Can generous expensing and deprecation provisions in the tax code explain structural change of the U.S. Farm? An analysis of the use of capital cost recovery over time

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Introduction

Farming requires large investments in machinery, equipment, and other depreciable capital. Under the current tax system, such costs may be treated as a current expense or capitalized and depreciated over time. In either case, this reduces the income subject to tax. The amount that can be expensed is subject to a limit, and the investment amount above the limit must be depreciated over a specified recovery period, generally 7 years for farm machinery and equipment.

The tax treatment of these investments is of considerable importance to the farm sector, especially to commercial farmers (farm sales above $250,000). Over the last decade, the amount that a farmer could immediately expense has increased dramatically. Beginning with the Economic Growth and Taxpayer Relief Reconciliation Act of 2001 (2001 Act), which set the expensing amount at $25,000, the amount of capital purchases eligible for immediate expensing has steadily increased (Figure 1). The amount was raised from $25,000 to $100,000 in 2003, and then again in 2008 to $250,000 through stimulus legislation. The Small Business Jobs Act of 2010 doubled the expensing amount to $500,000 for property placed in service in 2010 and 2011.

The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 extended the modified expensing amount, but the amount was lowered to $139,000 for property placed in service in tax year 2012. The American Taxpayer Relief Act of 2012 temporarily increases the amount to $500,000 for 2012 and 2013. The amount is reduced (but not below zero) by the amount by which the investment exceeds $2,000,000.

The ability to take an additional first-year depreciation deduction also benefits farmers making capital purchases. Combined with the expensing amount, the ability to accelerate depreciation has meant that much of the capital purchases made during the past decade have been completely deducted in the first year (table 4). For tax years 2012 and 2013, the first-year depreciation allowance is 50 percent. In 2012, 39 percent of U.S. farms made a capital investment, but the percentage varies by farm size. In general, the greater the sales revenue of the operation, the more likely it is to make a capital investment in a given year. Based on 2012 ARMS data, 75.7 percent of midsized—farms with between $350,000 and $1,000,000 in gross cash farm income—reported they made a capital purchase (See figure 3).

Section 179 Expensing and Bonus Depreciation

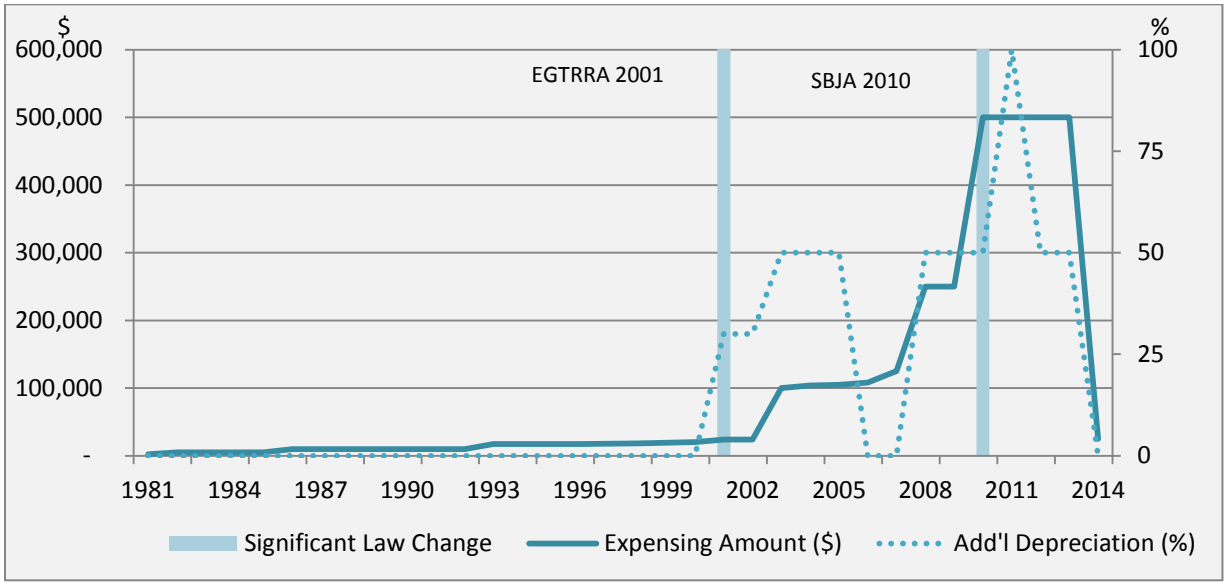
The US tax system imposes a tax on net income. That is, the system generally allows for the deduction from gross income of the regular cost of doing business. Capital expenditures are one such cost eligible to be deducted from gross income. Under, a normal tax system, the cost of a capital asset is amortized and the asset depreciated over a set period of time. In each period, a depreciation expense is taken in accordance with the income the capital produces over the useful life of the asset.

For tax purposes, the Internal Revenue Service produces depreciation tables that businesses follow when they compute the depreciation deduction.[1] The table specifies the percentage of the asset's value that may be deducted in accordance with depreciation, and is loosely associated with the deterioration of the asset, and hence useful life in later periods. Under the published General Depreciation Schedule, the recovery period can vary from between three and twenty years. For example, depreciable assets (machinery and equipment) used in agriculture are generally recovered in seven years. Farm buildings, excluding those that are single purpose structures, require 20 years to recover. Other assets qualify as well, particularly certain livestock. Cattle for breeding and dairy and sheep, and goats for breeding are recovered in 5 years; hogs for breeding are recovered in 3 years.

Under current law, the tax code offers two deviations from the normal tax code: Section 168(k) "Bonus Depreciation" and 179 expensing. The deviations, in this case recovering depreciated capital through the tax system in an accelerated manner, can be beneficial to farm businesses that make eligible investments. To the extent that capital costs can be recovered in a shorter period of the time, the cost of capital can be reduced.

[1] The Modified Accelerated Cost Recovery System (MACRS) is used to recover the basis of most business and investment property placed in service after 1986. MACRS consists of two depreciation systems, the General Depreciation System (GDS) and the Alternative Depreciation System (ADS). Generally, these systems provide different methods and recovery periods to use in figuring depreciation deductions.

Figure 1. Maximum Section 179 expensing amount and additional depreciation percentage, 1981-2013



Source: Internal Revenue Service. Note: *Expensing for 2012 was retroactively changed to $500K by ATRA 2012 (signed into law in January 2013). The Small Business Jobs Act of 2010 (SMJA 2010). Economic Growth and Taxpayer Relief Reconciliation Act of 2001 (EGTRRA 2001). If the cost of qualifying section 179 property placed in service in a year is more than investment maximum, you generally must reduce the expense amount (but not below zero) by the amount of cost over the investment maximum.

The tax value of "Bonus Depreciation" and Section 179 Expensing

Following Hall and Jorgenson (1976), the net present discounted value of the normal depreciation allowance to the firm is given by

(2) $$N^k = \sum_{i=1}^{T} \frac{D_i^k}{(1+r)i(1+\pi)i}.$$

It is assumed the farm is able to recover the value of the deduction in the first year of the investment of type *k*. Therefore the net present value of the deduction is the sum of the depreciation deductions over the life of the investment, adjusted for inflation, π, where *r* is the real interest rate.

To incorporate bonus depreciation, γ_t^k represents the additional percentage of the cost of the investment that can be deducted in the first year, or time t. The "normal" depreciation schedule is then applied to the remainder of the depreciation base, $(1- \gamma_t^k)$. Therefore, the net present value of the bonus depreciation is equal to the $\gamma_t^k + (1- \gamma_t^k) \cdot N^k$.

The tax value of bonus depreciation is simply the marginal rate multiplied by the net present value,

(3) $$\psi_t^k = \tau \cdot \left(\gamma_t^k + \left(1 - \gamma_t^k\right) \cdot N^k \right).$$

The change in the tax value of depreciation with respect to the bonus depreciation allowance is

(4) $$\delta\psi_t^k / \delta\gamma^k = \tau \cdot (1 - N^k) > 0$$

and increases with the tax rate.

(5) $$\delta\psi_t^k / \delta\gamma^k \delta\tau = (1 - N^k) > 0.$$

Table 1 presents the net present value of the depreciation allowance, as well as the percentage change in the tax value due to bonus depreciation. It is evident for the table the tax value of bonus depreciation can be quite small, particular in times of low nominal interest rates. With a nominal rate of 7 percent and bonus depreciation allowance worth 100 percent, the maximum tax value of the subsidy is 7.68 percent relative to a baseline of no bonus depreciation. For context, the last time the nominal 10-year Treasury security yielded 7 percent was in 1991. The average yield between 1997 and 2012 was 4.35 percent; therefore, the tax subsidy has been between 1.5 and 5.2 percent.

Table 1. Net present value of depreciation allowances

	Nominal Interest Rate			
NPV of depreciation	.025	.035	.05	.07
0% Bonus	0.939	0.916	0.884	0.846
30% Bonus	0.957	0.941	0.919	0.892
50% Bonus	0.969	0.958	0.942	0.923
100% Bonus	1	1	1	1
Percent change in tax value of additional depreciation*				
0% Bonus	0	0	0	0
30% Bonus	0.96	1.30	1.76	2.30
50% Bonus	1.60	2.16	2.93	3.84
100% Bonus	3.20	4.32	5.86	7.68

Source: Author's calculation using MACRS recovery rate, 7-year, half-year convention, 150 percent declining balance method. IRS publication 946. * Assuming a 35 percent maximum individual tax rate.

Under Section 179, a farm may elect to deduction all or part of the cost of a capital investment in the first year of the purchase (placed in service). Again, the net present value of the tax deduction is the discounted stream of deductions multiplied by the marginal tax rate (equation 6).

(6) $$E^k = \sum_{i=1}^{T} \frac{\theta_i C^k}{(1+r)i(1+\pi)i} \cdot \tau,\ 0 < \theta \leq 1.$$

The basis or cost of the investment *k* is represented by C^k, τ is the marginal tax rate, r is the real interest rate and π is the rate of inflation. Although the farm may elect to deduct the entire cost in the first year, it may also use expensing in conjunction with depreciation if, for example, it chooses to use only a portion of the election; therefore, θ represents the fraction of the cost deducted in period *i*. This may be the case when more than one piece of eligible capital is purchased in a year and the aggregate invest cost exceeds the Section 179 dollar limit. In that case, the net present value of the deductions equals the sum of the value of expensing and depreciation deductions,

(7) $$F^k = E^k + \psi^k.$$

Data

The data are cross-sectional and come from the US Department of Agriculture's *Agricultural Resource Management Survey* (ARMS). The ARMS is a series of interviews with farm operators designed to solicit information about production practices, costs of production, business finances, and operator and household characteristics.

Farm Capital Investments Eligible of Expensing

Capital expenditures include improvements to land such as irrigation, wells, and feedlots; New construction or remodeling of existing farm dwellings such as barns, buildings, silos, and sheds; cars, trucks, tractors and other self-propelled equipment used by the operation; non-self-propelled such as pumps and capital equipment for livestock and crop production; and farm office equipment placed on a depreciation schedule.

Table 2. Production and capital expenditures by farm typology, 2012

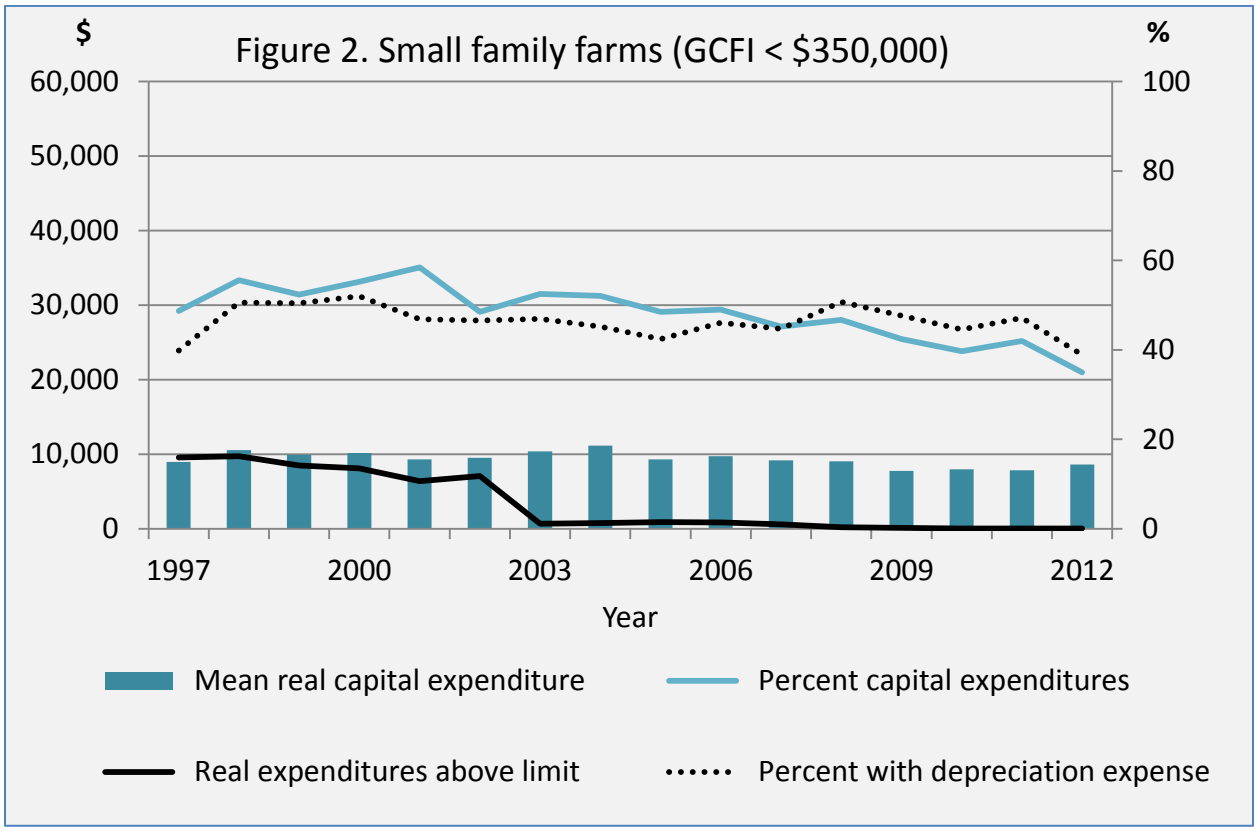
Typology	Number of farms/ percent of total	Percent of production	Percent of capital expenditures
Small family farms	1,924,000 / 91.6	16.2	43.4
Midsized family farms	115,802 / 5.5	33.0	23.4
Large family farms	56,484 / 2.7	23.6	27.4
Very large family farms	4,867 / 0.2	27.2	5.8

Source: USDA ARMS data, 2012; small farms defined as having less than $350,000 in gross cash farm income; midsized farms: gross cash farm income between $350,000 and $1,000,000; large farms: gross cash farm income between $1,000,000 and $5,000,000; very large farms: gross cash farm income greater than $5,000,000.

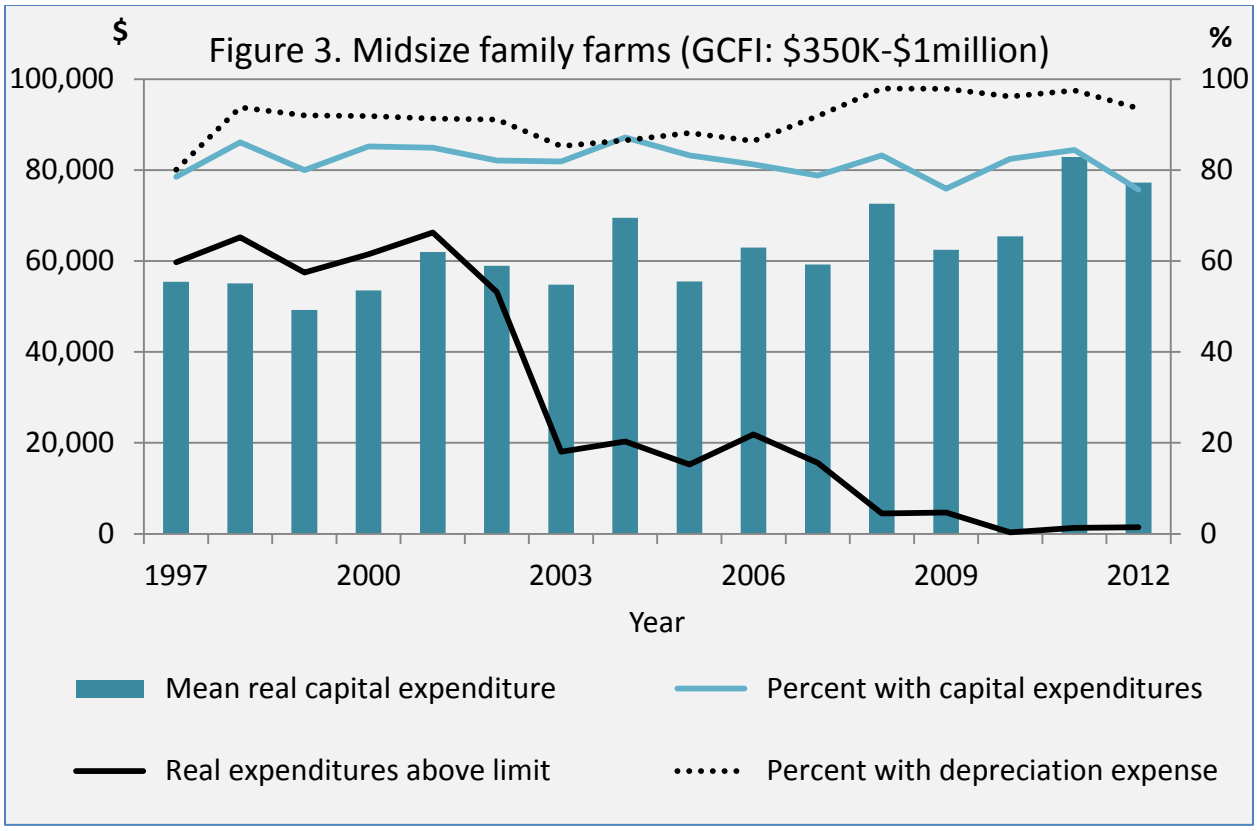
Table 3. Change in Mean Real Capital Expenditures Over Time			
	Percent Change		
	Time Period		
Commodity	1997-2000	2001-2004	2001-2012
Cash grains	4.6%	24.1%	154.2%
Beef	5.5%	27.2%	2.7%
Peanuts, cotton, tobacco	0.8%	42.1%	186.3%
Fruits and vegetables	-5.3%	51.4%	28.6%
Nursery and greenhouse	47.5%	10.5%	-52.5%
Dairy	66.4%	34.4%	19.4%
Poultry	129.8%	-11.6%	-57.0%
All Commodities	11.4%	29.1%	39.5%
Source: USDA ARMS data, 1997-2012.			

Mean capital expenditures adjusted for inflation have varied across time and by type of commodity production. In the period before 2001—the beginning of the recent legislation to make the expensing provisions more valuable—the growth in real mean capital expenditures was 11%. In the four years following the 2000, growth in the real capital expenditures was 29%; and it was 39.5% between 2001 and 2012 (Table 3).

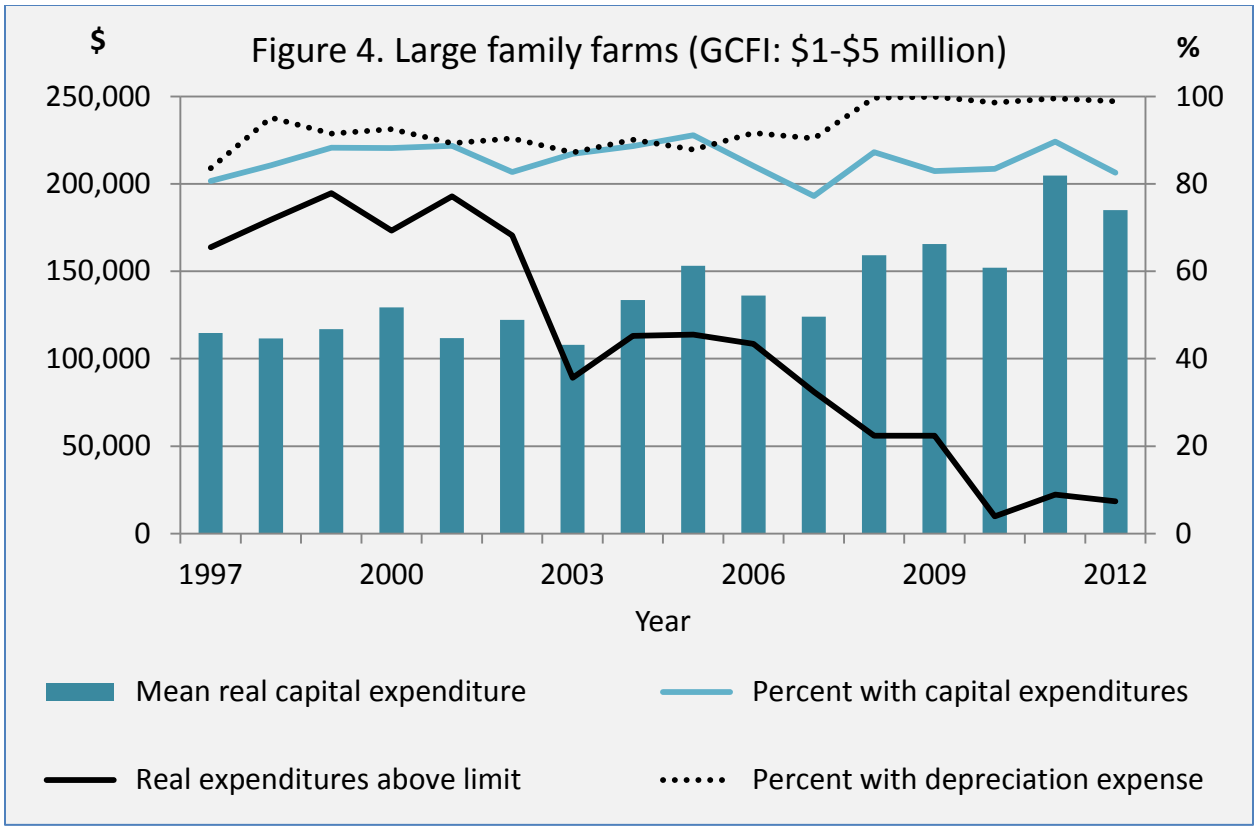
Figures 2-5 illustrate capital investment behavior between 1997 and 2012 by farm typology. The figures show mean real capital expenditure, the percent of farms that made a capital expenditure, the percent that took a depreciation expense, and the percent that had aggregate expenditures that exceeded the expensing limit that year.



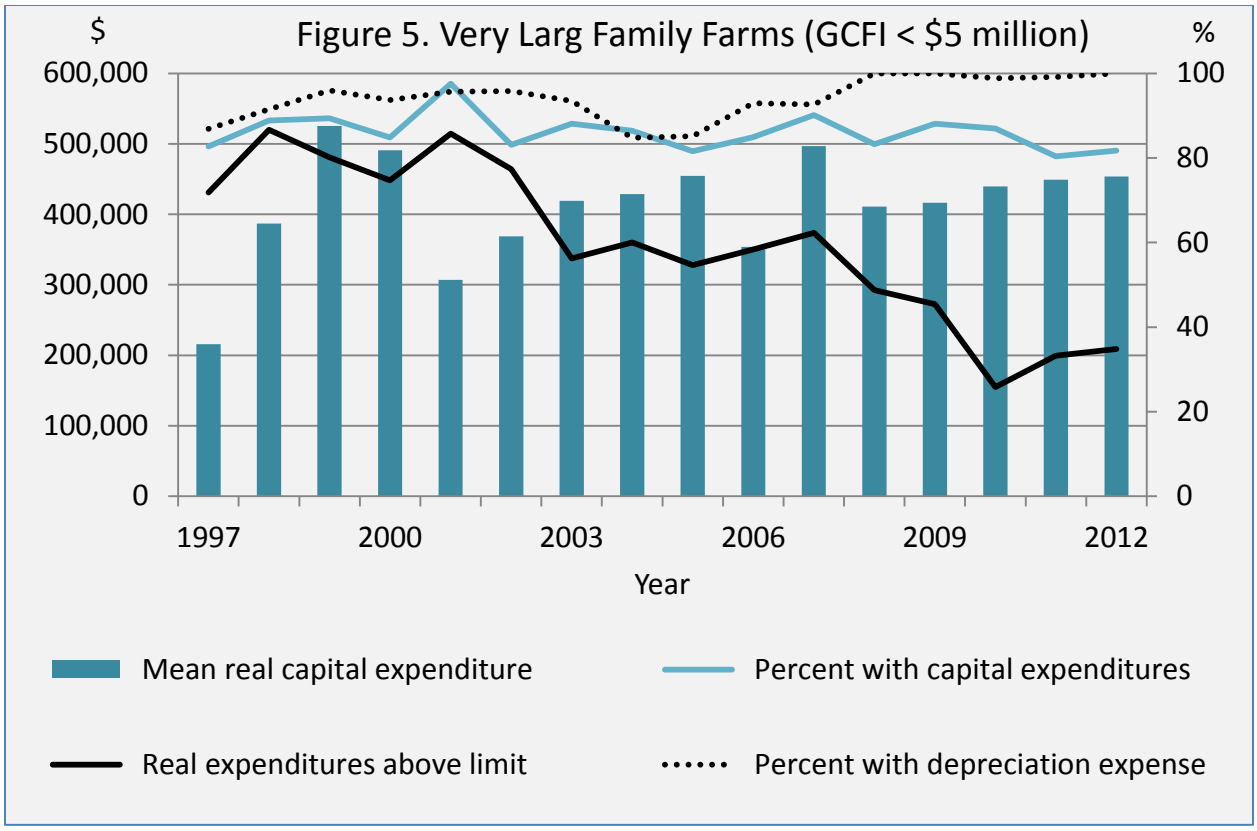
Source: USDA ARMS data, 1997-2012.



Source: USDA ARMS data, 1997-2012.



Source: USDA ARMS data, 1997-2012.



Source: USDA ARMS data, 1997-2012.

Table 4 presents the correlation between expensing provisions and total capital expenditures for family farms. The data are from the ARMS and represent the responses of 120,000 farms, over 16 years. After controlling for characteristics of the principal operator, such as age, highest level of education, and years of experience operating a farm, as well as size and profitability of the farm, the results suggest a $1000 increase in the Section 179 expensing deduction is associated with a $242 to $618 increase in total capital expenditures. The coefficient for Bonus Depreciation suggests the results can be large in magnitude. A one percent increase in additional first-year depreciation increases total capital expenditures by between $5,518 and $9,324.

Table 4. Correlation between select variables and total capital expenditures

Coefficient	Total Capital Expenditures			
Section 179 expensing	0.043**	0.0387**	0.0242**	0.0618**
	(0.004)	(0.004)	(0.005)	(0.005)
Bonus Depreciation	5518.43**	9323.56*	--	--
	(2446.74)	(2442.44)		
Operator age	-1081.34** (73.92)	-695.37**	-696.11**	-670.42**
		(62.29)	(62.60)	(63.40)
Education	3004.27**	3031.38**	2886.42**	2963.00**
	(789.09)	(814.12)	(819.65)	(805.47)
Years of experience	683.71**	393.21**	381.48**	370.44**
	(54.58)	(50.48)	(50.30)	(50.63)
Total value of production	0.012**	0.012**	0.012**	0.012**
	(0.002)	(0.002)	(0.002)	(0.002)
Total acres operated	0.792**	0.845**	0.843**	0.902**
	(0.312)	(0.329)	(0.329)	(0.347)
Return on capital	-0.658**	-0.639**	-0.639**	-0.639**
	(0.146)	(0.145)	(0.145)	(0.145)
Operating profit margin	0.671**	0.651**	0.638**	0.651**
	(.0146)	(.0146)	(.0146)	(.0146)
Commodity controls	No	Yes	Yes	Yes
Year controls	No	No	Yes	Yes
State controls	No	No	No	Yes
Observations N =120,000				

Data source: Agricultural Resource Management Survey, years 1997-2012. Total capital expenditure and total value of production are in 2012 dollars.
Note: Robust standard errors in parentheses.
** Statically significant at the 1% level.
* Statistically significant at the 5% level.

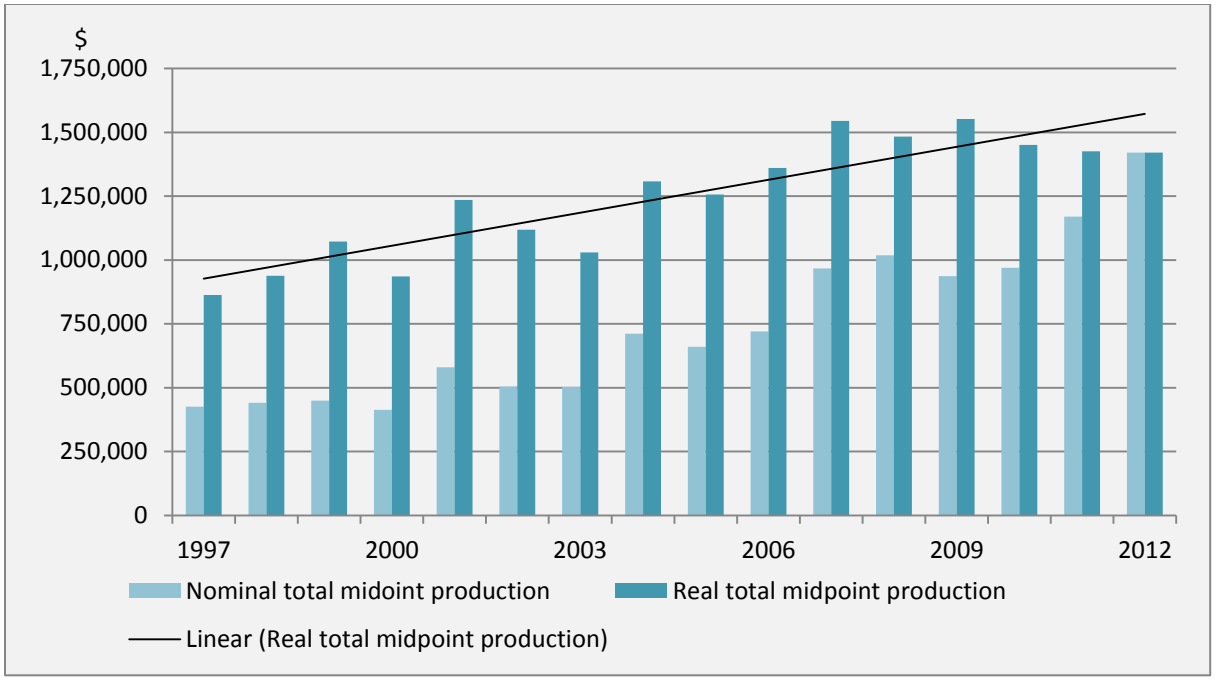
Have the tax provisions facilitated consolidation in the sector?

From a production standpoint, farm operations are getting larger—and they have been for a while. Today, half of all acres are on farms with more than 1,100 acres (the midpoint acreage); in 1982, the midpoint acreage figure was just under 600 (MacDonald et al. 2013). In 2012, half of all production took place on a farm with more than $1.4 million in gross value of production; 65% increase in real terms (farm prices received) since 1997 (author's calculations form 2012 ARMS data; see figure 6).

While variation in the growth in midpoint acreage exists by state and crop enterprise, consolidation is a consistent story across the board. Reasons for the growing concentration include government programs, namely lending, loan guarantees, and federal commodity programs. Each has been studied for its impact on changing farm structure; however, missing from the literature is the influence of the tax code on the issue. This research will continue to explore the relationship between capital expenditures and the growing concentration of production.

- Identification of causal effects of the tax provisions is confounded by the ubiquity of the provisions: all farms were "treated" with the new expensing amounts.
- Over the 16 year time period, only 15.4% of farms made capital purchases exceeding the Section 179 expensing limit.
- In the sector the change in capital expenditure behavior is not large after the initial law change in 2001:
    - Real mean capital expenditures between 1997 and 2000 were $13,440; Real mean capital in the first four years following 2001 were $14,562 (a difference of $1,122).
    - Between 2002 and 2012 the mean real capital expenditure was $15,151.
- In 2012, over two-thirds of total capital expenditures were still made by small and midsized family farms—this represents approximately half of the total agricultural production in 2012.
- The tax subsidy of Bonus Depreciation has been relatively small: between 1.5% and 5.2%.
- The relaxed expensing provisions may have had differential effects across commodity production:
    - Cash grains saw large increase in capital expenditures: The 2002-2005 average was $24,136, while the pre-2001 average was $21,136. Between 2002 and 2012 the average was $36,302.

Figure 6. Evolution of Midpoint Total Value of Production over time.



Source: USDA, Economic Research Service, Agricultural Resource Management Survey data, 1997-2012.

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