1987

ECONOMIC CONSEQUENCES OF TAX REFORM ON AGRICULTURAL INVESTMENT

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Taxation

AAEA 1987

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Abstract

The investment effects of five major tax proposals and the Tax Reform Act of 1986, are examined by combining an econometrically estimated investment function with the cost of capital associated with each proposal. All the tax proposals increase the cost of capital and amplify current decreases in agricultural capital disinvestment. The proposals are bounded above by the Kemp-Kasten plan which reduces net investment by about $190 million and below by the House plan which accounts for yearly declines in excess of $320 million. In addition, the repeal of the investment tax credit is responsible for about 98 percent of the decline in net investment under the Tax Reform Act of 1986.

Keywords: Tax policy, net investment, Tax Reform Act of 1986.

Introduction

Since the advent of income based taxation economists have recognized that taxes and tax rules affect the behavior of economic agents. Although considerable disagreement exists about the proper role for taxes in economic policy, tax policy is generally acknowledged to be an important determinant of capital accumulation and economic activity [Hall and Jorgenson, 1967; Feldstein, 1982; LeBlanc and Hrubovcak, 1986][1]. Tax rules affect investment by changing the after-tax cost of owning capital. If tax policy reduces the after-tax cost of owning capital, then investment is more profitable and the demand for investment increases. A symmetric argument can be made for tax increases.

Policy makers have utilized taxes in an attempt to achieve a wide range of social objectives. There are several reasons why tax policy is the preferred policy instrument. Most important, tax policy is believed to be an effective means of changing economic behavior.[2] Tax policy has been used extensively as a counter-cyclical measure, to promote industrial growth and the purchase of specific investment goods, and to alter consumption patterns. More often than not, tax policy has been used to achieve economic objectives by targeting investment behavior.

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[1] The literature on the effects of tax policy on economic behavior is superabundant. The citations given here represent only a small sampling of this literature.

[2] The effectiveness of tax policy to alter the timing and magnitude of net investment is supported by Hall and Jorgenson [1967] and LeBlanc and Hrubovcak [1986]. Contradictory findings are provided by Auerbach and Summers [1979] who are skeptical of the long-run effect on capital accumulation.

Initially, specific tax policies may be effective in achieving their goals. Economic and social conditions are, however, rarely in equilibrium: business conditions reverse, the social agenda changes (more guns less butter). Undesirable "side-effects" are manifested and policy makers clamor for new tax measures or amendments to old ones. A thorough rewriting of the tax code whenever the economic or social environment changes is simply not practical because the economic and social environment is undergoing ceaseless change. THe existing tax law is simply patched and amended. Over time, a law's complexity may lead to or promote inequity and inefficiency. It is conceivable that the web of tax laws rather than providing the incentives originally sought, may erect obstacles interfering with decisions of investors. According to a large number of critics, the federal income tax laws were inequitable, inefficient, and irreconcilably complex. The dissatisfaction with the federal tax code led to a series of proposals to overhaul the tax code to provide a more efficient, equitable, and simpler tax system. Although the details of each proposal differ, including the final law, the Tax Reform Act of 1986, each sought to promote efficient and equitable taxes by taxing real economic income.

We examine how each of five proposals (Kemp-Kasten, Bradley-Gephardt, Administration, House Committee, and Senate Committee) and the Tax Reform Act of 1986 might alter agricultural investment in long-lived capital equipment. The focus is on how changes in marginal tax rates, depreciation schedules, and the investment tax credit alter the cost of capital in agriculture. The effects of changes in important tax law provisions are traced by first identifying their effects on the implicit rental rate of capital and then, subsequently, on investment in long-lived equipment.

An Investment Function for Policy Analysis

Our analysis follows the general methodological approach adopted by Hall and Jorgenson [1967] in their study of tax policy effects on producers' durable equipment and subsequently applied by LeBlanc and Hrubovcak [1986] in their examination of how taxes affect agricultural investment. The approach is to use econometric estimates of an investment function in conjunction with a single rental price variable, which captures all the relevant tax information, to simulate the effects of alternative tax proposals on the demand for net investment. Our analysis, however, departs from both the Hall and Jorgenson and the LeBlanc and Hrubovcak tax policy studies in our use of a stochastic coefficient methodology [Swamy and Tinsley, 1980] to estimate the agricultural investment function.

The stochastic coefficient approach allows the structure of the estimated investment function to vary through time. More precisely, the stochastic coefficient approach allows the sign and magnitude of the estimated parameters of the investment function to vary through time. There are several reasons why parameter variability is an attractive feature. The "true" coefficients may be generated by a time-varying random process, omitted variables may induce parameter variability [Duffy, 1969], or coefficient variation may result from imposing an incorrect functional form [Rausser, Mundlak, and Johnson, 1983]. However, the most important reason for allowing for stochastic coefficients is the more intuitive notion that the economic landscape is always changing. Changes in economic or policy variables result in a new environment that may, in turn, lead to new decisions and new microeconomic and macroeconomic structures [Lucas, 1976].

The structural form of the investment equation follows a Nerlovian partial adjustment framework. This form is selected because of its previous success in other empirical work and because of its comparatively well developed theoretical foundation. Although Nerlove did little to theoretically justify the workings of the partial adjustment model, Eisner and Strotz (1963), Lucas (1967), Gould (1968), and Treadway (1971) have subsequently made important contributions in that endeavor. Although their models differ, each has a similar underlying structure.

Each specifies an objective function incorporating factor adjustment costs and a production function. They assume the firm maximizes net worth over a given time period, and interpret adjustment costs as either foregone profits because of short-run rising capital prices or as increasing costs associated with integrating new equipment into production. Costs vary with the speed of capital adjustments. Values of the expected output prices are assumed not to change. Because expectations are static, the firm adjusts to a fixed target considered to be the long-run equilibrium of neoclassical theory. A firm maximizing its present value changes its capital stock in a manner similar to that suggested by the accelerator model.

Additional assumptions are required before the theoretical framework can be applied: the adjustment relationship must be recast a difference equation and functional forms for the adjustment cost and profit functions must be selected. In addition, the nonlinear flexible accelerator is linearized to allow for a structural form that is estimable in a stochastic coefficients framework. While the flexible accelerator model allows parameter variation in the adjustment coefficient the stochastic coefficient variant allows variation

in all the parameters of the model and is, in this sense, more general.

A first-order variant of the generalized ARIMA stochastic coefficients process model developed by Swamy and Tinsley (1980) is used to estimate the investment model. Investment is assumed to be generated by a linear version of the flexible accelerator where

$$K_t - K_{t-1} = b_t + b_{wt}W_t + b_{ut}U_t + B_tK_{t-1} \qquad (1)$$

$$= x_t'\beta_t \qquad \text{for all } t,$$

W is the ratio of input to output price, K is the capital stock, and U is the implicit rental rate of capital.

The model is completed by adding

$$\beta_t = \overline{\beta} + \varepsilon_t \qquad (2)$$

$$\varepsilon_t = \Phi\varepsilon_{t-1} + v_t \qquad (3)$$

$$E(v_t) = 0 \qquad (4)$$

$$E(v_tv_s') = \Delta_s \text{ if } t=s \text{ and o otherwise,} \qquad (5)$$

where x_t, β_t, $\overline{\beta}$, ε_t, v_t are all kx1 vectors, Φ and Δ_s are kxk matrices, and x_t represents the vector of explanatory variables in equations (1) and (2), including a constant term. Equations (2) through (5) represent a special case of a more general variable coefficient specification which allows one to describe variations in coefficients with explanatory variables, allows for "simultaneous equations" complications, and allows for more general specifications of the error processes (Swamy and Tinsley, 1980).

Data

The analysis uses aggregate time-series data for 1923 through 1985. Changes in the stock of farm machinery are explained by the ratio of prices paid for farm inputs to prices received for farm outputs, the implicit rental

rate of capital inputs, and the lagged capital stock. The ratio of prices paid to prices received was obtained from the U.S. Department of Agriculture. The prices paid index includes allowances for interest, taxes, and wage rates in addition to production items, such as feed, seed, and fertilizer. The prices received index is an aggregate index of prices received for all farm products. Implicit rental rates for tractors and long-lived farm equipment are estimated and then aggregated into a single rental rate for farm machinery. Rental rates for each of the categories are functions of the price of assets, service lives, rates of capacity depreciation, the tax treatment of assets in each category, and discount rates. A single price index series for both farm machinery categories is from the Commerce Department's Bureau of Economic Analysis (BEA) capital stock study (U.S. Department of commerce, 1982). The constant dollar investment series is depreciated with the appropriate services lives to estimate a constant dollar machinery stock using the perpetual inventory method.

Results and Interpretation

The investment model given by equation (1) was estimated using a first-order variant of a generalized ARIMA stochastic coefficients process model (Swamy and Tinsley, 1980). Mean values of the estimated coefficients and their associated asymptotic standard errors and t-statistics are presented in Table 1. The value of each t-statistic exceeds two. However, it is difficult to meaningfully associate statistical significance to results dependent on large sample properties. The small sample properties of these asymptotic statistics are unknown.

Table 1. Parameter Estimates and Associated Statistics for the Stochastic Coefficients Model a/

Parameter	Value	Asymptotic Standard Errors	Asymptotic t-statistic	Coefficient of Variation
Constant	2459.9232	250.6532	9.8140	6.6E -04
Price Ratio	-2600.5522	300.7220	-8.6477	7.93E-04
Rental Rate	-3643.2544	1158.4516	-3.1449	8.50E-05
Lagged Stock	0.49877E-01	0.11380E-01	4.3828	.5301

a/ Parameter estimates are mean values conditioned on the estimates (second iteration) of Δ_a and Φ.

The estimated parameters attribute important explanatory roles to all the variables of the model. Changes in the input-output price ratio have the largest effect on net investment. Like the input-output price ratio, the rental rate significantly affects machinery investment. Only the parameter associated with the lagged capital stock manifests any important variation from year to year. All the other parameters could be treated as fixed without altering the results of this analysis.

Analysis of Alternative Proposals

The effects of each of the six major tax proposals are examined by combining the estimated investment function with the implicit rental rates associated with each proposal. Simulations for the period 1986 through 1991 are conducted in two steps. First, because the parameters of the investment function are stochastic, their values must be "forecasted". The forecasted parameters are then combined with the implicit rental rates to determine the net investment and capital stock. The rental rates for a specific proposal are unvarying throughout the simulation period with the exception of the retroactive repeal of the investment tax credit in 1986 (see Table 2). Simulations are, however, conducted over a six year period because the

investment equation includes a dynamic element. Although there is no change in the value of the rental rate, net investment and the capital stock will continue to change due to the action of the lagged capital stock on the demand for net investment.

Table 2 - Rental Rates under the Alternative Tax Plans

Year	Prior law	Presidents' Proposal	Bradley Gephardt	Kemp Kasten	House Bill	Senate Bill	Tax Reform Act of 1986
1986	0.6406	0.6406	0.6406	0.6406	0.6406	0.7115 1/	0.7115 1/
1987	0.6406	0.7116	0.7301	0.6920	0.7299	0.7152	0.7216

1/ The only change from current tax law is the elimination of the investment tax credit.

The most outstanding feature evident in all the simulations is net investment is negative in every year (Table 3). Negative net investment means capital expenditures on new machinery do not offset depreciation. The agricultural machinery capital stock therefore erodes over the entire simulation period. Declines in the capital stock are independent of the tax proposal considered. With no change in the tax law, net investment is simulated to decline in each year from 1986 to 1991. All the tax proposals increase the implicit rental rate of capital and decrease net investment relative to prior law. Net investment under prior law is forecasted to be -$2.5 billion in 1986, decreasing to -$3.1 billion by 1991. All the tax proposals decrease net investment by additional amounts ranging from $200 to $400 million depending on the proposal considered. The modest relative effects of the tax proposals when compared to the large decreases in investment under

prior law are a reflection that the most important determinant of net investment is the expectation of future profits and not the cost of capital. At the margin, the alternative tax proposals decrease capital accumulation, but do not alter the direction of net investment. All the tax proposals, including the Tax Reform Act of 1986, amplify current decreases in capital accumulation and reinforce the adjustment of agriculture to lower levels of capital. A liberalization of tax laws leading to a decrease the implicit rental of capital would put upward pressure on investment demand, but would do little to alter the direction of net investment.

Table 3. Net Investment and Capital Stock under Alternative Tax Proposals (Millions of 1972 Dollars) a/

Proposal	Year						
	1985	1986	1987	1988	1989	1990	1991
Prior Law:							
Net Investment	-2103	-2453	-2572	-2697	-2827	-2965	-3108
Capital Stock	22152	19699	17127	14431	11603	8639	5530
Tax Reform Act:							
Net Investment	-2103	-2707	-2879	-3018	-3165	-3318	-3479
Capital Stock	22152	19444	16566	13547	10382	7064	3584
President's Proposal:							
Net Investment	-2103	-2453	-2830	-2967	-3111	-3262	-3420
Capital Stock	22152	19699	16869	13901	10790	7529	4107
Bradley-Gephart:							
Net Investment	-2103	-2453	-2896	-3036	-3183	-3338	-3500
Capital Stock	22152	19699	16803	13767	10584	7246	3747
Kemp-Kasten							
Net Investment	-2103	-2453	-2757	-2891	-3031	-3178	-3333
Capital Stock	22152	19699	16942	14050	11019	7841	4508
House Bill:							
Net Investment	-2103	-2453	-2896	-3036	-3183	-3338	-3500
Capital Stock	22152	19699	16803	13767	10584	7246	3747
Senate Bill:							
Net Investment	-2103	-2707	-2853	-2992	-3137	-3289	-3449
Capital Stock	22152	19444	16591	13599	10462	7173	3725

a/ All changes effective in 1987 except for the retroactive repeal of the investment tax credit under the Tax Reform Act and the Senate Bill.

The six tax proposals can be split into two groups. The first group consists of Kemp-Kasten and the second group consists of all the other proposals. The Kemp-Kasten proposal provides the most favorable tax treatment for agricultural machinery investment. Like the alternatives, Kemp-Kasten repeals the investment tax credit. However, Kemp-Kasten's treatment of depreciation, indexing for inflation and recovery percentages exceeding the value of the asset's purchase price, offset the effect of losing the investment tax credit. Under Kemp-Kasten the value of the capital stock (1972 dollars) falls to $4.5 billion by 1991. If the tax code remains unchanged from provisions prevailing in 1985, then the capital stock is simulated to be $5.5 billion in 1991. Changing the tax code to follow recommendations made in the Kemp-Kasten "Fair and Simple Tax Act" would result in the agricultural sector decreasing its capital stock of farm machinery by one billion dollars within five years of enacting the measure.

The Kemp-Kasten proposal is not, however, as severe as the tax law ultimately enacted by Congress, the Tax Reform Act of 1986. The Tax Reform Act causes the farm machinery capital stock to decline by $1.8 billion, falling to $3.6 billion by 1991. The Tax Reform Act causes the greatest decline in the capital stock, 200 million more than under the House or Bradley-Gephardt plans and nearly $1 billion more than under Kemp-Kasten. The relatively greater decline under the Tax Reform Act over the simulation period is caused by higher rental rates and the retroactive repeal of the investment tax credit. In the near term, the retroactive repeal of the investment tax credit which occurs only under the Tax Reform Act and the Senate Plan leads to lower relative investment and capital stock because of the dynamic nature of the model. Lower initial investment in 1986, manifested under the Tax Reform Act and the Senate

Plan, leads to lower levels of lagged capital stock in subsequent simulations. In general, lower capital stock reinforces high rental rates throughout the simulation period and drives the capital stock under alternative proposals farther apart as time passes. The early repeal of the investment tax credit gives the Tax Reform Act and the Senate Plan the jump on the other plans. In the long term, the relative importance of the retroactive repeal of the credit is diminished. The reinforcing effect of capital stock on investment demand is, however, always apparent. The retroactive repeal of the credit causes net investment to be $255 million less in 1986 under the Tax Reform Act and the Senate Plan. By 1991 the capital stock is lowest for the Tax Reform Act because of the retroactive repeal of the investment tax credit. Other plans, however, have higher rental rates and greater reductions in net investment. In the longer term, the House and Bradley- Gephardt proposals will lead to a smaller capital stock than the Tax Reform Act.

The three most important changes introduced by the Tax Reform Act of 1986 are the repeal of the investment tax credit, change in depreciation policy, and decrease in marginal tax rates. Of these three major changes in the tax code, the repeal of the investment tax credit has the most significant effect on implicit rental rates and therefore on net investment and capital accumulation. Net investment under the Tax Reform Act is about -$2.9 billion in 1987. Eliminating the investment tax credit accounts for 98 percent of the decline in investment resulting from the imposition of the Tax Reform Act. The tax credit is most prominent because it is a dollar for dollar reduction in tax liability. Removing the investment tax credit accounts for $267 million of the $307 million difference between investment under the Tax Reform Act and prior law in 1987.

Summary and Conclusions

Although the implicit rental rate of capital is not the most important determinant of investment it, and therefore by implication tax policy, does have a measurable effect on agricultural capital accumulation. All the tax proposals reinforce current trends in net investment. The tax proposals lead to higher rental rates and less investment than under prior law. Negative net investment, implied under each proposal, means capital expenditures are insufficient to maintain the current level of capital stock. The capital stock erodes. And although investment decisions are driven primarily by expectations of future profitability, all the tax proposals including the Tax Reform Act put additional pressure on agricultural readjustment through changes in the capital stock.

The Tax Reform Act of 1986 falls squarely in the middle of the tax proposals in terms of its affect on capital accumulation. Its standing in the hierarchy of effects, less harsh than the House proposal but more severe than Kemp-Kasten, reflects the compromise nature of its creation. Within the Tax Reform Act the most controversial provision is the repeal of the investment tax credit. The repeal of the credit by far accounts for the bulk of the expected decline of agricultural investment resulting from tax reform. Although no reasonable measure of change in the Tax Reform Act can alter the current decumulation of capital in agriculture, it is likely that the coming year will bring forth strident efforts to reinstate the investment tax credit. The effects of tax reform legislation will not be known for several years. However, the results of this analysis suggest important implications for agriculture because the Tax Reform Act of 1986 increases the cost of owning capital and thereby decreases the demand for capital accumulation.

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