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Accelerated tax depreciation and farm investment: evidence from Michigan
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Abstract

Purpose – The purpose of this paper is to examine the use of accelerated depreciation deductions, which includes Section 179 and bonus depreciation, taken in the first year of asset life by Michigan farms. The frequency, value and influence of accelerated depreciation on farm investment are also analyzed.
Design/methodology/approach – Accrual adjusted income statements, balance sheets, depreciation schedules, and income tax information for 66 Michigan farms from 2004 to 2014 provide data for the analysis. The present value of the accelerated deduction and change in the cost of capital were calculated. Finally, investment elasticities were used to arrive at the change in investment due to accelerated depreciation.
Findings – Accelerated depreciation was utilized across all applicable asset classes. Section 179 was used more often than bonus depreciation in part because it was available in all the examined years. Based on actual farm business use, accelerated depreciation lowered the cost of capital for the operations resulting in an estimated increase in investment of 0.27 to 11.6 percent depending on asset class.
Originality/value – The data utilized are of a detail not available in previous investigations which used either aggregate data or estimated rather than the observed use of accelerated depreciation. This analysis reveals that accelerated depreciation as used by commercial farms lowers the cost of capital and thus encourages investment particularly in machinery and equipment.

Keywords Cost of capital, Taxation, Bonus depreciation, Farm investment, Section 179
Paper type Research paper

Introduction

Modern US commercial farms have large capital investments in depreciable property including machinery, equipment, buildings, facilities and land improvements. Income tax depreciation policy affects the cost of investment capital by shifting the recovery period closer to – or into – the current tax year. In 1981, Section 179 depreciation deductions were instituted into the US tax code. In 2002, "bonus depreciation" was added as another form of accelerated depreciation. Both forms of accelerated depreciation allow farmers to take large amounts of depreciation in the first year relative to the default tax depreciation. Accelerated depreciation deductions allow farmers to decrease their taxable income by moving cost recovery of long-lived assets into the current tax year, thus increasing after tax income and incentivizing investment in depreciable farm business assets.

The role of tax policy in influencing business investment has been a frequent topic of past economic research. Hall and Jorgenson (1967) concluded that tax policy was effective in changing the level, timing, and composition of investment. Chisholm (1974) found that increased levels of depreciation encouraged the investment behavior. Kay and Rister (1976) calculated the present values and concluded that accelerated depreciation affected the investment value. Weersink and Stauber (1988) examined optimal farm combine replacement finding that initial tax deduction and length of cost recovery changed the optimal replacement interval. Ariyaratne and Featherstone (2009), examining Kansas farm businesses from 1998 to 2007, found that the addition of machinery and equipment and listed property depreciation was a strong determinant of investment decisions. House and Shapiro (2008) estimated aggregate investment supply elasticity and found that investment in qualified capital increased sharply with the use of accelerated depreciation. Hadrich *et al.* (2013) studied

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machinery investment by farmers in North Dakota concluding that Section 179 had a large effect. However, their analysis ignored bonus depreciation and did not actually observe the use of Section 179 instead assuming that farm annual investment must be at least equal to the allowance limit for its use. Williamson and Stutzman (2016) used a synthetic panel data and examined accelerated depreciation policies concluding these policies had small impacts as few farms made total annual capital purchases close to the maximum allowance.

In contrast to past research on these tax depreciation policies, we neither assume nor estimate the use of Section 179 and bonus depreciation. Instead, we observe the actual use for a balanced panel of farms. The data set used in this research is unique in its detail and also the inclusion of investment, financial, and tax depreciation information at the farm level. The data span 11 years from 2004 to 2014. This research examines the use of accelerated depreciation by asset class, year and farm type and measures the benefits farmers realized. The objectives are to: examine the extent to which and when farms utilized accelerated depreciation; calculate the after tax present value of accelerated depreciation deductions; and calculate the realized decreased cost of capital from these tax policies and implications for investment. The next section briefly examines the history of accelerated depreciation policies for US farm managers and mechanics of using accelerated depreciation compared to the default depreciation methods. The third section examines the panel data set of Michigan farms. Summary statistics on farm taxable income, investment, and depreciation choices by year, class, and farm type reveal the frequency and magnitude of accelerated depreciation use. The fourth section calculates the present value of accelerated depreciation relative to default IRS depreciation by year, class and farm type. The effect of accelerated depreciation on the cost of capital is examined using a model based on Hall and Jorgensen (1967). Finally, the investment implications of a reduction in cost of capital are discussed.

Depreciation and farm income tax management

In 1942, the US Treasury created a listing of useful asset lives for over 5,000 types of assets used in 57 industry activity categories in what was known as Bulletin F (US Treasury Department, Office of Tax Analysis, 1989). These useful asset lives became the de facto standard for depreciation deductions, which could be refuted only by substantial evidence produced by the taxpayer (US Treasury Department, Office of Tax Analysis 1989). The 1954 Tax Code authorized accelerated methods of depreciation, called accelerated cost recovery system (ACRS), to encourage businesses to increase investment in depreciable assets (US Treasury Department, Office of Tax Analysis 1989). Prior to this time, only straight line depreciation, which allocates equal amounts of depreciation each year, was available to tax filers. ACRS depreciation originally utilized 200 percent declining balance to calculate annual cost recovery and had an alternate option of depreciation utilizing fixed percentages for each class of property annually. In 1962, the IRS abandoned Bulletin F in favor of asset classes which are still used today. In 1986, Congress modified ACRS and renamed it the modified accelerated cost recovery system (MACRS). The change to MACRS extended the recovery period of assets and included two depreciation systems, the General Depreciation System (GDS) and Alternative Depreciation System (ADS). Depreciation on farm property placed in service after 1988 is limited to 150 percent declining balance unless tax law states otherwise.

The IRS allows farm tax filers to depreciate most types of tangible business property except land. Thus, depreciable farm business assets include farm buildings, machinery, equipment, vehicles, land improvements, and purchased breeding livestock. To be depreciable, property must be owned by the business, used in the business, have a determinable useful life, and must be expected to last more than one year (Internal Revenue Service, 2014).

There are six classes of frequently used agricultural property denoted by the number of years over which they are depreciated. Three-year property includes semi-tractors, breeding hogs, and horses. Five-year property includes farm trucks and breeding cattle. Seven-year property includes farm machinery and equipment (including farm tractors), fences, and grain bins. Ten-year property includes single-purpose agricultural structures including manure pits. 15-year property includes drainage facilities, paved lots, water wells, and land improvements such as driveways, culverts, tile and erosion control. Finally, 20-year property includes farm buildings which are not single-purpose (e.g. machine sheds and shops).

The Economic Recovery Tax Act of 1981 introduced what is recognized as Section 179 depreciation deduction. Internal Revenue Code Section 179 is formally titled the "Election to Expense Certain Depreciable Business Assets." Section 179 allows farms to deduct any amount up to the full purchase price of qualifying equipment purchased or financed during the tax year from their gross taxable income (Internal Revenue Service, 2014). Section 179 sets a maximum expense deduction and investment limit for the tax year. The maximum expense deduction is the largest value a business can elect as their Section 179 deduction in the current year. The investment limit dictates how much a business can spend in the year and still claim a Section 179 deduction (detailed in Table AI). The investment limit decreases the maximum expense deduction dollar for dollar if total investment in eligible property is over the current investment dollar limit. Section 179 does not allow filers to create a net farm loss.

In addition to the Section 179 expensing allowance, farm taxpayers have the option of claiming an additional first-year depreciation allowance as stated in Section 168(k) of the IRS tax code (Sherlock, 2015). Created by the Job Creation and Worker Assistance Act of 2002 (PL 107-147), the "bonus" depreciation allowance (hereafter bonus depreciation) originally had a limit of 30 percent of the adjusted basis of new qualified property (Sherlock, 2015). Bonus depreciation applies only to new MACRS GDS property with a recovery period of 20 years or less that is placed into service for business use in the current year. Bonus depreciation may not be taken on used property, assets that require an ADS recovery period, or assets that have a recovery period longer than 20 years. Bonus depreciation may be claimed over all qualifying assets in an asset class after deductions that reduce the depreciable basis have been applied. In addition, bonus depreciation may be taken over multiple asset classes in the current year. The remaining depreciable basis of the asset after bonus depreciation is taken is placed on a regular MACRS depreciation deduction in the following years. The historic percentage constraints to bonus deduction are displayed in Table AI.

When electing deductions to reduce the depreciable basis of property, farmers have the option of using either or both accelerated depreciation deductions, any additional investment credits, and a regular yearly MACRS GDS 150 percent DB depreciation. If a farmer elects only one of the accelerated deductions, that amount is subtracted from the current depreciable asset basis and MACRS depreciation deductions are calculated from the new adjusted asset basis. If the taxpayer elects both forms of accelerated depreciation in the current year, Section 179 must be deducted first followed by bonus depreciation. The remaining book value of these assets after accelerated deductions is then depreciated via MACRS over the appropriate recovery period.

Data and summary statistics

The balanced panel data set used in this research included 66 Michigan farm operations covering the period 2004-2014. The farms were identified from the Michigan State University farm accounting system clientele. In order to be included, each operation had a complete set of farm financial information including accounting records, balance sheets (cost and market), income statement farm income tax, and farm asset depreciation schedules for all years.

These operations should not be interpreted as statistically representative of Michigan farms. In general, these operations were larger and better financially managed than the "average" farm operation. In addition, as we examined a balanced panel, none of these operations exited over the period examined as might have occurred in a representative sample. These farm operations are, however, indicative of commercial size farming operations with high-quality financial records. As such, their farm financial records are useful to examine the use and impact of accelerated tax policy on farm investment.

Classified by primary revenue generating agricultural enterprise, 29 farms were dairy and 31 were field crop farms. The remaining six were categorized as "other" and included beef (one farm), custom heifer raiser (one), hog (three), and vegetables (one) as primary enterprises. All producers in the data utilized MACRS depreciation as the default method.

To summarize farm size, income, and profitability over time and across farm type, acres operated, gross farm income (GFI), net operating profit, and Schedule F net farm profit or loss statistics are displayed in Table I. Acres operated included all farm land, rented and owned. GFI is the sum of all farm-related income the operation generated in a given year. Net operating profit is the net cash income plus inventory change including prepaid expenses where the net cash income is the gross cash income less total cash expenses. The net income a farm reports to the IRS is generated from their Form 1040 Schedule F "Profit or Loss from Farming" and is the farm gross cash income less farm expenses including depreciation.

The average farm was approximately 1,000 acres with a large standard deviation of 800 acres. GFI averaged $1.36 million with a net operating profit of $313,000 and a Schedule F farm income of $246,000. Crop farms operated more than average acres but generated a lower than average GFI, net operating profit and Schedule F income. Dairy farms averaged less acres operated but much higher gross farm income, operating profit and Schedule F income. The other farm category operated more acres with a higher GFI but with lower net operating and Schedule F income. All categories had large amounts of variation across farms and years.

Figure 1 displays average GFI by farm type and year revealing a trend of increasing GFI for all three farm types over the period from 2004 to 2014. High grain prices in 2011, 2012 and 2013 resulted in larger crop farm GFI compared to early years. Dairy farm GFI followed a similar pattern to the crop farms with the exception of 2009 when milk prices were very low.

Farm group	Measure	Mean	SD
All farms	Acres	1,042	803
	Gross farm income ($)	1,357,355	1,669,207
	Net operating profit ($)	313,261	503,877
	Schedule F profit/loss ($)	246,701	699,571
Crop farms	Acres	1,118	886
	Gross farm income ($)	776,525	659,729
	Net operating profit ($)	219,423	261,220
	Schedule F profit/loss ($)	145,861	204,522
Dairy farms	Acres	931	761
	Gross farm income ($)	1,894,807	2,234,477
	Net operating profit ($)	422,518	681,947
	Schedule F profit/loss ($)	373,786	1,021,024
Other farms	Acres	1,197	254
	Gross farm income ($)	1,786,059	1,071,822
	Net operating profit ($)	263,098	339,000
	Schedule F profit/loss ($)	159,007	161,896

Table I. Summary statistics

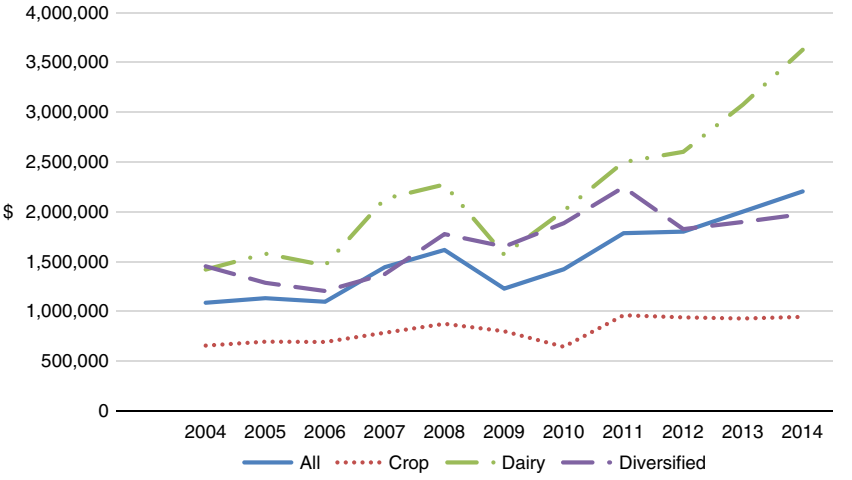

Figure 1.
Average gross farm income by year and farm type (nominal $)

Income tax depreciation

Average annual tax depreciation values include all forms of depreciation taken on Schedule F, including deductions from MACRS as well as accelerated depreciation. Figure 2 displays average annual depreciation by type over the examined time period. Accelerated depreciation made up a minority of total annual farm depreciation but was larger and more important in high-income years – most notably 2008 and 2011. Section 179 deductions were larger than bonus depreciation and increased in later years.

Figure 3 displays average accelerated depreciation deductions as a share of average total farm depreciation. Section 179 use trended upward strongly from 2009 on correlated with higher commodity prices. Bonus depreciation use was more variable than Section 179 (and not available in several years examined). Bonus depreciation use spikes in high-income years.

Figure 4 displays the percent of operations utilizing the accelerated depreciation deductions by year. In general, about 40 percent of operations used some form of accelerated depreciation during the examined period. In 2011 and 2012, more than half of the operations

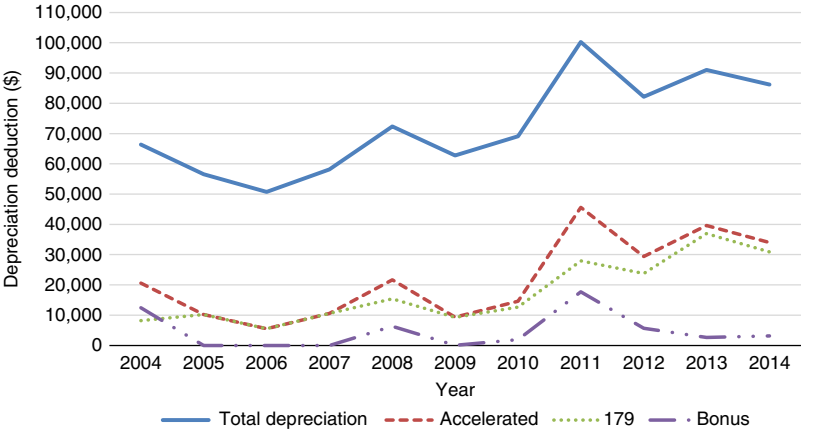

Figure 2.
Average depreciation deductions (nominal $)

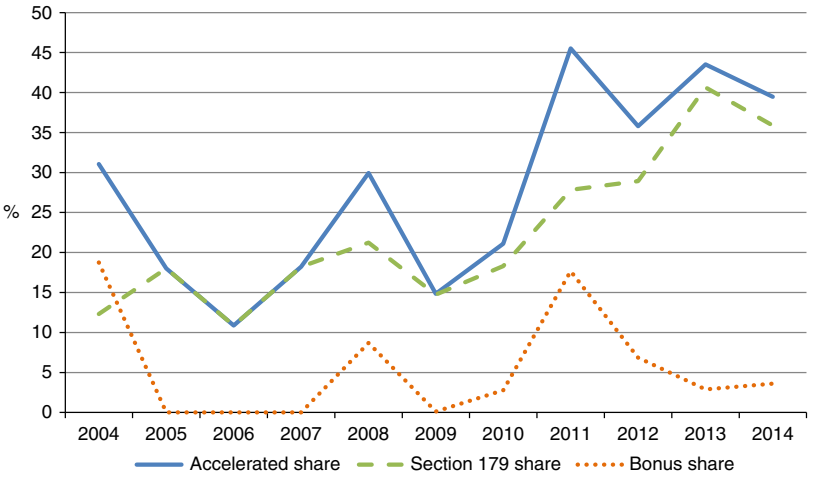

Figure 3.
Section 179, bonus and total accelerated share of total depreciation deduction

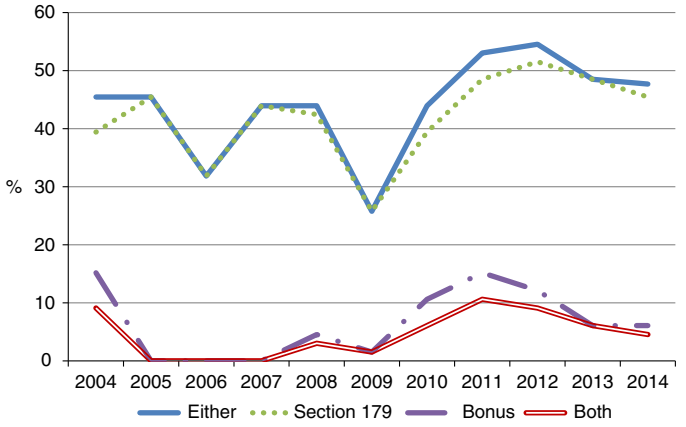

Figure 4.
Percent of operations utilizing accelerated depreciation deductions

used accelerated depreciation to off-set higher GFI. Section 179 was by far the most common method used accounting for nearly all of the accelerated depreciation use by frequency across operations. 2009, being a low farm income year, witnessed only about one-quarter of operations using any accelerated depreciation.

Table II displays the average percent of investment in each class across farms and years, average value of 179 and bonus deduction conditional on farms using those depreciation allowances. In these data, there were a total of 47 annual bonus depreciation deductions utilized across all operations for the 11-year period. Recall that in 2005, 2006, and 2007, bonus depreciation was not available.

Table II shows that when Section 179 depreciation deduction was used the average deduction was more than $50,000 annually for seven and ten-year assets which include farm machinery and equipment as well as single-purpose agricultural structures. Five- and seven-year property made up 60 percent of farm investment on these operations. Five-year property includes farm pick-up trucks and breeding cattle while seven-year property includes machinery and equipment. Dairy farms in particular would be expected to

regularly purchase replacement cattle and all farms must regularly re-invest in crop and livestock-related machinery and equipment. Of course, longer lived assets would be expected to be replaced less often. The largest average deductions for both Section 179 and bonus depreciation occurred in seven-year property. The second largest class by average deduction was for ten-year property which includes structures such as cattle barns and milking parlors which are major investments.

Tax policy and the cost of capital

The schedule of depreciation deductions for type m capital is denoted by D_j^m. The present discounted value of these deductions z^m is:

$$z^m = \sum_{j=1}^{R} \frac{D_j^m}{(1+r)j}$$

where D^m is the share of the depreciation deduction for year j and r is the appropriate discount rate. Thus, z^m is present value of the depreciation deduction on one dollar's investment and will equal 1 if the entire purchase is deducted in the current year. Let λ_j denote the share of accelerated depreciation invested in year j which is immediately deducted as a business expense with the remaining $(1-\lambda_j)$ depreciated according the to the appropriate depreciations schedule (i.e. MACRS). The present value of the accelerated depreciation allowances is $\lambda_j+(1-\lambda_j)z$.

The effects of tax policy on investment demand are generally captured in the user cost of capital (Hall and Jorgenson, 1967). A farm manager is assumed to set investment level so that the marginal benefit of an additional dollar's investment equals the user cost of capital. Under static expectations, the standard formula for cost of capital is expressed following Hall and Jorgenson (1967) as:

$$c = (r-\pi+\delta)\frac{(1-\tau z)}{(1-\tau)}$$

where r is the rate of return the company requires to attract investors, π is the inflation rate on capital goods, δ is the rate of economic depreciation, τ is tax rate, and z is the present value of depreciation deduction[1]. This expression, or a variant, for cost of capital for firm investment has been used by many studies following Hall and Jorgenson (1967) including: Auerbach (1983), Auerbach and Hassett, (1989), Chirinko (1993), Chirinko *et al.* (1999), Cummins *et al.* (1994), Desai, and Goolsbee (2004), Goolsbee (1998) and Liu (2011)[2].

Note that when $z = 1$ as when all investment is taken as depreciation in the current year, the second term becomes 1 so that taxes do not affect c. Thus, the use of accelerated depreciation allows the manager to directly lower the cost of capital by choosing the present value of the depreciation deduction.

Asset class (years)	Investment per class (percent of total)	Conditional[a] Average 179 deduction ($)	Conditional[a] average bonus deduction ($)
3	4	28,351	38,775
5	25	19,205	86,189
7	35	67,406	186,833
10	9	56,456	93,659
15	10	21,281	14,830
20	8	30,946	43,829

Note: [a]Average values conditional on use > 0

Table II.
Frequency of farm investment and deductions utilized by asset class

For r, the farm return on equity was assumed to be 0.06 which closely approximated the long-run average on Michigan farms (Wolf and Wittenberg, 2016). Inflation rates were calculated from the average change per year in the prices paid index from the US Department of Agriculture National Agricultural Statistics Service from 2004 to 2014. The resulting capital goods inflation rate, π, was 0.06 used on Class 3-, 5- and 7-year assets with an inflation rate of 0.03 for Class 10-, 15- and 20-year property. The economic depreciation rate, δ, came from Brazell and Mackie (2000), who proposed an economic depreciation life of 12 years for machinery and equipment and 20 years for longer lived assets such as buildings. These useful lives translate into an economic depreciation rate of 0.083 and 0.05, respectively. The tax rate, τ, was the marginal IRS tax rate the farm dictated by their Schedule F net farm profit or loss assuming married, filing jointly tax status[3]. The present value of the depreciation deduction, z, was calculated as described above using the actual investment in each class from the farms from 2004 to 2014.

Table III displays the resulting cost of capital accounting for actual farm accelerated depreciation used in each asset class. The column denoted "total" accelerated depreciation includes both or either type while the other columns capture the actual use of Section 179 and bonus depreciation. The realized cost of capital was 8 to 9 percent for each class. The highest cost of capital under MACRS was Class 15 assets with the lowest being Class 20. When accounting for the use of accelerated depreciation, the mean cost of capital decreased over all asset classes compared to the MACRS cost of capital. Class 15 assets had the lowest cost of capital when accounting for both types of accelerated depreciation at 0.0813. The highest average cost of capital with accelerated depreciation use was Class 7 property but this cost was more than 5 percent lower than under MACRS.

The greatest decrease in the cost of capital came from the use of Section 179 depreciation deductions. The larger relative effect on cost of capital caused by Section 179 depreciation can be attributed to the policy characteristics of the deduction. Section 179 allows producers to deduct 100 percent of the depreciable basis of property in the first year. Bonus depreciation dictates a percent of depreciable basis to be claimed in the first year. The greatest decrease in the cost of capital occurred in 15-year property when Section 179 depreciation was used where the cost of capital decreased by 11.57 percent compared to utilizing MACRS depreciation alone. These tax policy incentives have proven to provide a benefit to farmers in both the present value of the depreciation deduction as well as a reduction in the cost of capital when an investment decision is made.

Investment effects of accelerated depreciation

Tax policy has long been considered a primary lever to alter the investment behavior (Hall and Jorgenson, 1967). To measure the responsiveness of investment to the depreciation

Asset class (years)	MACRS depreciation Cost of capital (%)	Total accelerated depreciation Cost of capital (%)	Total accelerated depreciation Change from MACRS (%)	Section 179 depreciation Cost of capital (%)	Section 179 depreciation Change from MACRS (%)	Bonus depreciation Cost of capital (%)	Bonus depreciation Change from MACRS (%)
3	8.57	8.32	−2.92	8.32	−2.92	8.48	−1.05
5	8.76	8.40	−4.11	8.39	−4.22	8.53	−2.63
7	8.89	8.42	−5.29	8.42	−5.29	8.48	−4.61
10	8.87	8.17	−7.89	8.15	−8.12	8.35	−5.86
15	9.16	8.13	−11.24	8.10	−11.57	8.47	−7.53
20	8.37	8.16	−2.51	n/a	n/a	8.16	−2.51

Note: Percent change = change from MACRS depreciation cost of capital

Table III. Realized cost of capital by depreciation type

tax policy changes, economists use the elasticity of investment which is defined as the percentage change in investment with respect to the percentage change in the user cost of capital. Hassett and Hubbard (1996) reviewed the literature on the effect of tax policy on business investment and concluded that the elasticity of investment with respect to the tax-adjusted user cost of capital was between −0.5 and −1.0[4].

Using the range of investment elasticity from −0.25 to −1.0, Table IV displays the resulting increase in investment by asset class for both types of accelerated depreciation, followed Section 179 and bonus depreciation independently. As with the previous table, these responses are relative to MACRS depreciation based on the actual farm use. The largest investment responses occurred in the 10- and 15-year property although seven-year property also had a relatively large response to accelerated depreciation. Section 179 was driving more investment than bonus depreciation. The availability, flexibility, and increasing limits of Section 179 allowed its use to consistently lower the cost of capital and encourage investment. Not only was bonus depreciation not allowed in 3 of the 11 years examined, there were also spending limits on its use. Meanwhile, the maximum amount allowed under Section 179 increased from $100,000 to $500,000 annually.

The most important effects were on five- and seven-year property as dairy farms often invest in replacement breeding stock and all farms invest frequently in machinery and equipment. Both of these property classes have shorter economic lives than the investments in longer-term assets that occur less often. Further, these farms witnessed a large variation in commodity prices and, thus, farm revenues during the period examined as the impacts of energy prices, ethanol policy, and the great recession occurred.

Conclusions

Section 179 and bonus depreciation deductions are forms of accelerated tax depreciation available to US farmers. These policies were created to incentivize farm investments. While the agricultural industry is not the only beneficiary of accelerated depreciation deductions, it has become commonplace for farmers to take advantage of these deductions. With widespread use of these tax tools by farmers, it is important to quantify the use and benefits producers are receiving.

In this panel data set of 66 farms spanning 11 years, there were 305 Section 179 depreciation deductions taken with an average of $52,250 and 70 bonus depreciation deductions taken with an average of $100,886. Over the 11-year time period, there were seven Section 179 depreciation tax policy changes and four bonus depreciation policy changes.

The present value of the depreciation deduction is the benefit the farmer receives from electing an accelerated depreciation deduction in the form of decreased cost of capital investment for the producer. If the cost of the asset is lowered through accelerated

Asset class (years)	Accelerated depreciation			Section 179 depreciation			Bonus depreciation		
Investment elasticity	−0.25	−0.5	−1.0	−0.25	−0.5	−1.0	−0.25	−0.5	−1.0
% change in investment									
3	0.73	1.46	2.92	0.73	1.46	2.92	0.27	0.53	1.05
5	1.03	2.06	4.11	1.05	2.11	4.22	0.66	1.32	2.63
7	1.33	2.65	5.29	1.33	2.65	5.29	1.15	2.30	4.61
10	1.97	3.94	7.89	2.03	4.06	8.12	1.46	2.93	5.86
15	2.81	5.62	11.24	2.85	5.79	11.57	1.88	3.76	7.53
20	0.63	1.26	2.51	n/a	n/a	n/a	0.63	1.26	2.51

Note: Percent change = change from investment under MACRS depreciation

Table IV. Accelerated depreciation investment responses relative to MACRS depreciation

depreciation deductions, the business can more easily generate the required return from that asset, thus increasing the likelihood of investment.

This paper calculated the decrease in cost of capital attributed to accelerated depreciation deductions using a range of previous estimates of investment elasticity. The use of accelerated deprecation created an average estimated decrease in the cost of capital of up to 11.6 percent. For the most frequently invested in asset class, seven-year property including machinery and equipment, there was a 5.3 percent decrease in the cost of capital from using accelerated depreciation.

These immediate benefits in the present value that translate into a decrease in the cost of capital for farmers from election of accelerated depreciation are worth noting. Farmers realize benefits from these tax policies, especially in years of high net farm income. With Section 179 maximum expense and investment limits monotonically increasing over the life of the policy, it is important to know the resulting producer benefits. If the expansion of these policies is driven by the desire to decrease the cost of capital face by farmers when making an investment decision, then it appears to be working.

Notes

1. The general formula from Hall and Jorgenson (1967) also contains tax credits. However, no farms utilized investment credits over this time period so that term was set to zero.
2. There are many simplifying assumptions used to derive this cost of capital formula in addition to static expectations including no adjustment costs, and constant marginal cost of new capital goods (Gale and Orszag, 2005).
3. This analysis ignores income and expenses from non-farm activities. The data were not available for non-farm income.
4. Liu (2011) estimated that the elasticity was up to −2.0 for machinery and equipment. House and Shapiro (2008) estimated that the elasticity might be 6 or more. Because these estimates are outside of the typical range, we do not use them in our calculations instead tending towards more conservative estimates.

References

Ariyaratne, C.B. and Featherstone, A.M. (2009), "Impact of government payments, depreciation and inflation on investment behavior in American agriculture sector using sample of Kansas farms", *Agricultural and Applied Economics Association Annual Meeting*, Milwaukee, WI.

Auerbach, A.J. (1983), "Taxation, corporate financial policy and the cost of capital", *Journal of Economic Literature*, Vol. 21 No. 3, pp. 905-940.

Aurebach, A.J. and Hassett, K.A. (1989), "Tax reform and adjustment costs: the impact of investment and market value", *International Economic Review*, Vol. 30 No. 4, pp. 939-962.

Brazell, D.W. and Mackie, J.B. III (2000), "Depreciation lives and methods: current issues in the US capital cost recovery system", *National Tax Journal*, Vol. 53 No. 3, pp. 531-562.

Chirinko, R. (1993), "Business fixed investment spending: modeling strategies, empirical results, and policy implications", *Journal of Economic Literature*, Vol. 31 No. 4, pp. 1875-1911.

Chirinko, R., Fazzari, S.M. and Meyer, A.P. (1999), "How responsive is business capital formation to its user cost?", *Journal of Public Economics*, Vol. 74 No. 1, pp. 53-80.

Chisholm, A.H. (1974), "Effects of tax depreciation policy and investment incentives on optimal equipment replacement decisions", *American Journal of Agricultural Economics*, Vol. 56 No. 4, pp. 776-783.

Cummins, J.G., Hassett, K.A. and Hubbard, R.G. (1994), "A reconsideration of investment behavior using tax reforms as natural experiments", *Brookings Papers on Economic Activity*, Vol. 2 No. 1, pp. 1-74.

Desai, M.A. and Goolsbee, A.D. (2004), "Investment, overhang, and tax policy", *Brookings Papers on Economic Activity*, Vol. 35 No. 2, pp. 285-338.

Gale, W.G. and Orszag, P.R. (2005), "Deficits, interest rates, and the user cost of capital: a reconsideration of the effects of tax policy on investment", *National Tax Journal*, Vol. LVII No. 3, pp. 409-426.

Goolsbee, A. (1998), "Investment tax incentives, prices, and the supply of capital goods", *The Quarterly Journal of Economics*, Vol. 113 No. 1, pp. 121-148.

Hadrich, J.C., Larsen, R. and Olson, F.E. (2013), "Impact of the Section 179 tax deduction on machinery investment", *Agricultural Finance Review*, Vol. 73 No. 3, pp. 458-468.

Hall, R.E. and Jorgensen, D.W. (1967), "Tax policy and investment behavior", *American Economic Review*, Vol. 57 No. 3, pp. 391-414.

Hassett, K.A. and Hubbard, R.G. (1996), "Tax policy and investment", National Bureau of Economic Research Working Paper No. 5683, Washington, DC.

House, C.L. and Shapiro, M.D. (2008), "Temporary investment tax incentives: theory with evidence from bonus depreciation", *American Economic Review*, Vol. 98 No. 3, pp. 737-768.

Internal Revenue Service (2014), *Farmer's Tax Guide*, Publication No. 225, Washington, DC.

Kay, R.D. and Rister, E. (1976), "Effects of tax depreciation policy and investment incentives on optimal equipment replacement decisions: comment", *American Journal of Agricultural Economics*, Vol. 58 No. 2, pp. 355-358.

Liu, L. (2011), *Do Taxes Distort Corporations' Investment Choices? Evidence from Industry Level Data*, Centre for Business Taxation, Oxford University, Oxford.

Sherlock, M. (2015), "Tax provisions that expired in 2014 ('tax extenders')", CRS report prepared for Member and Committees of Congress, Washington, DC.

US Department of the Treasury, Office of Tax Analysis (1989), *A History of Federal Tax Depreciation Policy*, IRS Pub. OAT Paper No. 64, GPO, Washington, DC.

Weersink, A. and Stauber, S. (1988), "Optimal replacement interval and depreciation method for a grain combine", *Western Journal of Agricultural Economics*, Vol. 13 No. 1, pp. 18-28.

Williamson, J.M. and Stutzman, S. (2016), "Tax policy and farm capital investment: Section 179 expensing and bonus depreciation", *Agricultural Finance Review*, Vol. 76 No. 2, pp. 246-269.

Wolf, C. and Wittenberg, E. (2016), "2015 Michigan farm business analysis summary", MSU Agricultural Economics Staff Paper No. 2016-02, East Lansing, MI.

Further reading

Abel, A.B. (1982), "Dynamic effects of permanent and temporary tax policies in a Q model of investment", *Journal of Monetary Economics*, Vol. 9 No. 3, pp. 353-373.

Bierlen, R. and Featherstone, A.M. (1998), "Fundamental q, cash flow, and investment: evidence from farm panel data", *Review of Economics and Statistics*, Vol. 80 No. 3, pp. 427-435.

Boehlje, M. and Tweeten, L. (1980), "The impact of inflation on farmers and agriculture", Paper No. 16 presented at the NCR-113 (Farm and Financial Management) Meeting in Kansas City, MO.

Clark, P.K. (1993), "Tax incentives and equipment investment", *Brookings Papers on Economic Activity*, Vol. 1 No. 1, pp. 317-339.

Edwards, W. (2015), "Estimating farm machinery costs", Iowa State University Extension and Outreach, Ag Decision Maker, Ames, IA, May 5.

Farmer, R. (1991), "The Lucas critique, policy invariance and multiple equilibria", *The Review of Economic Studies*, Vol. 58 No. 2, pp. 321-332.

Gloy, B.A. and Ladue, E.L. (2003), "Financial management practices and farm profitability", *Agricultural Finance Review*, Vol. 63 No. 2, pp. 157-174.

Guenther, G. (2015), "The section 179 and bonus depreciation expensing allowances: current law and issues for the 114th Congress", *CRS Report Prepared for Members and Committees of Congress,* Washington, DC.

Jorgenson, D.W. (1963), "Capital theory and investment behavior", *The American Economic Review*, Vol. 53 No. 2, pp. 247-59.

Lazarus, W.F. (2009), *Machinery Cost Estimates*, University of Minnesota Extension, St Paul, MN.

LeBlanc, M., Hrubovak, J., Durst, R. and Conway, R. (1992), "Farm machinery investment and the Tax Reform Act of 1986", *Journal of Agricultural and Resource Economics*, Vol. 17 No. 1, pp. 66-79.

Rotz, C., Hannibal, A., Muhtar, A. and Black, J.R. (1983), "A multiple crop machinery selection algorithm", *Transactions of the ASAE*, Vol. 26 No. 6, pp. 1644-1649.

Smith, D. and Butters, J. (1949), "Depreciation and depletion", National Bureau of Economic Research, pp. 53-86.

US Department of Agriculture, National Agricultural Statistics Service (2016), *Quick Stats*, GPO, Washington, April 3.

US Department of the Treasury, Internal Revenue Service (2015a), *Additional First Year Depreciation Deduction*, IRS Publication No. 26 CFR 1.168(k)-1, GPO, Washington, DC.

US Department of the Treasury, Internal Revenue Service (2015b), *Farmer's Tax Guide*, IRS Publication No. 225, GPO, Washington, DC.

US Department of the Treasury, Internal Revenue Service (2015c), *How to Depreciate Property*, IRS Publication No. 946, GPO, Washington, DC.

US Department of the Treasury, Internal Revenue Service (2015d), *Schedule F (Form 1040), Profit or Loss from Farming*, IRS Publication No. 1040, GPO, Washington, DC.

Appendix

Year	Maximum Section 179 expense deduction ($)	Maximum Section 179 investment limitation ($)	Bonus deduction (% of total expense)
2004	102,000	410,000	50
2005	105,000	420,000	0
2006	108,000	430,000	0
2007	125,000	500,000	0
2008	250,000	800,000	50
2009	250,000	800,000	50
2010	500,000	2,000,000	50
2011	500,000	2,000,000	100
2012	500,000	2,000,000	50
2013	500,000	2,000,000	50
2014	500,000	2,000,000	50

Table AI. Section 179 investment and bonus deduction limits, 2004-2014

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