The 1996 Federal Agriculture Improvement and Reform Act: Correcting a Distortion?

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Abstract

This study makes use of farm-level data from the Agricultural Census to evaluate the effects of the 1996 Federal Agriculture Improvement and Reform (FAIR) Act, which intended to "decouple" commodity payments from production decisions. Prior to this Act, agricultural support payments were linked to production decisions via prices and a complex set of restrictions that acted to control the supply of agricultural commodities. We compare farm-level 1992-to-1997 changes in commodity crop plantings of farms that participated in government programs with farms that did not participate. We find that the growth rate of program-crop acreage of non-participants was 19 percentage points below that of participants. This estimated difference remains unchanged after we account for unobserved effects relating to farm size, type, location, and interactions of these factors using over 1900 fixed-effects variables. These results may imply that program participation rules associated with pre-1996 programs effectively acted to limit program acreage in 1992. An alternative explanation is that payments associated with decoupled programs instituted with the 1996 Act were in fact distortionary and induced farmers to produce more than they would have without the payments. Additional research would be needed to test these competing theories.

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Introduction

Decoupled payments are lump-sum income transfers to farm operators that do not depend on current production or commodity prices. Agricultural payments were decoupled in the U.S. in 1996, in part to improve economic efficiency and to satisfy obligations to international trade agreements. Prior to this Act, agricultural support payments were linked to production decisions via prices and a complex set of restrictions that acted to control the supply of agricultural commodities. The payment decoupling that occurred with the 1996 Federal Agriculture Improvement and Reform (FAIR) Act was expected to enhance efficiency by removing constraints on planting and distortionary incentives to over-produce.[1] This paper uses farm-level data from the Agricultural Census to evaluate the effect of the 1996 commodity payment decoupling—a regime change in which payments with strong links to production decisions are removed and replaced with payments with few or no links to production decisions. We explore whether decoupling caused farmers to increase or reduce land allocated to program crops. In doing so, we gain insight into the degree to which the 1996 decoupling reduced, or even potentially increased, production of program crops. These findings will inform debates on future agricultural policy reforms and are especially relevant to the on-going World Trade Organization (WTO) talks, in which possible distortions created by agricultural support programs in industrialized countries have become a major source of contention.

Prior to 1996, deficiency payments and commodity loan programs were the main source of U.S. government agricultural support. These programs essentially placed a floor under the price that participating farmers received for their crops. By raising the price farmers could expect to receive and reducing price risk, deficiency payments would have had the effect of stimulating output. To prevent excess supply, acreage limitation and set-aside provisions were used to limit production and program costs. In addition, prior to 1996, program enrollment was based on a five-year planting history, which created a further potential market distortion due to the incentive to maintain acreage to ensure

[1] Throughout this paper we use the word "decoupling" to refer to a regime change (such as that implemented by the 1996 FAIR Act) in which payments with strong links to production decisions are removed and replaced with payments with few or no links to production decisions.

eligibility for future payments. Although particular features of government programs often varied from year to year, farm programs before 1996 can be characterized as being largely coupled because of their strong links to farmers' production decisions. Given the complicated nature of these former programs, which included offsetting features requiring farmers to idle (leave fallow) a certain portion of their acreage, the extent to which these programs impacted production, and even the net direction of any impacts, remain unclear.

Decoupled payments to farmers began with the Production Flexibility Contracts (PFC) program in the 1996 Farm Act. PFC payments were based on historically-enrolled contract acreage, not current plantings. Farmers in the PFC program were given almost complete flexibility in deciding what crops to plant, subject to some land management regulations. The Act also fixed contract acreages (called "base acres") at 1995 levels. Because the levels of decoupled payments were independent of farmers' production decisions and market prices, it has been maintained that these programs minimally affect production. The 1994 Uruguay Round of the General Agreement on Tariffs and Trade (GATT) included commitments by developed nations to reduce subsidies for agriculture, but permitted domestic support measures if they had a "minimal impact" on production or trade, did not increase market prices or consumer costs, and were financed by general tax revenues. Such so-called "green box" policies include decoupled income support for producers. Although decoupled payments theoretically should be minimally trade distorting under certain conditions, there have been few empirical studies to verify this theory. Decoupled payments may distort production by allowing for greater agricultural investment via wealth effects, and by creating expectations of future payments that influence current production decisions (Hennessy, 1998; Tielu and Roberts, 1998).

Although other studies have attempted to estimate production effects resulting from decoupled payments using cross-sectional data (eg., Goodwin and Mishra, 2002), we are not aware of any studies that estimate the degree to which the 1996 Act affected production distortions. In this study, we use farm-level panel data from the US Agricultural Census from 1992 and 1997 to estimate the effect of payment decoupling on agricultural production. The Agricultural Census includes information on the

amount of land allocated to particular crops, total government payments, and land set-aside in accordance to program requirements.

Our basic empirical approach is to compare the growth in program crop acreage of farms participating in government programs with the growth of those not participating, controlling for farm sales class, farm type, location and other farm and operator characteristics. If coupled program payments previously caused farms to over-produce program crops, we would expect decoupling to reduce plantings of program crops for program participants relative to non-participants. Thus, program participants should have increased (decreased) their acreage in program crops between 1992 and 1997 by less (more) than non-participants. On the other hand, if acreage reduction provisions that accompanied program participation effectively restricted program-crop plantings in 1992, then decoupling could result in a greater (smaller) increase (decrease) in program acreage for program participants relative to non-participants.

Our identification of the effects of decoupling exploits an exogenous policy change (the 1996 Act) coupled with ex-ante variation in government program participation. Farms with similar cash sales of program crops, located in the same state, and producing the same crops in 1992 were differentially affected by the 1996 Act because of differential participation in government farm programs. Prior to 1996, restrictions on what could be planted on base acreage elicited less than full participation in government programs – between 60 and 85 percent of qualified acres for most program crops, and markedly less for oats.[2] In our sample, approximately 18% of farms did not participate in government programs.

Since farms are not randomly assigned to participate or not in farm programs, the empirical challenge faced in this paper is to control for unobserved factors that could influence both program participation and plantings of program crops. Using a unique panel data set comprised of the Census microfiles, we control for time-invariant unobserved factors by examining farm-specific changes in

[2] This information can be obtained from historical commodity specific yearbooks that are available on the Economic Research Service web site (www.ers.usda.gov)

program-crop acreage between 1992 and 1997. We also control for fixed affects associated with farm type, scale, and location, as well as operator age. These controls allow us to compare program participants and non-participants that are otherwise similar. We explore the possibility of remaining sample selection bias (that unobserved determinants of program participation are correlated with determinants of program-acreage growth) by examining the sensitivity of the estimated difference between participants and non-participants as we introduce more controls in to the analysis. The robustness of this difference over a range of controls provides evidence that the estimated effect reflects a causal relationship (Altonji et al, 2000).

Preliminary results indicate that decoupling caused farms participating in programs in 1992 to increase their acreage in program crops by about 19.2 percentage points more than farms not participating in farm programs.[3] Among farms that did not change size between 1992 and 1997, program crop acreage increased by about 8.3 percentage points more for participants compared to non-participants.

Background

Before 1996, the largest farm subsidy payments took the form of price-contingent payments. The government assured a minimum per-acre return on program crops using target prices and loan rates. In exchange for some of these guarantees, farmers were required to limit planting of program crops to some proportion of their historically-based program acreages. These limits were designed to mitigate over-production induced by price-contingent payments. However, the limitations connected to program eligibility also created new potential distortions, because they gave farmers an incentive to farm land more intensively, and also discouraged farmers from changing crops in response to changing commodity prices, input costs, or newly invented seed varieties and farming technologies. The many

[3] Because this estimate is derived by a comparison of acreage growth between participating and non-participating farms, it excludes general equilibrium effects stemming from decoupling-induced changes in commodity prices. One should expect the decline in acreage to increase commodity prices, thereby offsetting the effect of decoupling with a positive supply response.

contingencies farmers accepted in order to obtain the payments presumably tended to reduce the overall value of the payments they received. In some instances, the costs of the additional restrictions may have outweighed the payment benefits. Thus, it is not surprising that between 10 and 40% of land eligible for enrollment in these programs was not enrolled, despite the payment benefits.

Farm programs began adding planting flexibility and, thus, possibly reducing distortions gradually with the Food Security Act of 1985. Perhaps the largest change occurred in 1996, a time when market prices stood well above target prices and government payments to farmers were historically low. The 1996 Federal Agriculture Improvement and Reform Act (FAIR) significantly modified price supports so that the bulk of payments would subsequently derive from Production Flexibility Contracts (PFC), which did not depend on farmers' current production decisions.[4] The amounts of these payments depended only on land enrolled in farm programs prior to 1996 and were scheduled to decline modestly over a seven-year horizon. Unlike earlier payments, these payments were not tied to prices and placed few restrictions on farmers' planting decisions. In subsequent years, however, after prices declined, Marketing Loss Assistance (MLA) payments were provided to farmers. The levels of these payments were tied to already-scheduled PFC payments, not to current production decisions. The 1996 Act also did away with annual supply management (acreage reduction) programs. Unlike the payment programs prior to 1996, nearly all qualifying acres were enrolled in PFC and MLA programs. Full participation in these programs was unsurprising as there were few costs or contingencies required in order to receive payments.[5,6]

[4] The 1996 Act did not remove the Marketing Loan Program, which acted to support the prices farmers received for program crops. In 1996 and 1997, however, loan rates (to which payments or marketing loan gains were tied) were far below market prices for commodities, and so were unlikely to affect production in these years.

[5] Two eligibility restrictions made these payments less than fully-decoupled from the outset. First, participation required that the land remain in crops, ranching, or forest-related uses. Second, farmers could not plant fruit or vegetable crops unless they had a history of planting these crops. (Historically, fruit and vegetable producers have not received income support payments.)

[6] Note that participation was nearly 100% for *qualifying* acreage. Our census data suggest that a small but significant share of acreage planted in program crops in 1997 did not receive PFC payments. Presumably, these plantings were not on base acreages, either because the farmers did not have a history of planting program crops on these lands or, more likely, because these farmers did not report historical crop plantings to county offices.

The Farm Security and Rural Investment Act of 2002 continued PFC payments under a new name ("direct payments") and introduced "counter-cyclical" payments. Although counter-cyclical payments are decoupled in the sense that they are not contingent on farmers' current production, they are tied to market prices of crops historically grown on the land. The 2002 Act also increased loan rates for most crops (which do depend on current production). In this paper, we focus on the original PFC payments, because these are the payments to which our data pertain.

Decoupled payments, production, and trade

The Uruguay Round of the General Agreement on Tariffs and Trade (GATT) in 1994 placed limits on domestic agricultural subsidies for the first time. In order to reduce trade distortions brought about by domestic agricultural programs, GATT signatories established the World Trade Organization (WTO) and agreed to limit expenditures on agricultural subsidies, with exceptions made for decoupled income support payments.[7] This exception was made because these kinds of payments theoretically have little or no effect on production or trade. With total farm program payments in the U.S. exceeding $20 billion annually in the years 1999-2001, a large portion stemming from PFC and MLA payments, many began to question whether or not these payments were in fact minimally production distorting. These payments did possess some planting restrictions and some suggested the payments influenced production via indirect channels. Others questioned the basic theoretical reasoning underlying the non-distortionary effects of decoupled payments.

Economists have offered several reasons why PFC, MLA, and counter-cyclical payments may affect production and trade, despite having few direct connections to planting decisions. Most of these reasons involve indirect effects stemming from the increased wealth the payments provide farmers.

[7] Decoupled income support payments must meet five criteria in order to be exempted from WTO expenditure limits: (1) Support must be provided through a publicly funded government program; (2) The support may not have the effect of providing price support to producers; (3) Eligibility must be defined by some clearly defined criteria in a fixed base period; (4) The amount of the payment must not be related to the type or volume of production, prices, or factor employment in any year after the base period; (5) No production shall be required in order to receive payment. See http://www.wto.org/english/tratop_e/agric_e/negoti_e.htm for information on current agricultural trade negotiations.

Greater wealth may allow farmers to more easily finance their operations and cope with year-to-year fluctuations in profits, effectively reducing farming costs. It is plausible that wealth effects are important for some farmers, such as those near the brink of solvency. It is less plausible (theoretically) that these effects are important for aggregate production. Even if some farmers pay higher interest rates or are credit constrained, it unlikely that all farmers are credit constrained. If constrained farmers did not receive payments, one might expect unconstrained farmers to outbid constrained farmers for key resource inputs (such as land) and thereby mitigate aggregate production effects stemming from these constraints or relief of these constraints.

Others have argued that farmers are risk averse and that they become less risk averse as they become wealthier (Hennessy, Sumner). Thus, as farmers receive more government payments, they collectively become less risk averse, and as a result, may be willing to produce more. Economic theory suggests that these effects would be small.[8] Furthermore, if risk aversion truly limited production, this would generate a competitive advantage for wealthier and less risk-averse farmers. It is not clear whether many strongly risk-averse farmers could remain viable in a competitive market. Thus, theoretically, it seems decoupled payments could have no more than a minimal effect on production via wealth and risk effects.[9] An important counter to this argument is that behavior toward risk is poorly understood. Empirical findings show considerable evidence against basic theoretical reasoning that underlies the standard economic notion of risk aversion (Rabin and Thaler).

Alternatively, decoupled payments may act to reduce production if they cause farmers, who feel wealthier due to the payments they receive, to work less both on and off the farm. To the extent

[8] David Just shows that effects stemming from risk aversion are likely to be too small to be empirically measurable. The proposed effects from decoupled payments are from *changes* in risk aversion, not risk aversion itself. Theoretically, effects stemming from changes in risk aversion are even smaller than effects stemming from risk itself.

[9] Despite the fact that MLA and counter-cyclical payments do not satisfy the WTO criteria, the basic conceptual reasoning underlying the non-distortionary effects of decoupled payments applies equally to these payments as they do to PFC payments. Some propose, however, that MLA and counter-cyclical payments might have a greater effect than PFC payments because MLA and counter-cyclical payments provide insurance against unexpected drops in commodity prices. In other words, this argument suggests that the wealth effect associated with risk aversion is larger for these payments than for PFC payments (Hennessy).

that farmers receiving payments may work less because they feel richer, there are others in the rural economy who might replace their lost work effort. With or without decoupled payments, theory suggests that farmers would collectively produce about the same amount in aggregate, even in light of credit constraints, risk, and labor-related wealth effects.

Others have argued that PFC and MLA payments affect production and trade because they do not give farmers complete planting flexibility and thus are not fully decoupled. In particular, receipt of these payments precludes planting of fruits or vegetables. Although planting of fruits and vegetables is unlikely to be viable in many regions of the U.S. that traditionally produce field crops, these effects may be important in some regions (Sumner).

Empirical measurement of production distortions stemming from decoupled payments is difficult. Estimates of coupled-payment production distortions are usually constructed by assuming that a coupled payment of $1 per unit of a commodity output (or input) causes a production response equal to that caused by a $1 per unit price increase, which can be estimated using historical relationships between prices and production. However, due to the complicated nature of the supply-control contingencies that existed prior to 1996, and the fact that these contingencies often changed over time, estimation of production effects for these programs is quite difficult (e.g., McDonald and Sumner). However, the approach for coupled payments, which infers production responses from price responses, does not apply to decoupled payments—this approach simply predicts zero effect.

Rather than attempt to measure the distortionary effect of decoupled payments, in this paper we examine the distortion of decoupled payments as compared to distortions caused by pre-FAIR-Act payments. If decoupled payments are truly non-distortionary, our results give estimates of aggregate production distortions in 1992.

Methods

Our empirical estimates are based on a simple concept: the event of decoupling (the 1996 Act) would be expected to affect farms constrained by pre-1996 programs and would not be expected to directly

affect similar farms that were not constrained by the program.[10] Our "control" group is comprised of all farms not participating in government programs in both 1992 and 1997. The "treatment" group is comprised of all other farms that were constrained by the 1992 farm programs and were therefore directly affected by the 1996 Act (decoupling). We compare the 1992-1997 change in program-crop acreage for the control and treatment groups.

Since program participation is not randomly assigned across farms, our empirical approach is to control for unobserved factors that influence both program participation and plantings of program crops—factors which might confound the estimated effect of the 1996 Act. Using a unique data set comprised of the Census microfiles, we control for most of the likely unobserved factors by examining farm-specific changes in program-crop acreage between 1992 and 1997. By examining acreage changes rather than levels we remove all unobserved factors that are time invariant. We then use the operator's age and a series of fixed effects to control for farm type, scale, and location, as well as interactions of these variables. These controls allow us to compare farm operations in our treatment and control groups that were quite similar in 1992, although some were constrained by the 1992 programs and others were not. We explore the possibility of remaining selectivity bias (that unobserved determinants of program participation are confounded with determinants of program-acreage growth) by examining the sensitivity of the estimated difference between treatment and control groups as we include more controls. If observed variables are any guide to the confounding effects of unobserved factors, then robust findings over a range of controls provides evidence that our estimated effect is causal (Altonji et al, 2000).

The dependent variable of interest is the change in program acres planted between the 1992 and 1997 censuses. Program acres are the sum of acres planted to corn, wheat, sorghum, oats, cotton, rice, and barley. We define the percentile point change as

[10] Decoupling could still have indirectly affected all farms, regardless of their pre-1996 conditions, through general equilibrium changes in commodity or input prices.

ΔP_i = 100 * (1997 program acres – 1992 program acres) / (½ *(1997 program acres + 1992 program acres)).

We use the average of 1992 and 1997 plantings as a base because this measure has a distribution that is far less skewed and therefore less susceptible to the influence of outliers.

The key explanatory variable is the indicator variable for our control group: non-participants in commodity programs in 1992 and 1997. We measure participation in 1992 by all farms planting program crops and reporting set-aside acreage. This indicates participation in 1992 because all participating farmers were required to set aside (leave fallow) a portion of their "base acreage." It is important to note, however, that non-participation in commodity programs in 1992 does not imply that government programs did not influence behavior. Program participation precluded a farmer from expanding acreage beyond a share of base acreage, equal to the average acreage plantings of the program crop over the previous five years. Thus, some farmers had an incentive not to participate in the farm program for a year or more in order to "build base" in anticipation of future government payments. After the 1996 Act, farmers' base acres were frozen at 1995 levels, so there was no incentive in 1997 for farmers to build base. We define non-participation in government programs as not having set-aside acres in 1992 *and* not receiving payments in 1997 (there were no set aside requirements in 1997). This measure of non-participation excludes "base builders" who did not participate in 1992 (no 1992 set-aside acres) but continued to be involved in the programs, as indicated by non-zero 1997 payments.

It is not clear why some farmers chose not to participate in farm programs in 1997. After the 1996 Act, there were few apparent costs for participating in government farm programs and obtaining PFC payments. Indeed, participation records suggest that nearly all qualified base acreage received PFC payments in 1997. Census records indicate, however, that 35,461 farms in our selected sample of 192,765 farms (described below) were non-participants under our definition. Because nearly all qualifying acreages received payments in 1997, a logical conclusion is that many farms did not register their plantings with county agricultural offices and therefore did not accumulate qualifying base

acreages before the 1996 Act. Some farmers may have valued the flexibility of non-participation and may not have anticipated the decoupling of the 1996 Act. A majority of these non-participating farms were small farms with less than $35,000 per year in sales. Thus, even if these farms had anticipated decoupling under the 1996 Act, the transaction costs of reporting acreages to county offices might have exceed program benefits. For larger farm-class categories, there is a smaller share of non-participating farms, but the share is not insignificant. In our largest sales class (farms with more than $246,927 in 1992 sales) 831 farms in our sample (4.5% of this sales class) were non-participants.

The treatment group ("Participants") is comprised of all farms not in the control group. In our analysis we also separately consider "Base Builders," the farms not enrolled in 1992 government programs that received government payments in 1997.

Besides the treatment and control indicators, we make use of a series of control variables to examine the sensitivity of our estimated effects of the 1996 Act. These explanatory variables (controls) include the age of the operator in 1992 and a series of indicator variables. These indicator variables include:

Fixed effects for 1992 sales. These variables classify farms into five categories based on quantiles of the distribution total farm sales in 1992. The first quantile includes all farms with sales less than the 40% quantile; the second all farms in the 40-60% quantile range; the third includes all farms in the 60-80% quantile range; the includes fourth all farms in the 80-90% quantile range; and the fifth includes all farms above the 90% quantile. We choose quantiles in this way because the distribution of farm sales (like all other measures of scale) is strongly skewed to the right.

Fixed effects for each state. Classifies each farm according to the U.S. state in which it resides.

Fixed effects for each SIC code. Classifies each farm according to its 6-digit Standard Industrial Classification (SIC) code, indicating the operation is a wheat, rice, corn, soybean, cash grain, or cotton

farm. (Note that we drop the first two digits (01) in our tables because these are the same for all SIC codes considered.)

SIC code specific fixed effects for total sales. These variables classify each farm into one of five sales-class categories that are specific to each SIC code. Unlike the sales classes described above for all farms, this classification considers the quantiles (40%, 60%, 80%, and 90%) from the 1992 distribution of farm sales of each SIC code separately and categorizes each farm accordingly.

State-SIC code specific fixed effects for total sales. These variables classify each farm into one of five sales-class categories according to quantiles from distribution of each state *and* SIC code.

State-SIC code specific fixed effects for program-crop sales. These variables are like the previous ones except they consider only program-crop sales rather than sales of all farm products.

We estimate the effect of the 1996 Act by estimating a series of regressions each having the following structure:

$$\Delta P_i = \alpha + \beta_1 NP_i + \text{controls}_i + \varepsilon_i ,$$

where NP_i is an indicator variable for whether a farm was a "Non-Participant", α represents aggregate changes, and ε_i represents unobserved determinants of ΔP_i. To gain insight into the exogeneity of NP_i, we investigate how our estimate of β_1 changes as more controls are added to the specification. As more controls are incorporated into the model, the less selection is based on unobservables. If the observable variables are representative of all determinants of ΔP_i, and greater or lesser incorporation of controls has little effect on the estimated coefficients, it suggests that NP_i is uncorrelated with remaining unobservables, and that our estimates are unbiased (Altonji et al, 2000).

Data

Data on farm and operator characteristics are from the farm-level files of the 1992 and 1997 Agricultural Censuses maintained by the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture. The Agricultural Census is conducted every five years and it includes essentially all farms in the U.S. Merging Census records from 1992 and 1997 by farm operation resulted in a panel data set with 2,083,386 observations. The sample was restricted to continuing operations defined as those operations having positive sales in both Censuses. Since we are interested primarily in how growers of program crops are affected by the 1996 Act, we further restrict the sample to those farms that had positive sales of program crops in 1992 and average sales of program crops in the two census years between $100 and $2,000,000. We define "program crops" to include corn, wheat, barley, oats, cotton, rice, and sorghum.

We further restrict the sample to farms with one of six SIC codes (111, 112, 115, 116, 119, and 131) corresponding to wheat, rice, corn, soybean, cash grain, and cotton farms. Although soybeans were not a program crop prior to 1996, soybeans are typically rotated with program crops, so these farms tend to have a large amount of program acreage and therefore received government payments. Cash grain farms are farms with a mix of field crops, many of which are program crops. These six SIC codes comprise a large majority of program crop acreage.

Finally, because the Census reports harvested acreage and not planted acreage, farms with any failed cropland (with planted acres that were not harvested) are dropped from the sample—the Census does not identify which crops failed, only the total number of acres failed. With these restrictions, the sample used in this study consists of 192,765 operations observed in both censuses.

Results

Table 1 presents descriptive statistics for the different farm-program participation groups. About 18% of the farms in the sample are characterized as Non-Participants and 23% as Base Builders. The table shows that, over the entire sample, program-crop acres from 1992 to 1997 remained roughly

constant, increasing by just 0.59%. However, the average change in these acres varies across our different participation groups. While Non-Participants experienced declines of program-crop acres of 17.25% on average, program-crop acreage increased by an average of 4.39% for Base Builders and 1.89% for all Participants. This simple comparison of average growth rates implies that the 1996 Act markedly increased domestic production of program crops for participating farmers.

Table 1 also presents information about total farm-program payments per program crop acre (excluding payments for CRP and WRP) and operator age by program participation category. As shown in Table 1, the Non-Participants received low payments in 1992 ($4.40 per acre), reflecting their non-participation in government programs that year, and zero payments in 1997, by definition.[11] The Base Builders received slightly higher payments in 1992 ($6.58) but received significantly higher payments in 1997 ($23.17), above the $21.75 average for all groups. These levels reflect their non-participation in 1992 and, presumably, their higher accumulated base by 1997. The Other Participants received relatively high payments in both years, with average payments of $27.93 and $23.22 in 1992 and 1997, respectively. The final column of Table 1 reports the average operator age in 1992 across the different program participation groups. Non-Participants were the oldest at 50.64 years on average, about 2.5 years older than the average for Participants (48.08 years).

Tables 2-4 report regression results in which we estimate the impact of the participation groups on program-crop acreage change, after controlling for state, SIC code, sales class at the state and national level, operator age, and various interactions. In table 2, we examine the impact of the participation groups, with the Base Builders disaggregated. Results for the basic specification are listed in the first column, with results from specifications with progressively more controls ordered to the right. Results from the basic specification indicate that after controlling for Age and Age^2, State, SIC, and Sales Class, the Non-Participants had –20.91 percentage points lower growth in program-crop

[11] Non-Participants may have received disaster or other kinds of payments emanating from programs that were not terminated with the 1996 Act. In 1997, however, nearly all payments (except conservation payments, which we omit) were comprised of decoupled PFC payments.

acres than the Other Participants. On the other hand, growth for the Base Builders was 1.75 points higher relative to the Other Participants. As additional controls are added to this specification, the fit of the model improves from an R^2 of 0.021 in the basic model to 0.104 in the model with full interactions, but the magnitudes of the effects across the different participation groups are robust to the specification choice. As additional controls are added, the differences in program-acreage change between the groups decrease only slightly, suggesting that unobserved factors associated with the participation categories are not driving the results. In the model with full interactions, we estimate that the growth rates for Non-Participants and Base Builders differed from the Other Participants by –18.72 and 1.58 percentage points, respectively.

The same analysis is repeated with the Base Builders included with the Other Participants (table 3). The basic regression results indicate that Non-Participants increase program acres by 21.06 percentage points less than all the aggregated Participants. As additional controls are added, the fit improves from an R^2 of 0.021 to 0.104 in the model with full interactions. However, the estimated effects decline only slightly with the inclusion of the additional controls. The estimates from the model with full interactions are that Non-Participants grew by 19.16 percentage points less than the Participants.

We repeat the analysis again, this time restricting attention to the 32,027 farms that remained the same size between 1992 and 1997 (table 4). The fit of the model ranges from an R^2 of 0.042 in the basic model to 0.168 with the full set of interactions. Although changes in overall farm size are restricted to zero, we still observe the same basic pattern of relative changes across the different participation groups. We estimate that Non-Participants increase by 10.44 to 8.28 percentage points less than Participants, according to our basic and most complex specifications, respectively. By restricting attention to farms of the same size, we attempt to restrict our sample to farms that retained the same land base in the two periods. The decline in the magnitude of the coefficient indicates that some of the difference in program-crop acreage changes between Participants and Non-Participants might be attributed to a decline in total acres for the latter. However the results indicate that a

substantial portion of the effect could reflect reallocation of the same land base to different crops, rather than structural changes across operations.

Summarizing our results so far, we have found that farm program participation was associated with relative increase in program crop acreage between 1992 and 1997—a period spanning the decoupling of farm programs. This result appears robust to model specification suggesting that our estimates of the effect of decoupling on program growth are not biased in an important manner by unobservable factors correlated with the program participation and program-crop acreage growth. While the aggregate effect of decoupling appears substantial, the effect is likely to differ across farms of different scales and types. To examine how the effect varies across farm typologies we compare program participant and non-participant growth rates across sales categories and SIC codes.

We first consider variation across farms in terms of their levels of sales of program crops, differentiated by the categories described above. Table 5 reveals that the Non-Participants and Base Builders on average have lower program-crop sales. About 76% of all Non-Participants and 50% of all Base Builders lie within the lowest sales category. The Base Builders and Other Participants are spread out more evenly across the different sales categories.

Table 5 shows how the aggregate means obscure much larger difference in program-crop acreage growth rates between participants and non-participants for particular sales classes. Nevertheless, while the changes vary in magnitude, the qualitative pattern observed in Tables 1-4 persists within each of the five sales classes. Changes in acreage in program crops ranged from -21.90 to -13.16 percentage points for Non-Participants, and ranged from –2.38 to +13.06 percentage points for Participants. The difference among the groups is most dramatic for farms in the lowest sales class. For farms with less than $35,001 in 1992 program-crop sales, Non-Participants decreased program crop acreage by 21.90 percentage points, while Participants actually increased acreage by 13.06 percentage points. For farms with the largest sales, the general pattern is also evident: Non-Participants with sales over $246,927 decreased program-crop acres by 15.97 percentage points while Participants with similar sales experienced a decline of just 2.38 points.

We next examine whether observed variation in program-acre change across the participation groups persists across farms engaged in the production of different crops. For each sales class, table 6 reports the average change in program-crop acres for each of the six SIC codes in our sample. In contrast to the aggregate averages, Non-Participants primarily growing soybeans experienced positive growth in program crop acres in the first and fourth sales classes. Within each SIC code and sales class, however, the Non-Participants still experience greater declines (or lower growth) relative to the Participants for wheat, corn, soybeans, cash grains, and cotton. Standard errors are too high to make statistically significant comparisons for rice farms.

Tables 5 and 6 suggest that the change in program crop acres from 1992 to 1997 varied significantly across different categories of farm program participation, sales classes, and SIC codes. However, the basic pattern and magnitude of impacts shown by the simple means in Table 1 is robust to a series of increasingly complex controls.

Conclusion

In order to reduce trade distortions brought about by domestic agricultural programs, trade negotiations concluded in 1994 resulted in international agreements to limit expenditures on agricultural subsidies, with exceptions made for decoupled income support payments. Decoupled payments—lump-sum income transfers to farm operators that do not depend on current production or commodity prices—are generally thought to have little or no effect on production or trade. In the US, the 1996 FAIR Act that decoupled farm payments from production was expected to enhance efficiency by removing constraints on planting and distortionary incentives to over-produce, while bringing the US into compliance with WTO rules. Current agricultural trade controversies exist over the magnitude and nature of US farm payments, which exceeded $20 billion annually between 1999 and 2001. Some have argued that decoupled payments are themselves distortionary and provide farmers with incentives to overproduce.

This paper examined the effect of the 1996 commodity payment decoupling on program crop acreage using farm-level Agricultural Census data. We compared the growth in program-crop acreage of program participants and non-participants between 1992 and 1997, a period spanning the decoupling of farm programs. We found that program participation was associated with a relatively greater growth in program-crop acreage over this period. This result suggests that decoupling—a regime change in which payments with strong links to production decisions are removed and replaced with payments with few or no links to production decisions—had the effect of increasing program-crop production for those farms directly affected by the program.[12]

There are three possible explanations for our results. First, the results may imply that program participation rules associated with coupled programs effectively limited program acreage in 1992. Program participants desired to produce more program crops in 1992 but were constrained by acreage-reduction programs and rules governing the maintenance of base acreage. Under this scenario, decoupling freed farmers to expand production onto new land and land that had previously been idled. If this hypothesis is correct, decoupling may have removed distortions but with potentially negative impacts on trading partners (and domestic non-participants) in the short run.

A second possible explanation for our results is that the decoupled programs may themselves be distortionary, inducing farmers to produce more than they would have otherwise. Under this scenario, farmers who normally would have reduced their acreage of program crops by shifting into non-program crops, switching to non-crop uses, or by renting or selling their land, instead maintained or increased their levels of program-crop production.

A third explanation is that participating farmers had not yet reacted to the new flexibility granted by the 1996 Act. Beginning in late 1996 and into 1997, commodity prices began falling. In response to falling commodity prices, non-participating farmers may have reduced program acreages.

[12] Our results do not indicate whether decoupling increased program-crop production overall, just that it affected the relative change for Participants versus Non-Participants.

Non-participating farmers, unaccustomed to the newly increased sensitivity of their income to commodity prices, may have been slower to react to changing prices.[13]

In future research, it would be interesting to examine program-crop acreage change between the 1987 and 1992 censuses and between the 1997 and 2002 censuses to determine whether our assignment groups responded differently between different farm bills. This examination may help to verify whether our estimated effects are due to the assignment itself or to the unique nature of the 1996 Act. It would also be interesting to explore how non-participating farms changed their plantings of non-program crops, as well as their allocations of land among non-cropping activities such as pasture and the Conservation Reserve Program (CRP). This information may provide deeper insight into whether the 1996 Act removed participation-constraints that had restrained the production of program crops, or whether the decoupled payments themselves stimulated the production of these crops by the participating farmers.

[13] We thank Roger Claassen for suggesting this highly plausible explanation of our findings.

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Table 1: Mean Change in Program Crop Acres, 1992-1997, by Farm-Program Participation Group

Farm-Program Participation Group	Definition[1]	Observations (N)	% Change in Program Crop Acres[2]	Payments per Program Crop Acre in 1992	Payments per Program Crop Acre in 1997	Age of Operator in 1992
Non-Participants	1992 set aside=0 & 1997 payments = 0	35,461	-17.25 (0.46)	4.40 (0.05)	0.00 (0.00)	50.40 (0.08)
Base Builders	1992 set aside = 0 & 1997 payments > 0	44,983	4.39 (0.31)	6.58 (0.05)	23.17 (0.19)	48.78 (0.06)
Other Participants (other than Base Builders)	1992 set aside > 0	112,321	1.24 (0.17)	27.93 (0.05)	23.22 (0.11)	47.90 (0.04)
Participants	1992 set aside >= 0 & 1997 payments > 0	157,304	1.89 (0.15)	23.49 (0.05)	23.21 (0.09)	48.08 (0.03)
All Farms	1992 set aside >= 0 & 1997 payments >= 0	192,765	0.59 (0.14)	22.20 (0.04)	21.75 (0.09)	48.24 (0.03)

[1] Set aside = set aside acres as percentage of program crop acres in 1992.
[2] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).
[3] Standard errors are in parentheses.

Table 2. Regression Results under Various Model Specifications with "Base Builders" Disaggregated

Dependent Variable: Percent-Change in 1992 Program Acres[1] (mean = 0.595 %)					
	Basic	**Basic with Age**	**More Fixed Effects**	**Interactions of Fixed Effects**	**Many Interactions**
Farm-Program Participation Group					
Non-Participants	-20.91 (0.561)	-19.56 (0.549)	-19.58 (0.549)	-18.67 (0.551)	-18.72 (0.553)
Base Builders	1.75 (0.372)	2.06 (0.347)	1.94 (0.346)	1.63 (0.346)	1.58 (0.364)
Other Participants	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Controls					
State Fixed Effects	**X**	**X**	**X**	**X**	**X**
SIC-code Fixed Effects	**X**	**X**	**X**	**X**	**X**
Sales Class (All Farms)	**X**	**X**	**X**	**X**	**X**
Age and Age squared		**X**	**X**	**X**	**X**
State-Specific Total Sales Class			**X**	**X**	**X**
State-Specific Program Sales Class			**X**	**X**	**X**
SIC-Specific Sales Class			**X**	**X**	**X**
State*SIC*State-Specific Sales Class				**X**	**X**
(Age and Age^2)*State-Specific Sales Class				**X**	**X**
State*SIC*Total Sales Class					**X**
State*SIC*State-Specific Program Sales Class					**X**
State*SIC*SIC-Specific Sales Class					**X**
(Age and Age^2)*Total Sales Class					**X**
R^2	0.021	0.062	0.066	0.087	0.104

Observations = 192,765

[1] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).

[2] Standard errors are in parentheses.

Table 3. Regression Results under Various Model Specifications with "Base Builders" Not Disaggregated

Dependent Variable: Percent-Change in 1992 Program Acres[1] (mean = 0.595 %)					
	Basic	**Basic with Age**	**More Fixed Effects**	**Interactions of Fixed Effects**	**Many Interactions**
Farm-Program Participation Group					
Non-Participants	-21.06 (0.735)	-20.12 (0.541)	-20.11 (0.541)	-19.12 (0.542)	-19.16 (0.544)
Participants [2]	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Controls					
State Fixed Effects	**X**	**X**	**X**	**X**	**X**
SIC-code Fixed Effects	**X**	**X**	**X**	**X**	**X**
Sales Class (All Farms)	**X**	**X**	**X**	**X**	**X**
Age and Age^2		**X**	**X**	**X**	**X**
State-Specific Total Sales Class			**X**	**X**	**X**
State-Specific Program Sales Class			**X**	**X**	**X**
SIC-Specific Sales Class			**X**	**X**	**X**
State*SIC*State-Specific Sales Class				**X**	**X**
(Age and Age^2)*State-Specific Sales Class				**X**	**X**
State*SIC*Total Sales Class					**X**
State*SIC*State-Specific Program Sales Class					**X**
State*SIC*SIC-Specific Sales Class					**X**
(Age and Age^2)*Total Sales Class					**X**
R^2	0.021	0.062	0.066	0.087	0.101

Observations = 192,765

[1] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).

[2] *Participants* includes *Base Builders*.

[3] Standard errors are in parentheses.

Table 4. Regression Results under Various Model Specifications with "Base Builders" Not Disaggregated and Limited to Farms with Same Amount of Land in 1992 and 1997

Dependent Variable: Percent-Change in 1992 Program Acres[1] (mean = -3.58 %)					
	Basic	**Basic with Age**	**More Fixed Effects**	**Interactions of Fixed Effects**	**Many Interactions**
Farm-Program Participation Group					
Non-Participants	-10.44 (0.727)	-9.59 (0.733)	-9.55 (0.733)	-8.49 (0.738)	-8.28 (0.755)
Participants [2]	0 (-)	0 (-)	0 (-)	0 (-)	0 (-)
Controls					
State Fixed Effects	**X**	**X**	**X**	**X**	**X**
SIC-code Fixed Effects	**X**	**X**	**X**	**X**	**X**
Sales Class (All Farms)	**X**	**X**	**X**	**X**	**X**
Age and Age^2		**X**	**X**	**X**	**X**
State-Specific Total Sales Class			**X**	**X**	**X**
State-Specific Program Sales Class			**X**	**X**	**X**
SIC-Specific Sales Class			**X**	**X**	**X**
State*SIC*State-Specific Sales Class				**X**	**X**
(Age and Age^2)*State-Specific Sales Class				**X**	**X**
State*SIC*Total Sales Class					**X**
State*SIC*State-Specific Program Sales Class					**X**
State*SIC*SIC-Specific Sales Class					**X**
(Age and Age^2)*Total Sales Class					**X**
R^2	0.042	0.045	0.049	0.124	0.168

Observations = 32,027

[1] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).

[2] *Participants* includes *Base Builders*.

[3] Standard errors are in parentheses.

Table 5: Average Change in Program Crop Acres, 1992-1997, by Sales and Farm-Program Participation Group

Value of 1992 Sales	Farm-Program Participation Group[1]	Observations (N)	% Change in Program Crop Acres (1992-1997)[2]	Payments per Program Crop Acre In 1992	Payments per Program Crop Acre in 1997	Age of Operator in 1992
$0 to $35,000	*Non-Participants*	26,958	-21.90	3.91	0.00	52.68
			(0.64)	(0.07)	(0.00)	(0.10)
	Participants	50,143	13.06	18.84	22.15	50.59
			(0.38)	(0.08)	(0.25)	(0.07)
$35,001 to $76,000	*Non-Participants*	4,322	-19.06	4.43	0.00	50.46
			(1.34)	(0.15)	(0.00)	(0.22)
	Participants	34,235	4.72	21.04	22.41	49.25
			(0.36)	(0.09)	(0.16)	(0.08)
$76,001 to $157,480	*Non-Participants*	2,425	-13.42	5.20	0.00	49.01
			(1.60)	(0.21)	(0.00)	(0.28)
	Participants	36,069	2.20	22.60	23.31	47.70
			(0.29)	(0.09)	(0.25)	(0.07)
$157,481 to $246,927	*Non-Participants*	925	-13.16	4.42	0.00	48.09
			(2.39)	(0.30)	(0.00)	(0.43)
	Participants	18,411	1.71	24.42	23.98	47.02
			(0.37)	(0.13)	(0.19)	(0.09)
Greater than $246,927	*Non-Participants*	831	-15.97	4.20	0.00	50.21
			(2.36)	(0.34)	(0.00)	(0.46)
	Participants	18,446	-2.38	25.93	23.27	47.86
			(0.36)	(0.15)	(0.20)	(0.09)

[1] *Participants* include *Base Builders*.

[2] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).

[3] Standard errors are in parentheses.

Table 6: Mean Change in Program Crop Acres, 1992-1997, by Sales, Farm-Program Participation Group, and Standard Industry Classification (SIC)

Value of 1992 Sales	Farm-Program Participation Group[1]	% Change in Program Crop Acres (1992-1997)[2]					
		Wheat (SIC=111)	Rice (SIC=112)	Corn (SIC=115)	Soybeans (SIC=116)	Cash Grains (SIC=119)	Cotton (SIC=131)
$0 to $35,000	*Non-Participants*	-19.58	72.08	-28.68	4.62	-27.43	-43.52
		(1.74)	(64.05)	(1.01)	(1.48)	(1.16)	(6.57)
	Participants	14.05	36.10	11.79	28.22	6.14	26.23
		(0.80)	(19.38)	(0.70)	(1.00)	(0.73)	(2.69)
$35,001 to $76,000	*Non-Participants*	-22.16	-180.93	-20.91	-5.13	-19.38	-14.84
		(4.01)	(18.90)	(2.36)	(3.17)	(2.17)	(10.74)
	Participants	4.91	-6.40	4.45	13.16	0.25	24.08
		(0.84)	(10.17)	(0.62)	(1.08)	(0.61)	(2.50)
$76,001 to $157,480	*Non-Participants*	-10.90	-17.25	-19.79	-3.85	-16.15	2.68
		(4.51)	(17.93)	(2.86)	(4.70)	(2.54)	(8.14)
	Participants	2.82	-7.97	1.09	9.40	-0.29	13.02
		(0.76)	(5.86)	(0.48)	(1.06)	(0.49)	(1.73)
$157,481 to $246,927	*Non-Participants*	-17.85	-22.14	-16.30	-8.48	-14.22	10.66
		(6.63)	(17.98)	(4.27)	(8.57)	(3.90)	(7.99)
	Participants	2.73	-3.66	-0.28	6.48	-0.09	11.75
		(1.10)	(4.41)	(0.57)	(1.57)	(0.61)	(1.63)
Greater than $246,927	*Non-Participants*	-18.60	0.14	-16.47	-8.23	-15.42	-16.59
		(7.15)	(15.73)	(4.07)	(9.51)	(4.00)	(6.60)
	Participants	-6.09	-11.56	-2.57	3.33	-2.42	1.07
		(1.50)	(3.51)	(0.56)	(1.64)	(0.57)	(1.20)

[1] *Participants* include *Base Builders*.

[2] Percent change in program-crop acres = 200*(1997 program-crop acres – 1992 program-crop acres)/(1992 program-crop acres + 1997 program-crop acres).

[3] Standard errors are in parentheses.