higher than expenditures in the absence of transfers (fig. 2-2). The rise in the value of assets held by recipient households should also increase their access to credit. If liquidity constraints are binding, then PFC payments may not be decoupled in that sense.

The Case of Segmented Capital Markets

In the second version of the model, we assume that capital markets in agriculture are segmented from those in the rest of the economy – farmers are assumed able to invest payments only in agricultural assets. Within agriculture, and within the rest of the economy, rates of return are equalized, but returns to agricultural assets are no longer perfectly arbitraged with nonagricultural assets (although they are in the long run.)

With segmented markets, within the first 10 years of payments, the rate of return to agricultural capital declines by a modest 0.1 percent (fig. 2-3) below the capital rental rate observed in the base scenario. The effect on the returns to capital outside agriculture and on the price index of goods is almost imperceptible. And, even though direct payments continue in equal amounts throughout the period, agriculture's return to capital slowly converges with that of the rest of the economy. In other words, in spite of the presumed differences between agriculture and the rest of the economy, in the long run, direct payments do not distort the rate of return to capital in agriculture.

Figure 2-4 shows why direct payments cause returns to agricultural capital to decline. In early periods, farmers tend to allocate more of their payments to investment in agricultural assets than in later periods. In the short run, the amount of capital invested in agriculture rises to about 0.25 percent more of the capital stock than would otherwise be accumulated (relative to the base). As additional capital investments lead to diminishing returns to capital stock, farmers save less and spend more of their decoupled payments on final goods. In the long run, the amount of capital employed in agriculture is equal to the amount that would be employed without transfer payments; in

Figure 2- 3

Decoupled payments lower on returns to capital in agriculture: the segmented capital markets case

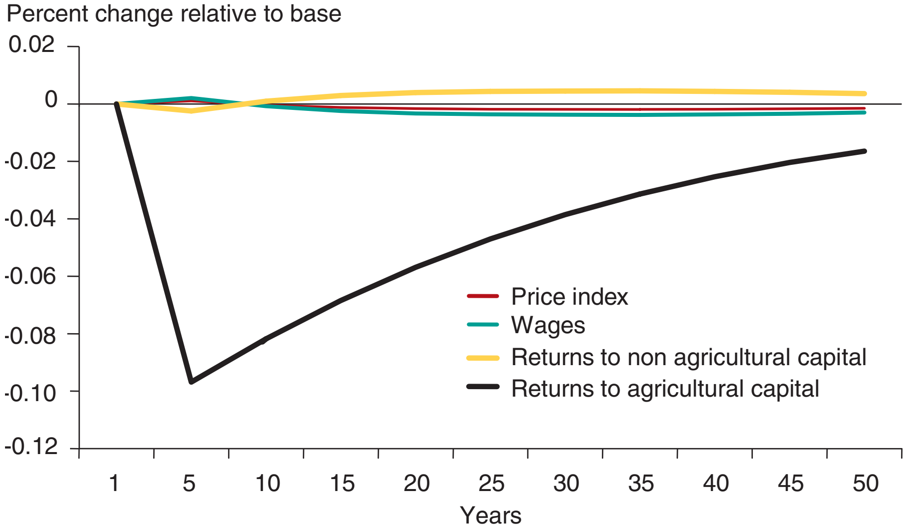
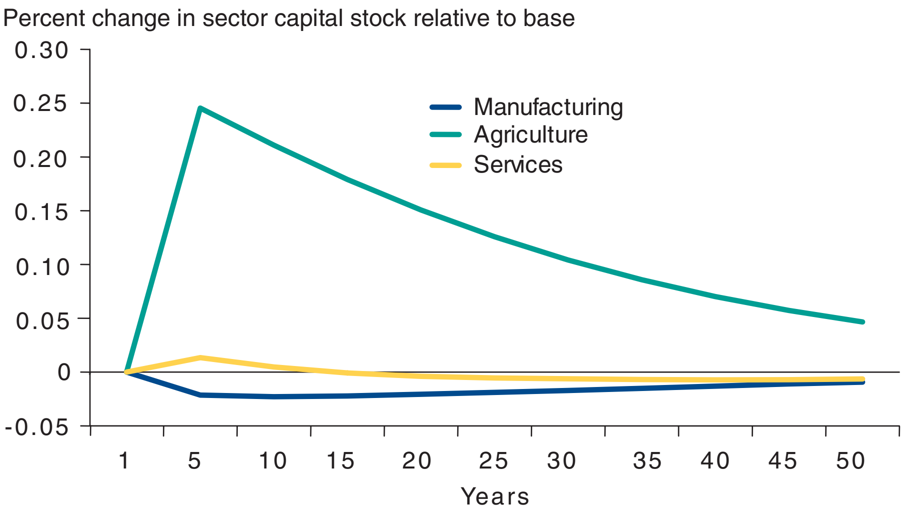


Figure 2-4

Decoupled payments have small effects on the stock of capital in agriculture: the segmented capital markets case



other words, payments do not affect the longrun level of capital stock in the sector. Nevertheless, the half-life of the adjustment is about 25 years because the depreciation rate for buildings and structures is minor. The effect on capital stocks in the rest of the economy is almost imperceptible.

As farmers increase their levels of capital stock, more labor hours, relative to the base, are also allocated to production (fig. 2-5). These hours come from a combination of reduced leisure time and more hired labor.[14] Decoupled payments encourage the employment of capital relative to labor (fig. 2-6). This is because the assumed preference for investing in agriculture causes the rate of return to capital to fall slightly relative to the change in wages. The change in the wage-rental ratio encourages more substitution of capital for labor relative to the base. In the long run, the wage-rental ratio converges to the level expected in the absence of payments.

[14] Since leisure is typically found to be a normal good, although not modeled explicitly in this report, the combination of wealth and price effects would likely leave the average level of leisure consumed by farmers to be virtually unchanged. The slight increase in agricultural labor in the segmented market case relative to the base year, comes from the hired labor market. Nevertheless, in absolute terms, in all of the analysis, there is an outmigration of labor from agriculture.

Figure 2-5

Decoupled payments cause a small increase in agricultural employment: the segmented capital markets case

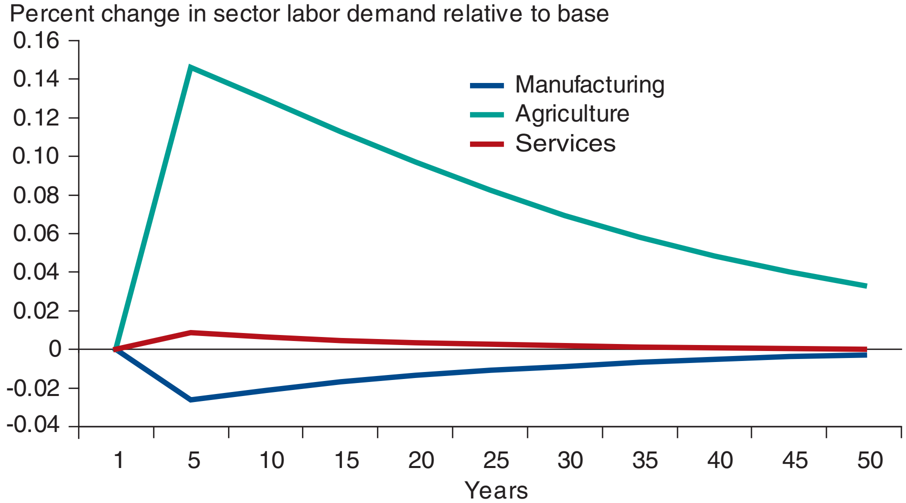
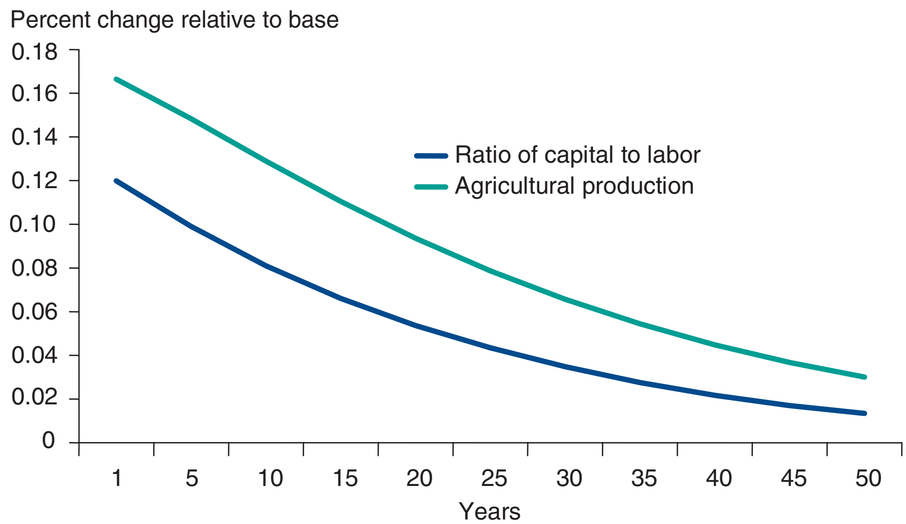


Figure 2-6

Decoupled payments cause small shortrun increase in agricultural production and in use of capital relative to labor: the segmented capital markets case



The decline in agriculture's rate of return to its capital stock also affects the price of land. As agriculture becomes more capital-intensive and returns to agricultural capital fall (shown in fig. 2-4), the returns to land rise. Land prices in the first 5 years of the simulation rise to a greater extent than in the case where capital markets are assumed to be nonsegmented, by roughly 1 percentage point in the short run (fig. 2-1). After 5 years, land values become similar to those of a nonsegmented capital market. Effectively, with decoupled payments, the segmented capital market speeds up agriculture's capital accumulation and convergence to its longrun equilibrium.

Finally, do the resource allocation effects of decoupled payments affect aggregate agricultural production? U.S. agricultural production rises by an estimated 0.17 percent of its base value in the short run. In the long run, output returns to approximately the levels that would prevail in the absence of payments (fig. 2-7). The effect that prevails in the long run is the elevated price of land (8.4 percent).

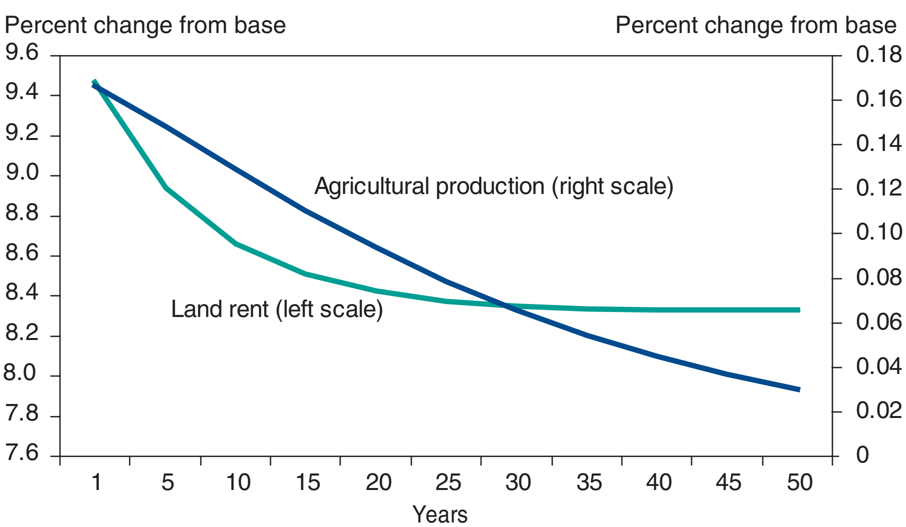
Conclusions

Are decoupled payments to farmers likely to affect resource allocation in agriculture? If not, decoupled payments can be thought of as an efficient policy instrument to transfer resources from one segment of the population to another, with minimal distortion of production or trade. Since the real economy is obviously complicated and encumbered with imperfect markets, this is a complex question. Our contribution lies in showing the circumstances under which payments have minimal market distortions. We also consider the most stringent capital market imperfections – when recipients' investment opportunities are restricted to agriculture – and show just how distorting these payments might be.

Our economywide analysis finds that if agricultural capital markets are perfectly integrated with capital markets in the rest of the economy and if the taxed and recipients hold identical preferences for goods and services, then the key effects of payments over time are to increase the value of land by about 8 percent and, of course, to increase the wealth of program recipients and their expenditures on final goods.

If we presume that farmers invest in agriculture that portion of decoupled payments not spent on consumption, payments seem to affect resource allocation and production. Over the long run, recipient households respond to declining rates of return to agricultural capital by increasing their consumption and lowering their savings rate until rates of return between agricultural and nonagricultural assets are re-equilibrated. As a result, the small production increases in the short run, less than 0.2 percent, become negligible in the long run. The only long-term effect of payments is to increase land values.

Figure 2-7
Decoupled payments have small and declining effects on output but lasting effects on land values and land rental rates: the segmented case



Chapter 3

Decoupled and Coupled Payments Alter Household Labor Allocation

Mary Clare Ahearn, David Harrington, Robert Hoppe, and Penni Korb

U.S. agriculture is one of the most productive industries in the U.S. economy and one of the most productive agricultural systems worldwide. Labor used in U.S. agriculture, both hired and family labor, has declined in absolute terms since 1948 (Ahearn et al., 1988). The long-term trend of less farm labor (in favor of other production inputs) has enabled farm operators and other household members to allocate more of their time to off-farm jobs. Off-farm income has dominated cash earnings of most farm families for over three decades and for those farm families, the pursuit of an off-farm career may supersede the effect of farm policy (including decoupled payments) on farm household decisions. As a result, off-farm labor conditions, as well as onfarm earnings and government payments, influence households' labor supply decisions.

In this chapter, we examine the relationship between farm household labor allocations and the decoupled and coupled commodity payments received by households. We first describe a theoretical model of household labor allocation that incorporates both on- and off-farm labor markets. We use the model to derive predictions about the response of household labor supply to coupled and decoupled payments. We then present descriptive statistics as well as statistical results—that control for factors other than government programs—to analyze farm household labor response to payments.

Theoretical Model of Household Labor Choices

In the standard household labor allocation model, households are assumed to maximize "utility" – the consumption of goods and leisure. Consumption is limited by a household budget constraint based on labor and other sources of income and a fixed amount of time for labor and leisure[15] (see Singh et al., 1986; Huffman, 1991). A key factor linking labor, leisure, and household income is the marginal return from working an additional hour, the market wage rate. The wage rate is also the "opportunity cost" of allocating an hour to leisure rather than to working.

From this model, we can derive the demand for farm household labor in farming, the demand for household leisure time, and the off-farm labor supply of the farm household. The derivations depend on assumptions about the decision process of the household and about the "completeness" of labor markets. Complete labor markets imply that off-farm labor opportunities are available to farm households and that nonfamily farmworkers are available for hire locally.

[15] Individuals must allocate some of their time to maintaining their households. This time is considered as part of leisure, the residual time category.

The model also distinguishes between two types of income: earned labor income and nonlabor income, such as an income transfer or dividends. The household is predicted to respond to them differently. Earned labor income can have two effects on the labor allocation decision. ***A wealth effect*** occurs if an increase in wealth or income causes the household to want to work less and enjoy more leisure. ***A substitution effect*** occurs if the household increases work hours in response to the higher marginal return to labor and reduces leisure in response to its higher opportunity cost. Nonlabor income has only a wealth effect, but no substitution effect, because it does not change returns to labor.

To make this model more useful for applied analysis, it can be extended to incorporate household resource allocations among farm work, off-farm work, and leisure time. And, whereas the household budget is assumed to be fixed in the standard model, a farm household's budget can be viewed as dependent on farm production decisions, i.e., the budget is endogenous. Taylor and Adelman (2003) call this a "farm profit" effect.

Decoupled/Coupled Payments and Total Work Hours

A decoupled payment is an income transfer; its amount does not vary with changes in hours worked onfarm. A coupled payment is labor income that varies with the amount of output, and hence the amount of labor input. So, how would decoupled and coupled payments be expected to alter the allocation of farm households' labor? And if farm households choose more leisure time, would it be at the expense of farm or off-farm work? Following are some model predictions:

- ***Workers will tend to decrease total hours worked in response to decoupled payments.*** If a farm household receives decoupled payments, the impact on labor hours worked is certain because there is no change in the hourly return from work. Household members will prefer to work less and enjoy more leisure as a result of the wealth effect. Conversely, if decoupled payments are removed, hours worked are likely to increase to compensate for reduced wealth.
- ***The effect of coupled payments on total hours worked is ambiguous.*** Increased wage rates can cause a household member to want to work more and consume less leisure because each hour of work now brings a greater return (substitution effect). But it can also cause a household member to want to work less and consume more leisure if it has more income than before (wealth effect). The net effect will be determined by a household's individual preferences and the magnitude of payments. Only by observing the behavior of households can we determine the impact of coupled payments on the allocation of time and labor.
- ***When more leisure time is demanded, farm households will tend to reduce their labor hours in the job with lower marginal returns.*** If a farm household is not involved in off-farm work, fewer hours would be devoted to farming if more leisure time is demanded by the household as a result of increased income. For multiple-job holders

who prefer more leisure time, theory predicts that a household will decrease its work hours at the job with the lower marginal returns. So, if farm work has a higher marginal return, a household desiring more leisure would allocate fewer hours to off-farm work. However, a definitive prediction in such a case depends on assumptions about the household decision process and whether labor markets are complete.

Often, economists assume that households first make optimal farm production decisions and then decisions about consumption. Where increased nonlabor income results in increased leisure, the assumption of making farm decisions first dictates that farm households will work less at their off-farm job in lieu of reducing farm work. However, it can alternatively be assumed that households first allocate their labor to off-farm work and subsequently allocate their remaining time to farm production (or make decisions simultaneously). Hence, the differing assumptions can result in differing theoretical predictions about which labor hours are reduced – farm, off-farm, or both. Because the effect of government payments on leisure time is uncertain, the use of data to study actual decisions made by recipients is essential.

Although the theoretical model predicts an adjustment away from labor hours with a lower marginal return, data on farm and off-farm labor returns, relative to hours worked, do not support the expectation that farm households closely align their labor allocation with their farm returns. All U.S. farm households receiving payments allocated, on average, 60 percent of their work hours to farming but derived only 20 percent of their income from the farm (table 3-1). Only on very large farms (which represent 5 percent of all farms) does the share of work hours on the farm correspond closely to the share of earned income from farm sources. Obviously, considerations in addition to net farm income enter into the time allocation decisions of farm households. The allocation of family labor varies considerably by the life-cycle of the family and farm type. Other factors include capital gains returns, tax management, farm succession planning, psychological rewards,

Table 3-1—Share of hours worked in farming (by operator and spouse combined) and share of earned household income from farming for participating farms, by farm type, 2000

	Participating farms' share of:			Farming share of the household's:	
Farm type	Operator households	Value of production	Government payments	Earned income[1]	Work hours
			Percent		
Limited-resource	2	--[a]	--[a]	--[b]	61
Retirement	8	1	1	--[b]	76
Residential	31	6	9	--[b]	29
Farm occupation-low sales	28	10	14	--[b]	70
Farm occupation-high sales	18	21	27	38	77
Large	8	23	26	64	80
Very large	5	40	22	82	83
All family farms	100	100	100	20	59

[a] = Less than 1 percent.
[b] Negative farm income and positive total income (from both farm and earned off-farm sources).
Source: Agricultural Resource Management Survey, 2000.

and expectations about future program eligibility (see box, "Factors Other Than Current Income Affecting Farm Labor Choices"). Similarly in considering off-farm work, health insurance benefits are often a factor in a worker's off-farm employment choices (Jensen and Salant, 1986).

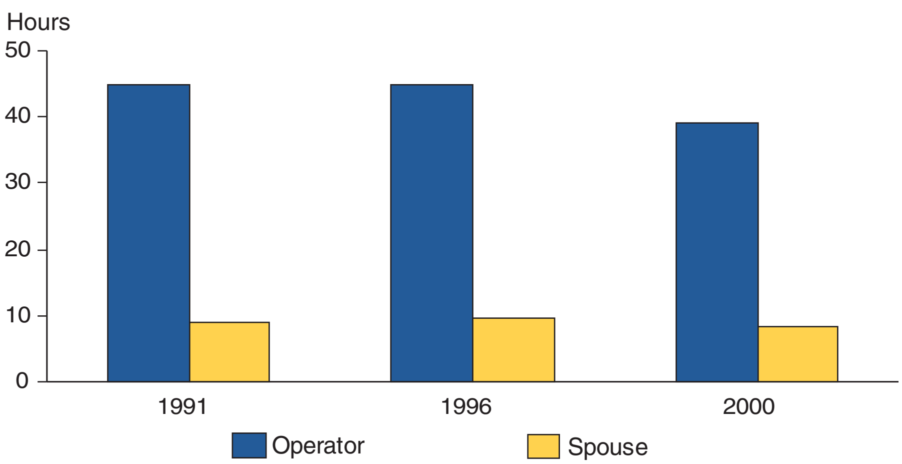
Do Farm Households Adjust Labor in Response to Government Payments?

Having reviewed some commonly held theories regarding income and labor, we now examine farm household responses to coupled and decoupled payments. USDA's Agricultural Resource Management Survey tracked labor supply responses to coupled payments as well as PFC payments during the 1990s. These data can be used to demonstrate the impact of government payments on labor hours on and off the farm during periods (1991, 1996, and 2000) when different types of policies were in place (see Westcott and Young, chapter 1).[16] This descriptive analysis is supplemented by three separate statistical analyses that isolate the effects of coupled and PFC payments on labor allocations.

- ***Households' onfarm hours changed little during the 1990s.*** The level of payments, as well as how they were distributed, varied in many ways across the time period, but farm operators and spouses receiving commodity payments maintained consistent farm work schedules during 1991-2000. ARMS data show very little difference for either operators or spouses in farm time allocations between 1991 and 2000 (fig. 3-1).

Descriptive analysis is a first step in determining the impacts of payments on labor allocations, but more advanced statistical analysis can control for other variables that may affect these decisions. Using 2001 data, El-Osta et al. (2004) analyzed the separate effects of three payments (PFC, disaster, and coupled loan deficiency payments) on farm, off-farm, and total hours worked for a sample of operators who received all three types of

Figure 3-1
Average farm hours worked per week by program commodity participants



Note: Differences across years are not statistically significant
Source: 1991 Farm Costs and Returns Survey; 1996 and 2000 Agricultural Resource Management Survey.

[16] Total payments in 1991 were about the same level as in 1996 ($8.2 billion). In 1996, the $5.9 billion in PFC payments were comparable to $5.9 billion in coupled payments in 1991, and conservation payments were relatively constant across the years. By 1999 and 2000, PFC payments and conservation payments were about the same as in 1996, but loan deficiency payments and emergency assistance resulted in total payments of just above $20 billion.

Factors Other Than Current Income Affecting Farm Labor Choices

Capital gains. Some farmers may own and operate their farms in anticipation of capital gains from increasing land values. Other farmers may be largely retired but maintain the farm to minimize capital gains taxes from selling or transferring the farm prior to death (Harrington, 1983; Davenport et al., 1982).

Current income tax management. Farm losses can be used to offset income tax liability on nonfarm income. This tax advantage could outweigh the incentive to leave farming for farms that have net income losses (Davenport et al., 1982).

Farm succession. Farmers intending to pass the farm onto future generations may place a value on this option in addition to current-year returns. Farmers surveyed in 1988 were twice as likely to state they intend to bequeath their farm as to sell it (Whittaker and Ahearn, 1991).

Psychological rewards. Farmers likely get satisfaction from farming beyond monetary returns. This presumed psychological dividend is often offered as an explanation for why farmers choose to stay on the farm despite low, and even negative, profits.

Expectations that current farm operation may affect future program eligibility. Farmland owners may expect that future rules of eligibility to receive payments may be conditional on how they operate their farms in the current period. Some farmers may perceive that producing traditional program commodities, even if the payments are decoupled from current year production decisions, may maintain or increase their eligibility for future payments. A 2002 ARMS survey of farmers at the close of the FAIR Act found a great deal of diversity in their expectations about government support under a future farm bill.

Farmer expectations at the end of the FAIR Act about prices and government support under a future farm bill.

Survey question	Share responding[1]
Do you expect to receive about the same level of government support for this operation during the next 4 years?	Percent
Yes	41
Expect more	9
Expect less	25
Unsure	25
Do you expect government support regardless of price developments during the next 4 years?	
Yes	65
No	35
During the next 4 years, do you expect the general trend in the prices of the commodities you produce to be—	
About the same	65
Decline	16
Increase	19

[1] Excludes respondents who refused. Refusals varied from 2-6 percent of respondents.

payments.[17] Moreover, they provided two treatments for payments, one that treated the decision to participate in programs as endogenous and the other as exogenous. All government payments combined had a positive impact on the hours that operators worked on the farm. When payments were modeled separately, PFC payments still had a weakly significant and small positive impact on operator's farm hours worked. For the average recipient who received just over $9,000 per year in 2001, the estimates suggest they might increase total work hours by about 1 workweek per year.

In another study using pooled 1998-2000 data, Dewbre and Mishra (2002) found that PFC payments did not have a statistically significant impact on farm hours worked for those payment recipients who allocated hours to both farm and off-farm work. Their analysis is not directly comparable to El-Osta et al. in research design. Dewbre and Mishra rexcluded retirement and residential/lifestyle farms and controlled only for farm size and receipt of other nonlabor income. (Dewbre and Mishra did not report an analysis of the impact of PFC payments on farm labor for the group that did not work off the farm.)

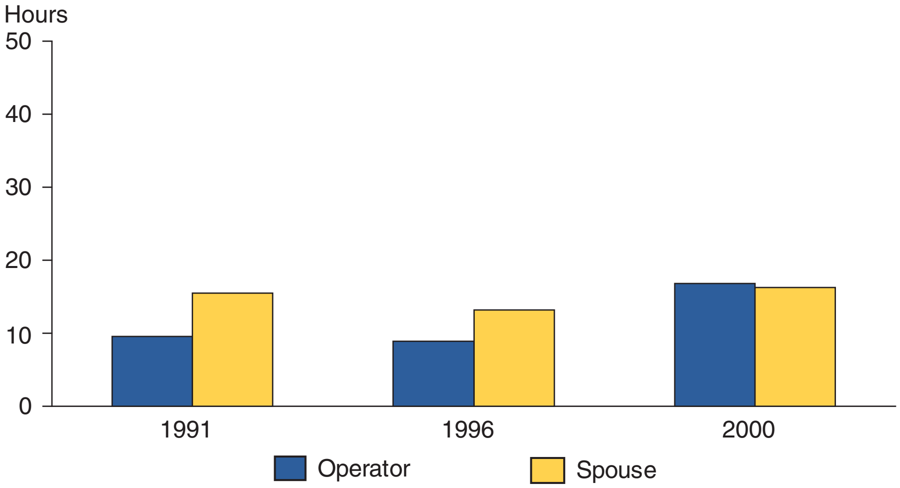
The modest labor response to decoupled payments reported by Dewbre and Mishra is consistent with similar findings in nonfarm labor markets. For example, the labor allocation model has been applied to labor supply decisions of lottery winners. Imbens et al. (2001) found that lottery winners who won an average of $80,000 per year (for 20 consecutive years) reduced their labor supply between 4.1 and 9.3 hours per week (from a base of 37.5 hours per week). However, small lottery winners, receiving annual payments of $15,000 or less, did not significantly alter their supply of labor. While the conditions in which PFC payments are given differ in important ways from lottery winnings, the example illustrates the relatively minor impacts on labor decisions to be expected from small, unconditional income transfers. Since lottery winners reduce work and increase leisure, while PFC recipients increase work on the farm, there are likely benefits of farm work or aspects of farm labor markets that differ from nonfarm.

- ***Work off the farm increased during the 1990s; still, coupled and decoupled payments helped reduce off-farm work hours***. ARMS data show a pronounced increase in off-farm work in the latter half of the 1990s (fig. 3-2). To augment this simple comparison of hours worked in different years, we describe estimates of a labor supply function that controls for dynamic variables that also may affect off-farm work hours, such as local labor conditions.

El-Osta et al. (2004), with an off-farm labor supply model using 2001 data, found that all payments combined—and PFC payments individually—had a negative impact on off-farm work. Ahearn et al. (2002) reached a similar conclusion using a model with operators who participated in government programs during 3 years in the 1990s. Ahearn et al. found no difference in the effect of payments on off-farm labor supply between 1991 and 1996 when coupled payments declined and PFC payments were introduced. Payments had a weaker negative effect on off-farm labor supply in 1999, when payments were a mixture of coupled and PFC payments. The smaller impact in 1999 was due to the significantly greater transfers in that year, rather than a difference in the impact of the different payment types. These

[17] Specifying the sample to be only those farms that received all three types of payments provided the most stringent statistical test. When the analysis was performed with a larger sample for farms that received any of the three categories of payments, the statistical significance of the relationships between payments and hours was even stronger.

Figure 3-2
Average off-farm hours worked per week by program participants



Note: For the operator and spouse, the 1991-96 change was not statistically significant; the 1996-2000 change was statistically significant.
Source: 1991 Farm Costs and Returns Survey; 1996 and 2000 Agricultural Resource Management Surveys.

analyses reinforce previous studies showing that coupled government payments decrease the likelihood of farm operators working off the farm (El-Osta and Ahearn, 1996; Mishra and Goodwin, 1997).

Given the consistency across studies, we conclude that the statistically significant increases in off-farm work of farm operators from 1996 to 2000 may have been even greater had payments not been so high. This conclusion holds for both coupled and decoupled payments.[18]

- ***Operators of large farms providing the bulk of output continue to work more than 40 hours per week on their farm.*** Of those farms that receive payments, more than 80 percent of production comes from the largest 30 percent of farms. Almost all of the operators of these farms are only employed on their farms. For example, in 2000, operators of the largest farms worked about 60 hours per week on their farms, and very little, on average, off their farms. This is consistent with the labor allocations of large farms in years prior to the 1996 Act.

Conclusions

The impact of decoupled payments—versus coupled payments—on farm labor and agricultural supply, compared to a scenario with no program payments, is much more complex than can be portrayed by the simple, shortrun models of labor allocation presented here. Still, we found that both decoupled and coupled payments help to decrease off-farm work hours. We also found that the introduction of lump-sum payments after the 1996 Farm Act seems to have encouraged farm households to devote slightly more hours to farm work.

The labor allocations of farm families are intertwined with their goals and decisions about managing farming operations now and into the future. If farm families adjust their work little or not at all in response to decoupled payments, it may be due to considerations such as expectations about future

[18] This is consistent with Dewbre and Mishra (2002) who found, for households that worked on and off farm, PFC payments did not affect their farm hours but did reduce the total hours they worked. That is, PFC payments likely induced farm households to work less off their farm in the late 1990s than they would have otherwise.

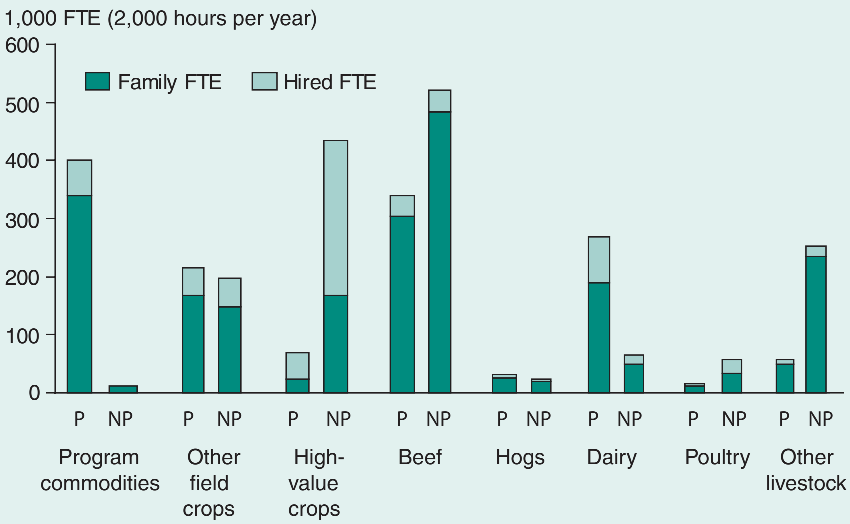
program eligibility. In addition, farm families may be limited in how they apportion their labor: farm work is highly seasonal and off-farm jobs are often inflexible in their time requirements. Life-cycle considerations influence labor choices, too. Perhaps most important, large commercial farms provide the bulk of U.S. output. The introduction of decoupled payments did little to alter the allocation of labor on these farms, where operators typically devote 60 hours per week (full-time) to farm work.

What is the impact on overall farm production? The potential effects of labor shifts on supply depend in part on the amount of labor used in production, and this varies across farm sectors (see box, "Family and Hired Labor on Farms Receiving Government Payments"). Also, if decoupled payments led to changes in hours worked by farm households, hired labor could adjust to maintain production levels—if rural labor markets are functioning well. Other material inputs may also substitute for labor, offsetting any impacts on production levels from changes in household work hours. Production effects, therefore, can be expected to be proportionately smaller than any changes in labor inputs in response to coupled or decoupled payments.

Family and Hired Labor on Farms Receiving Government Payments

Farm operators and their families supply, in aggregate, about two-thirds of the labor hours worked on U.S. farms, but labor shares vary considerably by participation in government programs and commodity specialization.

Family and hired labor FTE by specialization and program participation, 2000



P = Payments NP = No Payments
Note: Farm specialization = commodity accounting for at least 50 percent of the farm's value of production.

Chapter 4

Decoupled Payments and Farmers' Production Decisions Under Risk

Shiva S. Makki, Agapi Somwaru, and Monte Vandeveer

When decoupled payments were enacted in 1996, some identified ways that decoupled payments might indirectly influence production decisions (Hennessy, 1998; Tielu and Roberts, 1998; and Antón, 2000). Such indirect links include easing farmers' credit constraints, raising farmers' wealth and thus their tolerance for risk, instilling expectations of future payments, and affecting farmers' labor-leisure decisions. In this chapter, we are concerned primarily with farmers' wealth, risk attitudes, and production decisions. Decoupled payments increase producers' wealth, and this enhanced wealth, in turn, could increase their tolerance to risk. This willingness to assume more risk could lead to shifts toward more acreage for riskier crops or changes in use of risk-reducing (or increasing) inputs, leading to changes in total plantings. If such decisions at the farm level are significant, aggregate U.S. production could change, which could affect world markets.

Decoupled Payments and U. S. Farmer Income and Wealth

The size of decoupled payments since 1996 raises the question of whether they might still induce additional production indirectly. Specifically, do farmers' income and wealth increase to the point where they become willing to assume more risk and alter their production decisions?[19]

Like other government payments, decoupled payments represent an immediate supplement to farm household income and can be used for current needs, including paying for farm expenses and meeting family living costs. Decoupled payments also affect farm household wealth – the value of assets less liabilities – when they are used for purposes such as reducing debt, investing in the farm, or nonfarm investments. For landowners, decoupled payments also influence wealth by increasing farmland values. The value of agricultural land should largely reflect its current and future earnings potential. Because PFCs become a part of returns to farmland, they become capitalized into its price, changing the wealth of land-owners. Using a dynamic model, Roe et al. (chapter 2) estimated that PFC payments increased aggregate land values by about 8 percent. Goodwin et al. (2003a, 2003b) found that decoupled payments have increased land values, ranging anywhere from 2 to 6 percent in the Northern Great Plains and Corn Belt regions. Barnard et al. (2001) found that the gap between aggregate land values with and without government payments was about 13 percent during 1990-97, increasing to about 25 percent during 1998-2001 when payments included MLA and marketing loan benefits in addition to PFC payments. Note that farmers who buy land after the payments have already been capitalized into

[19] The remaining discussion will focus on payments having characteristics similar to the PFC payments and not the Market Loss Assistance emergency payments made in 1998 to 2001. Also, we do not address the issue of updating and expectations related to the direct payments created under the 2002 FSRI Act.

the land price do not benefit, since the capitalized value of the payments was, in effect, paid to the previous owner.

However, not all PFC payments benefit farm operators since not all farmland is owned by operators. Tenant farmers may pass these payments through to landlords through higher farmland rental payments and as a result do not benefit from the entire direct payment or its capitalization into land values. An ERS report indicates that about 60 percent of the acreage enrolled in the PFC program was rented in 1996 (USDA, ERS, 2003). Roberts (chapter 6) reports a one-third pass-through rate from farmers to landowners on cash-rented land in 1997. These values suggest nonfarm landlords received at least 20 percent of the payments (60 percent of land times 33 percent pass-through rate). After adjusting for payment pass-through, Roberts estimates that the total (coupled plus decoupled) payments in 1999 represented an average of 3 percent of overall farm household wealth for households receiving payments. Decoupled payments in 1999 accounted for 24 percent of total direct payments to these farm households.

Risk and Risk Management in Farming

Does greater wealth make producers more willing to accept risk in their production decisions? Risk is a fundamental component of the farm business and farm household, and it influences production choices and farm management decisions. The many sources of risk in agriculture range from price and yield risk to income/financial risk to personal injury/health risk (Harwood et al., 1999). Farmers who have borrowed money are at risk of default if income falls short. Because prices, yield, and other outcomes are contingent on markets and weather, the consequences of production decisions are not known until long after those decisions are made.

Several surveys have asked farmers to rank the risks they confront. The 1996 ARMS data indicate that producers of field crops—such as wheat, corn, soybean, tobacco, and cotton—were concerned more about yield and price variability than about other categories of risk, while producers of vegetables, greenhouse crops, cattle, and poultry were most concerned about changes in government laws and regulations. Across all farms, ARMS data clearly indicate that producers are most concerned about changes in government laws and regulations (institutional risk), variability in crop yields or livestock output (production risk), and uncertainty in commodity prices (market risk) (Harwood et al., 1999). Concerns about risk also vary across types of producers and by farm type and size groupings (Musser and Patrick, 2002).

Farmers generally use a combination of risk management tools to mitigate risk. Risk management strategies include diversification, production contracting, maintaining liquid assets, and crop insurance. In crop production, farmers may reduce risk by using more drought-tolerant varieties, varying tillage practices, or irrigating if possible. To transfer the risk of falling crop prices, farmers may use forward contracting, futures, or options. Government payments also provide support during periods of low commodity prices and in the event of natural disasters.

The farming household has additional means for coping with risk. Off-farm employment is a significant source of income for many farm households, and this source is usually more stable than farm income. Most farmers have some life insurance, health insurance, and insurance on major property such as their home, automobiles, and farm equipment. Investments can be shifted between farming and nonfarming uses. Household consumption may be tightened if income drops.

Even so, all of these strategies do not completely mitigate the risk of low incomes. For example, farmers with crop insurance must still absorb the deductibles, and price-hedging strategies often maintain some basis risk.[20] Government emergency payments usually do not cover all yield shortfalls. Even off-farm employment may be uncertain. So farming decisions will always be made in the face of at least some risk. Consequently, understanding farmers' attitudes toward risk is critical to ascertain how they may make use of decoupled payments.

[20] Basis risk is the risk that the producer's local cash price does not track perfectly with the price of the hedging instrument, such as a futures contract.

Farmers' Attitudes Toward Risk

Farmers allocate their assets and engage in production activities to maximize the utility of their income or wealth, rather than to simply maximize expected profits (see box, "Measures of Risk Aversion"). This implies that farmers use decision rules that account for not only expected profits but also the risks associated with their production and management decisions. When a decisionmaker prefers a particular amount of income generated with certainty from an economic activity or adoption of technology over an alternative that, on average, provides the same expected return but also has uncertainty in its outcome, the individual is said to be *risk averse*. A risk-averse person still prefers more income to less, but would be willing to give up some income in exchange for a more stable stream, while a *risk-neutral* person is interested only in expected or average profits and would not be dissuaded by any uncertainties in prices or output. The trade-off may depend on the level of wealth.

An individual's preference now and into the future for a certain outcome over an uncertain one with equal expected value can be measured by the risk aversion coefficient. Empirical studies have generally found evidence of risk aversion for most U.S. farmers, but with a wide range of risk attitudes (table 4-1). These studies date back 30 years and have examined the risk attitudes of many groups of farmers by using a variety of approaches to measure these attitudes.[21]

[21] Young (1979) categorizes these methods as direct elicitation of utility functions (DEU), experimental methods (EM), and observed economic behavior (OEB). The DEU process consists of interviewing farmers to determine their preferences among risky alternatives for hypothetical gains and losses. The EM process consists of presenting farmers with real risky prospects (that is, significant monetary payoffs instead of simply hypothetical choices) and observing their decisions. The OEB method consists of estimating risk attitude parameters reflected in observed farming decisions, such as input levels and crop acreage mix.

Some studies have examined whether the agricultural sector as a whole exhibits risk-averse behavior. In studies of the U.S. corn and soybean sectors, Chavas and Holt (1990 and 1996) found evidence of risk aversion as well as decreasing aversion to risk as wealth increases. Lence (2000) found mild risk aversion for the U.S. agricultural sector but also found that relative risk aversion among U.S. farmers appeared to decrease over time since the mid-1930s.

Just and Pope (2002) summarized research on risk preferences as generally supporting the "stylized fact" that utility (see box, "Measures of Risk Aversion") is increasing at a decreasing rate with wealth and profit; that is,

Table 4-1--Risk attitudes of U.S. farmers: Results of empirical studies

Source	**Description of producers**	**Measurement method**[1]	Sample size	**Risk attitudes**	**Effect of wealth**
Bard and Barry	Illinois farmers	DEU-interval method	81 farmers	>50 percent averse	Not evaluated
Brink and McCarl	Midwest grain farmers	OEB-compared profit max. vs. utility max. in QP model	38 farmers	66 percent averse, 34 percent neutral, 0 percent loving	Not evaluated
Chavas and Holt, 1990	U.S. corn and soybean sectors	OEB-model based on acreage allocations	Aggregate-used national data	Averse	Decreases aversion
Chavas and Holt, 1996	U.S. corn and soybean sectors	OEB - model based on acreage allocation	Aggregate-used national data	Averse	Decreases aversion
Collins, Musser, and Mason	Oregon grass seed growers	DEU-estimated utility functions	37 farmers	16-32 percent averse 38-52 percent neutral, 30-32 percent loving	Not evaluated
Halter and Mason	Oregon grass seed growers	DEU-estimated utility functions	44 farmers	About equal across averse, neutral, loving	Not evaluated
Hildreth and Knowles	Minnesota cattle producers	DEU-estimated various utility functions	13 farmers	85 percent to 8 percent averse, varies by functional form;	Generally decreases aversion
King and Oamek	Eastern Colorado wheat farmers	DEU - interval approach	10 farmers	30 percent averse, 70 percent mixed	No clear relationship
Lence	U.S. agricultural sector	OEB-model based on asset allocations	Aggregate-used national data	Averse	Not evaluated
Lin, Dean, and Moore	California crop farmers	OEB-compared utility max and profit max	6 farmers	50 percent averse, 33 percent neutral, 17 percent mixed	Not evaluated
Love and Buccola	Iowa corn and soybean farmers	OEB-estimated using FOC for input choices in utility max model	264 farmers in 3 counties-data aggregated by county	Averse for all 3 counties	No change (imposed by functional form)
Ramaratnam, Rister, Bessler, and Novak	Texas grain sorghum farmers	DEU-estimated various utility functions	26 farmers	100 percent to 73 percent averse, varies by functional form;	Varies by functional form
Saha, Shumway, and Talpaz	Kansas wheat farmers in utility max model	OEB-estimated using FOC for input choices	15 farmers (observations aggregated)	Averse	Decreases aversion
Schurle and Tierney	Kansas crop and livestock farmers	DEU-interval method	90 farmers	80 percent averse, 2 percent neutral, 18 percent loving	Not evaluated
Tauer	New York dairy farmers	DEU - interval method	72 farmers	34 percent averse, 39 percent neutral, 26 percent loving	Group test: decreases aversion
Thomas	Kansas crop and livestock farmers	DEU - interval method	30 farmers	20 percent averse, 13 percent loving, 67 percent mixed	Generally decreases aversion
Wilson and Eidman	Minnesota swine producers	DEU - interval method	45 farmers	42 percent averse, 36 percent neutral, 22 percent loving	33 percent decreases, 21 percent constant, 18 percent increases, 28 percent mixed

[1]DEU = direct elicitation of utility, OEB = observed economic behavior, FOC = first order conditions, and QP = quadratic programming.

Measures of Risk Aversion

Economists have theorized that individuals use decision rules that account for not only expected profits but also the risks associated with their management decisions. That is, individuals allocate their assets and engage in production activities that maximize the “utility” of their income or wealth, rather than simply maximize expected profits. “Utility” in this sense accounts not only for the mean or average level of income or wealth but also for its variability or riskiness.

A decisionmaker is said to be “risk averse” when he or she prefers a particular amount of income received with certainty over an alternative that, on average, provides the same expected return but also has uncertainty in its outcomes. Put another way, a risk-averse person still prefers more income to less, but prefers less variability over greater variability. A more risk-averse person is willing to accept a smaller income with certainty, relative to the expected value of the risky prospect. A person who cares only about expected profit and is indifferent to its variability is said to be “risk neutral,” while a person who prefers more variability for a given level of expected profits is said to be “risk loving.”

Risk aversion is indicated by a utility function that shows decreasing marginal utility as the level of income or wealth (w) is increased. Indifference to risk is represented by a linear utility function. More formally, risk attitude is defined by the second derivative of the utility function: $U''(w) < 0$ implies risk aversion, $U''(w) = 0$ implies risk indifference or neutrality, and $U''(w) > 0$ implies risk preference.

An individual’s preference for a certain outcome over an uncertain outcome with equal expected value is measured by the risk aversion coefficient, and this measure is suitable for comparisons across individuals or comparisons across income or wealth levels for a single decisionmaker.

The degree of risk aversion is measured by coefficient of absolute risk aversion, coefficient of relative risk aversion, and coefficient of partial (relative) risk aversion. The “coefficient of absolute risk aversion” is defined as: $r^a = - U''(w)/U'(w)$; while the “coefficient of relative risk aversion” is defined as: $r^r = - w\,U''(w)/U'(w)$. A third measure of risk aversion is the “coefficient of partial (relative) risk aversion,” defined as: $r^p = -x\,U''(x)/U'(x)$, where x is gain or loss or operating income. Partial risk aversion is the same as relative risk aversion, except that it is defined in terms of loss or gain, rather than wealth (Robison and Barry, 1987; Newberry and Stiglitz, 1981).

Constant Absolute Risk Aversion (CARA) implies that the preferred option in a risky choice situation is unaffected by the addition or subtraction of a constant amount to all payoffs. In other words, a person whose aversion to a particular level of risk is not affected by their level of wealth is said to display CARA. A negative exponential utility function such as $U = 1\text{-}\exp(-cW)$ exhibits CARA property. $r^a = c$ for this utility function. CARA is not a desirable property because it fails to represent rational decisionmaking. Most empirical studies in agricultural economics reject the assumption of CARA (Pope and Just, 1991; Chavas and Holt, 1996).

Decreasing Absolute Risk Aversion (DARA) implies that an individual becomes more willing to accept a particular risk as his or her wealth increases. A log utility function such as $U = \ln(w)$ exhibits DARA property. $r^a = 1/w$, implying that an individual becomes less risk averse as his or her wealth increases. Chavas and Holt, 1996 and Saha et al. 1994, found agricultural decision maker preferences to be consistent with DARA.

Economists have theorized that most people probably become less averse to a particular level of risk as their wealth increases and, in this case, are said to display DARA. In a sense, a person with a million dollars would be less averse to a gamble with some probability of losing $100 than if this person had only $2,000 to start with.

Increasing Absolute Risk Aversion (IARA) implies that an individual is less willing to accept a particular level of risk as his or her wealth increases. A quadratic utility function such as: $U = w - bw^2$ exhibits IARA property. $r^a = 2b/(1-2bw)^2$ suggests that an individual becomes more risk averse as his or her wealth increases. Since IARA implies rarely observed response to risk, quadratic utility function is not generally assumed in the literature.

Constant Relative Risk Aversion (CRRA) implies that the preferred option among a set of risky alternatives would not be changed if all payoffs were multiplied by a constant amount. That is, an individual will have constant aversion to a proportional loss of wealth even though the absolute loss increases. A special form of the power utility function such as $U = \{1/(1-r)\}W^{(1-r)}$ exhibits CRRA property. $r^r = r$ for this utility function. CRRA is implicit in many risk analyses in which calculations are on a per-acre basis. CRRA is inappropriate for risk analysis in agriculture because farmers with different farm sizes are known to react differently to risky alternatives.

In sum, with CRRA, a person feels the same about losing 10 percent of $100 and losing 10 percent of $1,000. With increasing RRA (IRRA), a person is more averse to losing 10 percent of $1,000 than to losing 10 percent of $100, while with decreasing RRA (DRRA) a person is more averse to losing 10 percent of $100 than to losing 10 percent of $1,000.

producers are generally risk averse. But they also found decreasing absolute risk aversion to be common among producers, implying that as producers become wealthier over time they have more tolerance for risk. Although farmers who receive PFC payments likely display varying attitudes toward risk, it is certainly plausible that some such farmers are willing to assume more risk.

Decoupled Payments and Production Decisions

Decoupled payments may influence farmers' production decisions if changes in wealth alter their attitude toward risk. A farmer's level of risk aversion may affect production decisions and management choices in several ways. The most obvious is the mix of farm outputs. Like an investor trying to balance risk and returns in a securities portfolio, a producer may adjust the acreage mix of crops to reflect some tradeoff between risk and returns. Compared with a more risk-averse farmer, a less risk-averse farmer would plant more land to a riskier crop or plant on marginal land if it enabled greater returns (Hardaker et al.).

Aversion to risk may also affect total output and input use. A more risk-averse producer, who dislikes income variability, may prefer slightly lower output and expected returns if variability of returns also declines (Sandmo, 1971). So if decoupled payments raise farmers' wealth and their tolerance for risk, they may take on more risk in their production choices in pursuit of higher returns. Risk aversion could also affect input decisions to the extent that the level of input use affects output variability. Other things equal, a risk-averse producer would prefer to use less of an input (such as fertilizers for corn production) that increases output variability, compared to input use for expected profit maximization (MacMinn and Holtman, 1983).

As mentioned, some have argued that decoupled payments encourage producers to increase their production and alter cropping patterns, with unintended aggregate effects. Many theoretical studies have described these possible links. For example, Tielu and Roberts (1998) examined how decoupled payments may boost production by increasing farm investment (increasing wealth and lowering risk), reducing farm exits (by raising land values), and increasing output in the long run (by creating expectations of future payments). They argued that the wealth and risk effects of decoupled payments on production are likely minimal.

Only a few empirical studies have examined the actual magnitude of such effects on crop production; these are simulations of the payments that suggest that decoupled payments have little effect on U.S. acreage allocation and production. Young and Westcott (2000) applied the acreage elasticities with respect to wealth from Chavas and Holt (1990) to U.S. crops receiving PFC payments. Because PFC payments are small (3 percent of total farm wealth) and because the impact of wealth on acreage is also small, Young and Westcott conclude that acreage shifts from PFC payments would be minimal.[22] Assuming that farmers receive the full value of PFC payments, the estimated acreage shift for the seven crops covered by PFC payments would range from 180,000 to 570,000 acres annually, on a base of about

[22] This elasticity shows the percentage change in crop acreage in response to a 1-percent change in farm wealth.

180 million acres. Accounting for the pass-through of PFC payments to nonfarming landlords would reduce this effect even further.

Burfisher et al. (2000) used a computable general equilibrium model of the United States, Canada, and Mexico to show the effects of decoupled payments on agricultural production, prices, and trade. They incorporated risk premiums reflecting the variability of net returns for four major crops into their model. Here, risk premiums work like a tax or added cost, resulting in lower overall production. By reducing risk premiums, decoupled payments lead to higher production. Their model suggests that a 50-percent increase in decoupled payments would boost U.S. crop production slightly, ranging from 0.5 percent for wheat to 1.1 percent for oilseeds. Burfisher et al. used a relative risk aversion coefficient of 2.0 for the U.S.; using Lence's (2000) value of 1.13 would reduce the risk premiums by roughly half, resulting in an even smaller acreage shift.

Conclusions

The effects of decoupled payments have become prominent as governments consider how to fulfill their WTO obligations to limit payments that influence production, prices, and trade. The notion that decoupled payments might influence production through "risk effects" presumes that such payments increase farmers' income and wealth such that they become less risk averse. This change in attitude could then be manifested through changes in input use, a new output mix, and changes in overall production.

The effects of payments on risk attitudes and production are likely small for several reasons. While many farmers are likely to alter their response to risk as they become wealthier, decoupled payments are small compared with participating farmers' net wealth—after adjusting for pass-through to nonfarming landowners. More important, while empirical studies of farmers' risk attitudes indicate some evidence of risk aversion, producers do not respond to risk solely through adjustments to production or inputs. Surveys find that producers already use various tools—such as insurance, hedging, and management strategies—to mitigate risks. And, farm households can respond to changes in their risk attitudes with adjustments throughout their portfolio, such as off-farm employment and investing in nonfarm real estate or financial assets.

Chapter 5

Decoupled Payments to Farmers, Capital Markets, and Supply Effects

Robert N. Collender and Mitchell Morehart

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.[23] 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.[24]

[23] 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).

[24] 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).[25] 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.

[25] 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

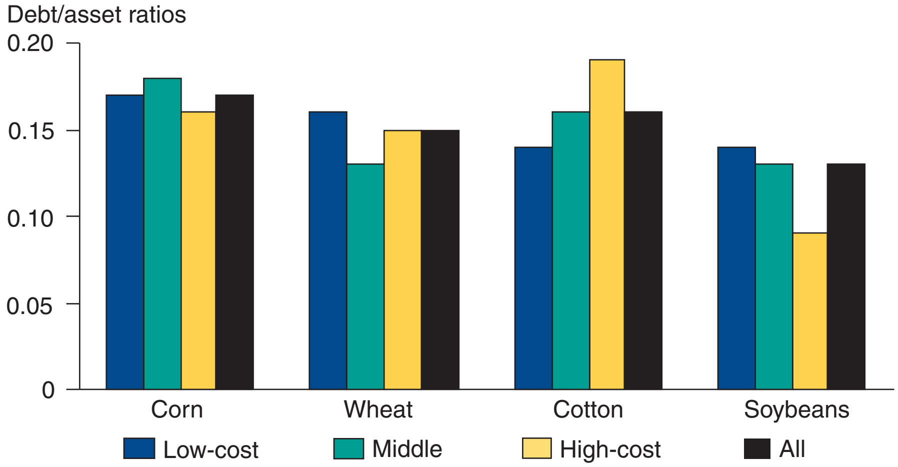


Figure 5-2
On average, high-cost farms invest at least as much as low-cost farms in machinery per acre farmed

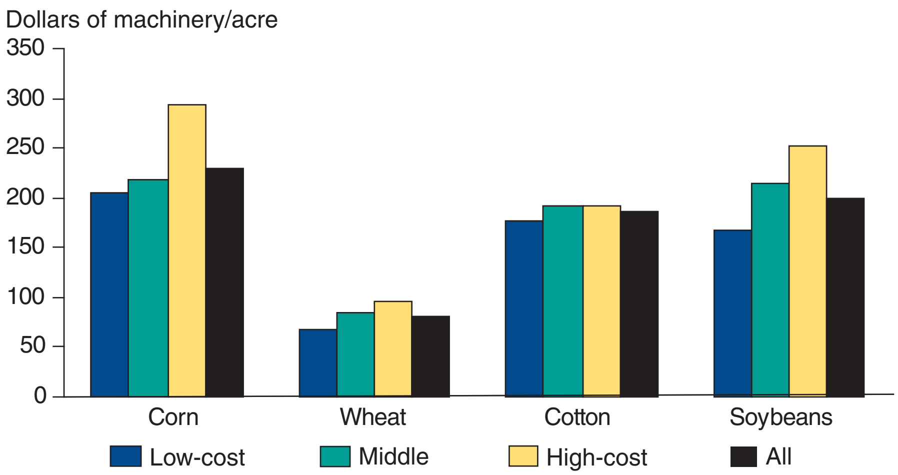
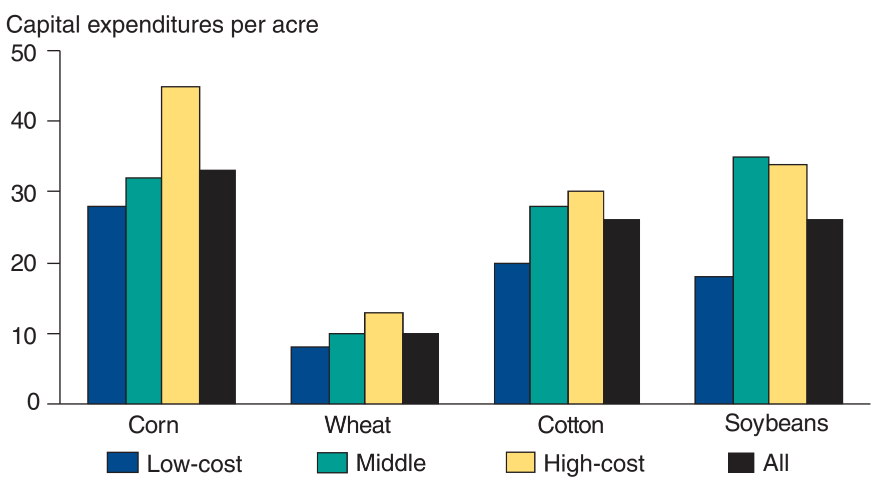


Figure 5-3
Capital expenditures per acre of high-cost farms exceed that of all farms, on average



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.

Chapter 6

Effects of Government Payments on Land Rents, Distribution of Payment Benefits, and Production

Michael J. Roberts

Economic reasoning and some empirical evidence suggest that farmland rental payments increase with more direct government payments to farmers (Barnard et al., 1997; Floyd, 1965; Gardner, 1992; Kuchler and Tegene, 1993; Goodwin et al., 2003; Kirwan, 2003; Lence and Mishra, 2003; Roberts et al., 2003). The roles of farm operator and farm landowner diverge on the 60 percent of U.S. cropland that operators rent from owners (USDA, 2003).[26] As a result, the degree to which farmland rents increase with government payments strongly influences the distribution of payment benefits between landlords and renters. By examining the degree to which land rents increase with increasing payments, we also obtain indirect evidence on the potential production impacts associated with domestic agricultural programs. This evidence is useful because a direct empirical assessment may be difficult or impossible, especially when program payments are decoupled. Understanding how agricultural payments could affect production is central to tracing the full range of market effects of agricultural payment programs, including impacts on world commodity prices as a result of national supply responses.

[26]This figure is derived from table 74 of the Agricultural Economics and Land Ownership Survey (2001).

Effect of Payments on Land Rents Depends on Production Distortions

If agricultural land markets are competitive, land rents will vary according to the profits tenant farmers expect to earn from farming. High-quality agricultural land, capable of producing higher yields or higher value crops, will command a higher rent per acre. Similarly, agricultural lands eligible for government payment programs also will tend to command higher rent per acre. How much higher the rent may be depends on the features of government programs, including the flexibility granted (whether they may grow crops, which crops they may grow, the production practices they may use).

Many agricultural payments—called coupled payments—are connected to the amounts and/or prices of certain crops. To maximize profits *plus* payments, farmers may use land differently than they would without the payments—for example, by producing greater amounts of more heavily subsidized crops. Altering types or quantities of crop production to boost payments may generate additional costs and so lower net revenues, which will offset some of the payments farmers receive. Moreover, if farmers collectively produce more output in response to payments, commodity prices will fall. When market revenues fall as a result of the program, per-acre rents are expected to rise proportionately less than the per-acre payments farmers expect to receive. If land markets are competitive, the difference will reflect the amount that profits are reduced by the production distortion. In other words, the greater the distortion, the less rents will increase with increasing payments.

In contrast, lump-sum, or decoupled, agricultural payments are allocated irrespective of land use, current production, prices, or input use. In the absence of market imperfections, these payments provide farmers with no incentive to manage their operation any differently than they would without them, and rents will tend to increase dollar for dollar with level of payments received. As an example, consider two parcels of land, identical in all attributes except that the decoupled payments are linked to the second parcel. If payments are decoupled, production activities and profits will be identical on both parcels, and the increase in rent can be expected to equal the level of payments.

No farm program appears to be completely without potential effects on production. Production Flexibility Contract (PFC) payments, established in the 1996 Federal Agriculture Improvement and Reform Act (and called "direct payments" in the 2002 FSRI Act), are perhaps the least coupled of all U.S. Government payments to farm operators. These payments are based on historical plantings and program participation and place few restrictions on farmers' production activities. The restrictions prohibit new fruit or vegetable plantings or conversion of payment-receiving land to a non-agricultural use. Thus, if these restrictions are not binding, these payments would not be expected to reduce profits. Accordingly, farmers would not be expected to discount the value of current payments when determining rent. Alternatively, if the FAIR Act programs were to induce an increase in production, which increases costs or lowers commodity prices and thereby reduces profits, then the increase in rents would be expected to increase less than the full amount of the payments.

If the land rental market operates efficiently, the program-induced increase in profits plus payments will tend to be passed through to the land owner – either the full face value of payments or a smaller amount. If efficient land markets are assumed, the amount by which payments are not passed through to land owners therefore signals the degree to which payments could be distorting production activities and profits. If, however, land rental markets adjust slowly and/or incompletely, then the value of the payments may not be passed through to land owners in the first year or two after the program is implemented. Thus, one cannot determine to what extent incomplete pass-through of payments in land rents is attributable to imperfect and/or slowly adjusting land rental markets rather than production distortions attributable to the payments themselves.

Evidence on the Links Between Payments and Land Rents

A first step toward understanding wealth and production effects stemming from coupled and decoupled payments is to determine how they affect land rents. Land rents would be expected to increase more (relative to a context with no payments) the smaller the production distortion induced by the payments. Land rents should rise commensurately with payments if payments have no effect on production and if land markets operate efficiently.

Income or wealth effects, which have often been used to explain possible production distortions from PFC and Market Loss Assistance (MLA) payments, depend in part on the share of payments passed on to landlords via higher rents. After accounting for rent pass-through, one can then examine the relationship between payment benefits received and the wealth of farm households that receive them. The magnitude of changes in wealth may indicate the potential for the different kinds of production distortions stemming from market imperfections (described in Chapter 3 on labor, Chapter 4 on risk, and Chapter 5 on capital).[27] Information about who ultimately receives payment benefits may also be interesting in its own right.

Roberts et al. (2003), by analyzing over 60,000 records of the Agricultural Census, estimated the amount by which total government payments (excluding conservation programs) increased land rents in both 1992 and 1997, on either side of the watershed 1996 FAIR Act. The estimates were based on a statistical comparison of farm-specific per-acre rental costs with county average rental costs and how much this comparison depended on the amount of payments received per acre farmed. Many variables were used to control for other factors affecting land rents, and statistical techniques accounted for differences between actual payments received and payments a farmer could have *expected* to receive at the beginning of the season, when rental agreements are typically negotiated.[28] For 1992, the study found that on land rented via cash leases, 21 cents of each dollar in government payments received (plus or minus 4 cents) was passed through to landlords via higher rents. The estimate for the same farms in 1997 was 33 cents per dollar of government payments (again, plus or minus 4 cents).[29]

These findings suggest that PFC payments have approximately 50 percent greater effect on land rents than pre-FAIR coupled payments. A large share of the benefits, for both coupled and decoupled payments, seem not to be passed through to landlords. This is true even in 1997, a year in which nearly all payments were from the PFC program.[30] Because nonoperator landlords own approximately 60 percent of cropland, they receive an estimated 20 percent of the total payment benefits via higher rent (33 cents of the 60 percent of program dollars paid to tenant operators).

Of course, 1997 was the first year in which rental contracts were negotiated after the FAIR Act, and 1992 was the second year after implementation of the prior farm bill. If cash rents adjust slowly to the new program benefits, we may be understating the benefits of the PFC payments to landlords – both relative to the prior program and in absolute terms. Also, lands receiving higher per-acre government payments likely differ in many ways from lands receiving lower per-acre payments, even within counties, and our analysis may be reflecting these unmeasured differences. Although great care was taken to control for confounding factors, some unobservable factors affecting rents may be correlated with government payments and cause the estimates to be biased.

[27] It makes sense that payment benefits retained by tenants would be relevant when assessing potential wealth effects. It could be, however, that wealth effects on landlords could also play a role. Landlords sometimes make decisions that affect production, as they often supply equipment, irrigation water, or other inputs to production. In any case, tracing out the flow of wealth is important for understanding where wealth effects are likely to be largest.

[28] A statistical technique called "instrumental variables" was used to account for expectation error.

[29] The analysis was based on cash rent leases only. In share-contract leases, the landlord receives a share of the proceeds from crops grown, where the share is established at the beginning of the growing season.

[30] The year 1997 was unique in that nearly all government payments (excluding conservation payments) emanated from PFC payments. Of the approximately $8 billion paid to farmers in direct government payments in 1997, $6.1 billion were PFC payments, $1.7 billion were toward conservation (not included in this analysis), and $257.3 million came from other sources. Unfortunately, the census data do not discern between PFC payments and other kinds of nonconservation payments.

Distribution of Payment Benefits

Most payments are tied to current or historical production of certain field crops. As a result, large farmers in Midwestern States generally receive more government payments than other farmers. Large farmers also rent a greater share of land from nonoperating landlords, and may pass more payment benefits on to landlords. An account of payment pass-through is therefore needed to understand the relationship between payments and household wealth.

Using 1999 ARMS data, Roberts and Key (2003) examined the relationship between total (coupled, decoupled, and conservation) payments received and the wealth of farm households. In 1999, payments totaled $21.1 billion, of which 23.8 percent were PFC payments, 35 percent MLA payments, and 32.2 percent loan deficiency payments. Loan deficiency payments have much stronger ties to production than PFC and MLA payments. Figure 6-1 shows the relationship between payments and wealth, both with and without adjustments for payment pass-through via higher rents. Each point represents 1 percent of the sample of farms sorted according to household net worth. The study adjusted total payments by reducing them (by a factor) for land rented in by the farm operator from another land owner and increasing them for land rented out by the operator to another farmer. The factor used for all payments was the 1997 estimate of 33 cents per decoupled payment dollar passed through to landlords.[31] With or without the pass-through adjustments, wealthy farmers receive far more payment benefits than less wealthy farmers.

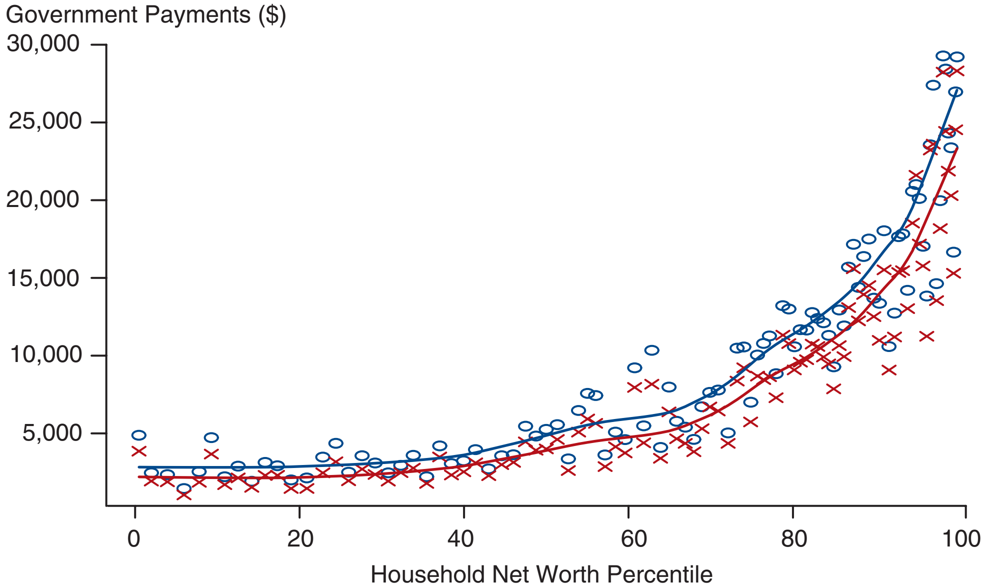
Table 6-1 presents data on government payments (coupled and decoupled) to farm households in 1999, adjusted to take into account their tenancy arrangements. More than 58 percent of farm households received no government payments in 1999, mainly because they did not produce program crops and did not participate in other programs. In contrast, 1.2 percent of farm households received slightly more than 25 percent of total adjusted government payments, and about 0.2 percent of farm households received almost 9 percent of all adjusted payments. Households in the highest payment category (more than $150,000 of adjusted government payments) averaged more than $2.1 million in net worth and $236,663 in (coupled and decoupled) government payments. Across all farm households, adjusted total government payments in 1999 were $5,860, about 1 percent of average net worth. Across PFC recipients, adjusted (coupled and decoupled) government payments in 1999 averaged $20,381, compared to an average net worth of $562,567. In 1999, PFCs accounted for 24 percent of total payments to producers.

By these tenancy-adjusted measures of well-being, a large share of government payment benefits went to the wealthiest farmers in 1999. Although adjusted total payment levels are substantial for the higher payment categories, other researchers have shown that wealth transfers on this scale have a relatively small effect on labor supply (see chapter 3).

[31] Note that payments in 1999 were substantially higher and of a different composition than in 1997 so it is not clear whether the pass-through rate affected payments by the same factors as in 1997. The calculations also assume the factor is the same for share leases as it is for cash-rent leases.

Figure 6-1

The Relationship between Government Payments and Household Net Worth, 1999



Note: Blue indicates payments received and red indicates adjusted payments, which account for higher rents paid and received.

Source: Roberts and key (2002).

Table 6-1—Coupled and decoupled payments to farm households, adjusted for land tenancy characteristics

Adjusted government payments category	Average unadjusted government payments	Average adjusted government payments	Share of farm households	Share of all government payments	Average farm household net worth
	$ per household		Percent		$
0	0	0	58.1	0.00	507,263
$1 - 10,000	3,373	3,019	27.4	14.1	514,431
$10,000 - 25,000	19,312	16,476	7.8	21.9	719,726
$25,000 - 50,000	42,020	34,978	4.1	24.3	992,557
$50,000 - 75,000	76,234	60,494	1.4	14.2	1,210,949
$75,000 - 150,000	126,331	100,643	1.0	16.6	1,461,119
> $150,000	278,817	236,663	0.2	8.9	2,146,703
All farm households	6,966	5,860	100.0	100.0	562,657
All PFC participants	24,882	20,381	22.0	64.2	660,031

Source: Roberts and Key (2002). Data are from 1999 USDA Agricultural Resource Management Survey. All averages are weighted to account for sample design. Payments are adjusted for payment pass-through on operators' rented-out and rented-in acreage. See Roberts and Key for details on how payments were adjusted for land tenancy arrangements.

Conclusions

Recent evidence suggests that government payments to farmers do induce higher land rents. The estimated effect is much larger for PFC payments than for pre-1996 payments, which had stronger ties to current production. Although cash rents vary a great deal across farmland, the rents seem not to vary dollar for dollar with PFC payments: only an estimated 33 cents of each decoupled payment dollar is reflected in higher cash rents. Many factors may contribute to this observation. Some rural land rental markets may not be competitive. It may take time for land owners to adjust rental agreements to changing government payment terms and levels, and they may not seek to extract all farming benefits from these tenants due to familial or personal relationships. It may be that production is affected by PFC payments via the wealth effect in combination with one of more of the market imperfections described in Chapter 1, by the remaining land restrictions, or perhaps via other channels not yet explored. Finally, it could be that these estimates are biased by variables not included in our model. At present, the finding that renters pass through only a third of a lump sum payment received may be viewed as puzzling.

The finding that wealthy farmers receive a large share of payment benefits—coupled and decoupled—is less ambiguous. This relationship is robust to different assumptions about the effect of payments on land rents and provides some insight into the distribution of payment benefits. Wealthy farm households receive sizable payments and produce most farm output.

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