

THE CAPITALIZATION OF DECOUPLED GOVERNMENT SUBSIDIES INTO
AGRICULTURAL LAND RENTS

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Abstract Under the 2002 U.S. Farm Act, direct and countercyclical payments are intended to be “decoupled” from production decisions in the current period. To accomplish this, these payments are tied to farms with agricultural land, called “base” acres, that has a history of production. I estimate the implicit rental rates of base and nonbase acres, showing that a premium is paid for base acres. The premium is driven by systematic differences between base and nonbase acres, including the receipt of direct and countercyclical payments. I discuss some of the domestic and international policy implications of the capitalization of government payments into agricultural rental rates.

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Introduction

Under the 2002 U.S. Farm Act, direct and countercyclical payments are intended to be “decoupled” from current production decisions. To accomplish this, the payments are tied to farms with agricultural land that has a history of producing certain crops (often referred to as “base” acres), such as corn, wheat, or soybeans. Hence, direct and countercyclical payments differentiate base from nonbase acres as factors of agricultural production. However, the two types of land in general do not explicitly rent at different rates. A single parcel of land that contains both base and nonbase acres may be rented at a single per acre rate. In this paper, I estimate the different implicit rental rates for base and nonbase acres. I show that in the U.S., base acres rent for approximately \$80 per acre on average while nonbase acres rent for \$69 an acre. This premium for base acres is driven by the presence of direct and counter-cyclical payments as well as any systematic differences between base and nonbase acres. These factors affect the supply and demand for base acres relative to nonbase acres. Market supply and demand conditions will determine the rates at which base and nonbase acres rent, with the difference including any premium paid for base acres due to direct and countercyclical payments.

When base acres are leased under a cash agreement, the relevant subsidies are paid to the tenant operator rather than the landlord. Because direct and countercyclical payments are tied to the land rather than production, they would in most cases go to the landlord in the absence of a lease agreement, even if nothing was produced. Therefore, the government payments represent a real opportunity cost to the landlord when they do lease out their land. The landlord has an incentive to demand a higher price for base relative to nonbase acres while the tenant has an incentive to pay a higher price, the incentive being the receipt of the payments.

The presence of a base acre premium leads to three major policy implications that receive attention in both the academic literature and the popular press. First, most landlords of agricultural land are nonfarmers. If the incidence of these government programs falls on nonfarming landlords rather than farm operating tenants, a significant portion of taxpayer dollars may be missing their intended mark. Second, if these government programs raise the cost of the primary input to agricultural production (land), they may be creating a barrier to entering the market for next generation farmers. However, the receipt of the payment largely mitigates any adverse effects on new farmers, especially if payments are not fully capitalized into land values. Third, if direct and countercyclical payments are capitalized into land values, they are less likely to be production and trade distorting. These three policy implications will be discussed in more detail after a review of the literature and a presentation of the methodology and results.

Literature Review

A considerable amount of literature is available that reports how government payments may be capitalized into agricultural land values (Featherstone and Baker 1988; Beach, Boyd, and Uri 1997; Barnard et al. 1997; Weersink et al. 1999; Lamb and Henderson 2000; Barnard et al. 2001; Goodwin, Mishra, and Ortalo-Magné 2003a, 2003b, 2005; Roe, Somwaru, and Diao 2003; Shaik, Helmers, and Atwood 2005). The overwhelming majority of these studies find that government subsidies increase land values. The studies cited use a variety of data sources and represent a wide range of theoretical underpinnings and empirical techniques. Much of the recent literature concerning the effects of government payments on land values focuses its attention on agricultural rental rates. Because leases for agricultural land are short term (most often one year), rental rates are based on the land's value in agricultural production for that year (Allen and Lueck 1992). The impact of urban pressures on agricultural land *values* can be quite

large, but is more limited on agricultural land *rents* due to the short term of most lease agreements.¹ In addition, reported rental rates from most surveys are different from reported land values in that rental rates are determined by participation in a market for land while land values are often a nonmarket assessed or stated value.

The literature is unanimous in estimating that decoupled subsidies increase the rental rate of agricultural land. However, the magnitudes of the estimated effects of these subsidies on rental rates vary. Lence and Mishra (2003) use county-level panel data for the state of Iowa for the years 1996-2000 to show that a \$1 increase in direct payments leads to a \$0.86 increase in agricultural rental rates. Goodwin, Mishra, and Ortalo-Magné (2005) use data for the years 1998-2001 to estimate that \$0.66 of every dollar of direct payments goes to the landlord under a cash rental agreement. Roberts, Kirwan, and Hopkins (2003) use nationwide census data from 1992 and 1997 in their analysis and conclude that for every dollar of government payments, rental rates increase in the range of \$0.34 to \$0.41. Kirwan (2005) performs a similar but more detailed econometric analysis using the same census data and estimates that \$0.18 of every dollar of direct government payments is passed through to the landlord. While decoupled payments may not be fully capitalized into land values, the literature clearly suggests that they do contribute to the premium paid for base acres.

Model and Results

For each observation i , total rents are mathematically equivalent to the sum of the rents paid for each type of acre, or

$$(1) \quad R_i = r_{ai}A_i + r_{bi}B_i$$

¹ See Barnard, Wiebe, and Breneman (2003) for more information on the effects urban sprawl has on agricultural land values.

where A_i and B_i represent total nonbase and base acres, respectively. Total rents for each observation are denoted by R_i . Average rent for a nonbase acre is denoted r_{ai} while average rent for a base acre is denoted r_{bi} . While equation (1) is linear, the parameters to be estimated vary by observation. An OLS regression requires that the parameters be constants. The nonbase acre rent for each observation is therefore defined as varying around some group average, or $r_{ai} = \bar{r}_a + \varepsilon_{ai}$, where \bar{r}_a is the group constant per acre rent and ε_{ai} is the individual observation's variation from the group constant. The same definition is applied to the rent paid for a base acre, or $r_{bi} = \bar{r}_b + \varepsilon_{bi}$.

Substituting these equalities into equation (1) yields equation (2), a linear equation in which the intercept term, α , is constant and theoretically equal to zero.

$$(2) \quad R_i = \alpha + \bar{r}_a A_i + \bar{r}_b B_i + (\varepsilon_{ai} A_i + \varepsilon_{bi} B_i)$$

The parameters to be estimated are also constant, satisfying the conditions for an OLS regression. The components of the error term in equation (2) are identifiable and assumed to be uncorrelated with the independent variables. This assumption is valid if the average rent for each type of acre does not systematically vary with its quantity of acres rented.²

Data for the analysis come from the 2002 Agricultural Resource Management Survey (ARMS), which is conducted each year by the US Department of Agriculture's National Agricultural Statistics Service (USDA-NASS).³ On the 2002 survey, farmers were asked how many base acres they operate and how many base acres they *own and operate*. The difference

²Some might argue that renting a large quantity of land may lead systematically to discounted average per acre rents from the landlord. However, farming operations that rent large quantities of land often do so from several different landlords, which would likely eliminate any discounts they receive for renting land "in bulk." Nevertheless, controls are used to minimize any correlation that might exist between the independent variables and the error term.

³For more information on ARMS, see the USDA-ERS (2007a) briefing room at <http://www.ers.usda.gov/Briefing/ARMS/>.

between the two measures yields the number of base acres rented.⁴ With measures of the total rent paid by each operation and the quantity of base and nonbase acres rented, implicit rental rates for the two types of land can be estimated. Observations are limited to farms that produced program eligible crops and rented land only under a cash lease agreement.

Table 1 shows the results for estimations of three different specifications of the model found in equation (2). The first specification estimates the different average rents paid for base and nonbase acres from the model as it is specified in equation (2). The second and third specifications control for regional (COUNTY), size (FARMSIZE), and production specialty (FARMTYPE) effects in order to check the robustness of the parameters estimated. The estimates for the rents paid to base and nonbase acres remain relatively consistent across the three specifications.

The results show that base acres rent for about \$80 per acre while nonbase acres rent for about \$69 per acre. The National Agricultural Statistics Service estimates the average rental rate for all cropland for the year 2002 to be \$71.60, a value that lies between the base and nonbase rents estimated here (USDA-NASS 2006). These results imply a rent premium of approximately \$11 for each base acre of land rented.⁵ While the results show a nonzero rent premium for base acres, they do not show what factors or combination of factors is driving this premium.

What Drives the Premium?

Agricultural land is a factor of production and its price is determined by the market forces of supply and demand. Any consistent and systematic differences between base and nonbase

⁴ The question was repeated for a limited sample of farms on the 2003 ARMS survey, and was dropped after that survey. Therefore, the set of data is limited to the 2002 survey respondents.

⁵ Rather than randomly sampling farms, the ARMS survey uses non-random, stratified sampling techniques. This implies the need for sample weights when utilizing ARMS data. The sample weights are determined by NASS, but are calibrated to estimate national-level statistics such as farm income and assets (USDA-ERS 2006). Therefore, the sample weights may not be correctly calibrated for a farm-level econometric analysis. The results presented here do not incorporate the NASS sample weights for the reasons stated. When weights are included, the estimated rents are \$78 for base acres and \$57 for nonbase acres.

acres, such as direct and countercyclical payments or productive quality, will affect their respective rental rates by affecting supply and demand. The supply and demand elasticities will determine to what extent the advantages of base over nonbase acres pass through to landlords.

Direct and countercyclical payments are associated with base acreage (USDA-ERS 2007b). The level of direct payments associated with a parcel of land is generally known by both landlord and tenant in advance of any lease agreement. Therefore, the actual value of payments is negotiated, perhaps implicitly, into the rental rate of land. Countercyclical payments, on the other hand, are paid only when commodity prices fall below a legislated target level. Any rental rate for land that includes base acreage will therefore include an implicitly negotiated expected value of countercyclical payments. This expectation may differ between landlord and tenant. All else constant, land that generates additional revenue from government subsidies will rent for a higher rate than land that cannot.

It has been argued that because base acres have a history of production, they may systematically be of a higher productive quality relative to nonbase acres (Roberts, Kirwan, and Hopkins 2003; Kirwan 2005). If so, base acres will command a higher rental rate than nonbase acres even in the absence of government support. However, in empirical analysis, it is difficult to disentangle any effects land quality might have on the base acre premium from the effects of direct and countercyclical payments. This is in part due to the nature of the base acre program. Base acres are assigned to a farm operation, not to specific acres of land. For example, assume a farm operation has 100 acres, 50 of which are designated as base. Further, 50 of the acres are of a higher productive quality than the other 50. Because the base acres belong to the farm operation, the farm operator may designate the 50 lower quality acres as the base acres. This diminishes the possibility of systematic differences in land quality between base and nonbase

acres in applied work, though the differences may still exist. By including regional fixed effects in the analysis, only within region differences in land quality between base and non-base acres could be driving the premium.

While government payments and possible systematic production advantages may increase the premium paid for base acres, other characteristics may reduce the premium. One example of this is the fruit and vegetable planting restriction on base acres (Young et al 2007). Fruit and vegetable operations often generate more value per acre than program crops, leading to higher per acre rents for fruit and vegetable acreage. The current restriction of planting fruits and vegetables on base acres could systematically lead nonbase acres to rent at higher rates than base acres in regions where fruit and vegetable production is more prevalent. This would reduce the premium paid for base acres.

The nature of the lease agreement may also affect the ability of landlords to capture the benefits of government subsidies when base acres are leased. Under a fixed cash agreement, as with the farm operations used in this analysis, it is possible for the landlord to capture the full benefits of the subsidies. Under a share-cropping agreement, where the landlord and tenant split the profits as well as the government subsidies, it is less clear how the farm operator tenant's share of government payments might be transmitted to the landlord. One possibility might be that the negotiated share is higher for rented land that includes base acres relative to rented land that does not. This is a testable hypothesis. In addition, leases may be a hybrid of cash and share agreements, where the cash portion may reflect the capitalization of government payments into the rental rate of agricultural land.

It is fundamentally the supply of and demand for agricultural land that determines the rate at which it will rent. Market conditions will affect how much of the additional revenue

generated by base acres, whether it is from government support payments or productive superiority, will pass through to the landlord in the form of higher rents. The demographic and production trends in the agricultural sector imply fewer tenants and more landlords as larger farming operations continue to rent from an increasing number of smaller, retiring landlords. A market in which there exist several landlords and few tenants may lead to some market power for tenants, who could then negotiate a rental rate that does not reflect the full incidence of direct and countercyclical payments.

The sample mean per acre direct payment is approximately \$30.⁶ If the base acre premium were driven by only direct payments, only a third of these payments are capitalized into the rental rates of agricultural land, a result supported by previous national-level studies (Roberts, Kirwan, and Hopkins 2003; Kirwan 2005). However, these results might rather reflect the full pass-through of direct payments in conjunction with higher *ceteris paribus* land values for nonbase acres in areas where fruits and vegetables are produced. It cannot be determined from this analysis what combination of forces is driving the estimated \$11 base acre premium.

Policy Implications

The capitalization of direct and countercyclical payments into agricultural land rents has several domestic and international policy implications. First, it implies that landlords may receive the support intended for farmers. Second, if government subsidies serve to inflate land values, it may discourage next generation farmers from entering the market. Third, if the incidence of government payments falls on landlords, their production distorting effects are likely to be diminished. If the payments are less production distorting, they are also less trade distorting.

⁶ The weighted sample mean is approximately \$26.

Most landlords are not farm operators (Burfisher and Hopkins 2003; Kirwan 2005). If the purpose of direct and countercyclical payments is to increase the incomes of farm households, at least some of these subsidies are missing their intended recipients. Even if payments do not benefit the farm household, they may benefit rural households. Many landlords are widows or heirs that inherited agricultural land. The political interpretation of this phenomenon lies in how one defines a farmer. For US government statistics, farms are generally defined as any place that produces or would have produced \$1,000 or more worth of agricultural products. As long as a landowner minimally maintains their agricultural land, they are considered the “farm operator” of any base acreage they own and are eligible to receive direct and countercyclical payments. A land owner may not produce anything and still be entitled to receive direct and countercyclical payments under this definition. This makes it possible for businesses or individuals who have little to do with farming to receive direct and countercyclical payments on land they own. Further, because base acres are assigned to the farm, a landlord may have the option of assigning the “base” designation to less desirable land, keeping the payment, and renting out the higher quality land. In other words, landlords could receive the payment explicitly rather than having to capture it implicitly through higher rents.

It has been argued that the premium for base acres may discourage new farms from entering the market (OECD 2005). If direct and countercyclical payments are inflating the price of agricultural land, new farm operators may not be able to overcome the high cost barrier to entry. However, the actual receipt of the payment will mitigate most of the effects of the higher priced land, especially if direct and countercyclical payments are not being fully capitalized into agricultural land rental rates. Additionally, the weight that banking and lending institutions place on a secure source of government funding when making loans to new agricultural producers will

affect the extent to which direct and countercyclical payments mitigate any effects of corresponding higher priced land.

Concerns about the trade impacts of decoupled payments are synonymous with concerns about the production effects of decoupled payments. Direct payments under the 2002 Farm Act are designed to be decoupled from current production decisions. Hennessy (1998) noted that while decoupled payments may not have overt production effects, they may have an indirect effect on production. Decoupled payments may affect a farm operator's expectations, risk preferences, or access to capital (Young and Westcott 2000; Westcott and Young 2004). If the landlord captures the entire benefit of the payment, then these indirect effects exert no influence on the farm operator tenant. However, production effects may still exist when base acres are rented, even if the landlord captures the entire benefit of the payment through higher rents. Direct and countercyclical payments may alter the *landlord's* expectation of future payments or their risk preferences. If a landlord has market power, they may be able to discriminate against which commodities will be produced on their land.

Conclusions

When discussing the domestic and international impacts of U.S. farm policy, the capitalization of government subsidies into agricultural land values is a topic that encompasses several of the issues involved. This paper estimates the different implicit rental rates for base and nonbase acres, showing that land associated with certain government subsidies rents at a significantly higher rate on average. The premium for base acres reflects the capitalization of direct and countercyclical payments into agricultural rental rates as well as any other systematic differences in the productive capabilities of base and nonbase acres.

The extent to which landlords capture the benefit of direct and countercyclical payments affects how well these payments achieve their domestic and international policy objectives. First, nonfarming landlords benefit from at least a portion of direct and countercyclical payments through increased rental rates, implying that potentially hundreds of millions of dollars are not benefiting their intended recipients. Second, while government payments contribute to the price of agricultural land, the price increase does not act as an additional barrier to market entry for next generation farmers because the receipt of the payment mitigates the effects of the higher priced land. This is especially true if direct and countercyclical payments are not fully capitalized into the rental rates of agricultural land. Third, to the extent that government subsidies are capitalized into land rental rates, they are less likely to be production, and therefore trade, distorting.

Future research should continue to better isolate the effects of direct and countercyclical payments from the effects of other systematic differences between base and nonbase acres. Care should be taken to incorporate nuances such as the fact that base acres are tied to farm operations rather than specific acres. While this study focuses on farm operations with only cash-leased acreage, the way in which payments are (or can be) capitalized under share or cash-share hybrid agreements also merits attention.

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Table 1. The Estimated Rents Paid for Base and Nonbase Acres

	Estimate	Robust Std. Error
<u>Specification 1</u>		
Intercept (α)	2,992	4,497
Base Rent (\bar{r}_b)	77.48*	7.95
Nonbase Rent (\bar{r}_a)	62.62*	7.15
R-Square	0.611	
<u>Specification 2</u>		
Intercept (α)	-4,618	9,054
Base Rent (\bar{r}_b)	81.83*	10.11
Nonbase Rent (\bar{r}_a)	71.19*	6.25
COUNTY	Included	
R-Square	0.913	
<u>Specification 3</u>		
Intercept (α)	3,307	39,185
Base Rent (\bar{r}_b)	80.31*	6.74
Nonbase Rent (\bar{r}_a)	69.19*	4.23
COUNTY	Included	
FARM SIZE	Included	
FARM TYPE	Included	
R-Square	0.915	

Note: * implies significance at the 1% level. Data are taken from the 2002 ARMS survey. Observations are restricted to farm operations that rented land under cash lease agreements only. The data also exclude farm operations from which 50% or more of their total value of production came from livestock, fruits, vegetables, or nursery products. The data set contains a total of 915 observations.