Economic Impacts of Increased Price Variability: A Case Study with Rice

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Abstract

This article investigates the impacts on the rice industry of increased price variability caused by the shift from stable economic conditions and a farm policy of supply control in the sixties to more variable economic conditions and a market-oriented farm policy in the seventies. The increased price variability associated with these changes has significantly increased marketing margins for rice These policy and economic changes reduce the probability that Texas rice producers will remain solvent for 10 years

Keywords

Marketing margins, producer viability, price variability, policy changes, economic changes, rice

Introduction

Agricultural legislation on rice dates from the early thirties with the enactment of the Agricultural Adjustment Act (Public Law 10, 73rd Congress) of 1933 (*8*)[1] The basic agricultural legislation currently affecting the rice industry had its origin in the Agricultural Adjustment Act of 1938 (Public Law 430, 75th Congress) The 1938 act attempted to stabilize rice supplies and prices through acreage adjustments, Government loans, and regulated marketing quotas The first loan activities or Government purchases occurred in 1948. Acreage allotments and marketing quotas were instituted in 1955 The industry operated under a price-support/acreage allotment/marketing quotas program through 1975 With the passage of the Rice Production Act of 1975, Congress changed the farm program for rice from supply control through marketing quotas and allotments to a market-oriented program with deficiency payments based on the difference between a weighted August-December farm price, the loan rates, and the target price

U S Government programs stabilized domestic prices from 1955 through 1971 (see figure). The world rice situation from 1972 to 1974 was characterized by reduced exportable supplies and increased import demand U S prices began to climb during the fall of 1972 toward the highest nominal price ever recorded The sharp rise in prices triggered a suspension of domestic marketing quotas for the 1974 and 1975 crops and opened the way for expansion of U S rice acreage The shift to target price programs in 1976 emphasized deficiency payments as a means of income support to producers If the farm program of the sixties had continued to the present, U S rice prices would have restabilized after the 1972-74 rise in world prices Prices supported at 65 percent of parity would have exceeded the farm price every year since 1975, except for 1977 The change in the market environment between 1960-71 and 1976 82, triggered by a change in economic conditions and coupled with a change in farm policy for rice, has seriously affected the rice industry In this article, we evaluate the effect of the shift in farm policy and economic environment on (1) marketing margins and (2) producer viability We examine the margin be-

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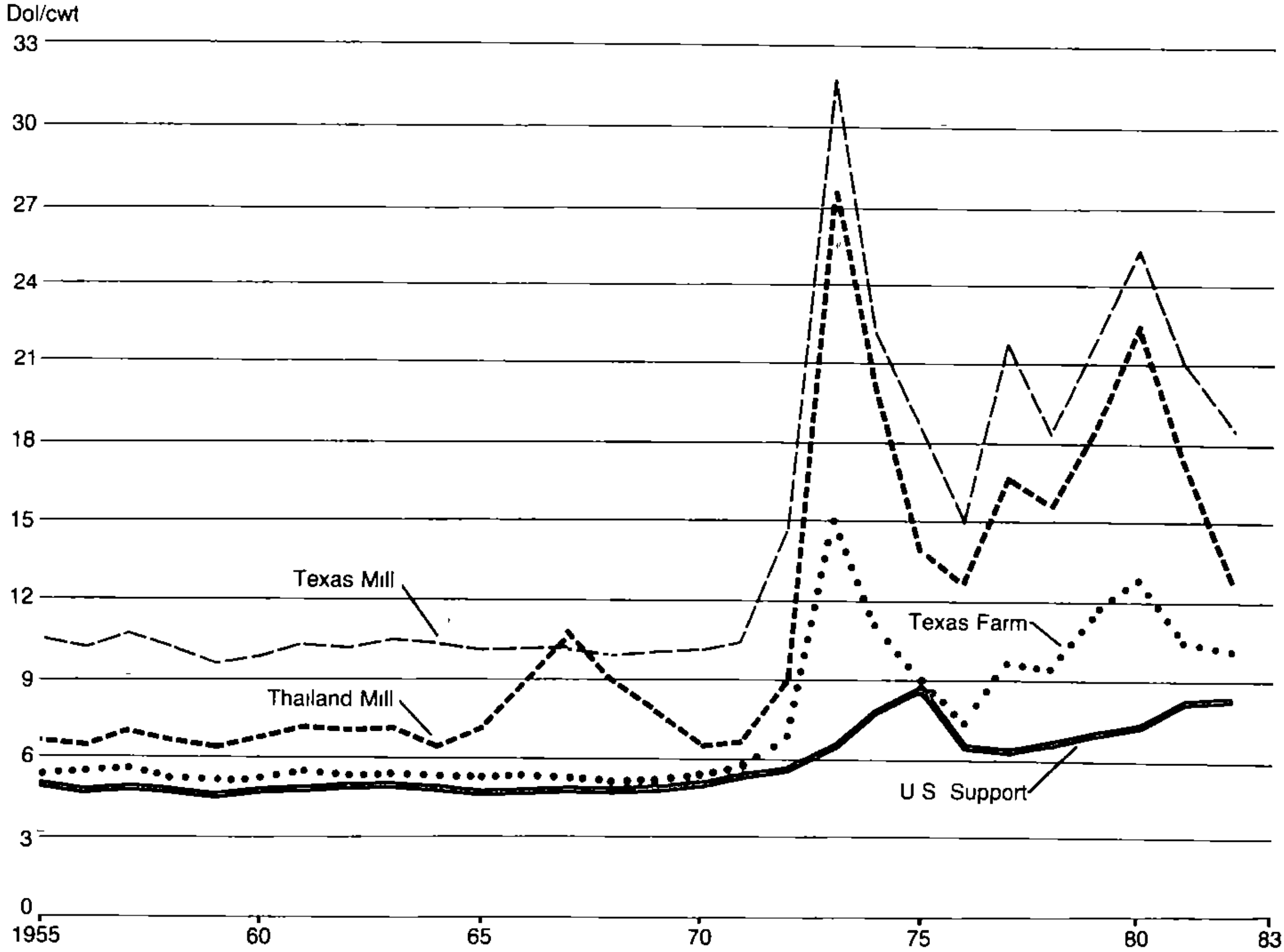
[1] Italicized numbers in parentheses refer to items in the references at the end of this article

Season Average Rice Prices, 1955-82



tween farm and mill prices and the variability of farm and mill prices[2] We estimate the survivability of Texas rice producers using the Firm Level Income Tax and Farm Policy Simulator (FLIPSIM V) (*11*)

Impact of Price Variability on Marketing Margins

If mills are risk averse, then increases in price variability should increase farm-mill marketing margins The price-support/acreage control program during 1960-71 stabilized U S prices to the extent that the rice industry experienced little risk from price variability (see figure) The taxpayer assumed this risk through the cost of the Government farm program As prices rose sharply in 1973, price variability increased The change in the economic environment and the changes in the rice farm program in 1974 and 1976 forced both millers and producers to contend with chronic increased price variability (*6*)

Theoretical Model

Gardner has developed a theoretical model of price determination between levels of a marketing channel (*4*) He contends that prices are determined by retail

[2]A continuous price series for retail rice for both periods is not available Thus margins between mill and retail prices are not used

demand, farm supply, and the supply of marketing services If mills are risk averse, then a change in price variability would be expected to shift the supply of marketing services Gardner's model assumes a competitive market Because of the concentration of rice mills in the Texas rice area, rice milling is probably not perfectly competitive The assumptions of perfect competition are stronger than needed for a firm to behave as a price taker

Baumol and others have proposed perfect contestability as a generalization of perfect competition They showed that a market is contestable if entrants can reverse their investments without loss and suffer no disadvantages relative to incumbents Although the assumptions of a contestable market are rather demanding, especially in the short run, they may provide a plausible approximation for many concentrated industries (see (*1*)). Under the hypothesis that the mere threat of entry makes firms behave as if they were price takers, it is appropriate to explore the implications of price uncertainty in the rice marketing channel

The supply of marketing service is written in price dependent form as:

$$S = f_1(Q,V,Z) \qquad (1)$$

where S is the margin, Q is quantity milled, V is a measure of price variability, and Z is a set of exogenous shifters (in this case, milling costs) The quantity supplied at the farm (Q_f^s) is:

$$Q_f^s = f_2(P_f,X) \qquad (2)$$

where P_f is the farm price and X is a set of exogenous shifters (for example, yield) The quantity demanded at the mill level (Q_m^d) is

$$Q_m^d = f_3(P_m,Y) \qquad (3)$$

where P_m is mill price and Y is a set of exogenous shifters (for example, population, income, and world rice production) The system is completed by the following identities

$$P_f = P_f^s = P_m - S \qquad (4)$$

$$Q = Q_f^s = Q_m^d \qquad (5)$$

The inverse supply of marketing services (equation (1)) can be estimated directly, assuming quantity is determined exogenously as most rice produced is milled in the same crop year (*13*). In addition, production of rice, like most other crops, is related to lagged price rather than to current price, thus, quantity is exogenously determined (*7, 16*) The incidence of a change in margin can be determined by a method like Fisher's (*3*) After obtaining estimates for equation (1), one can then obtain the impact of increased price variability on the margin by totally differentiating equation (1).

$$dS = \frac{\partial f_1}{\partial Q} dQ + \frac{\partial f_1}{\partial V} dV + \frac{\partial f_1}{\partial Z} dZ \qquad (6)$$

If dQ and dZ are assumed to be zero, then equation (6) can be solved for the change in margin with a change in price variability By equating the quantities in equations (2) and (3) and totally differentiating, one obtains.

$$\frac{\partial f_2}{\partial P_f} dP_f + \frac{\partial f_2}{\partial X} dX - \frac{\partial f_3}{\partial P_m} dP_m - \frac{\partial f_3}{\partial Y} dY = 0 \qquad (7)$$

By assuming dX and dY to be zero and writing equation (7) in elasticity form, one obtains

$$e_s \frac{dP_f}{P_f} - e_d \frac{dP_m}{P_m} = 0 \qquad (8)$$

where e_s is the elasticity of farm supply and e_d is the elasticity of mill demand By totally differentiating equation (4), one obtains

$$dP_f = dP_m - dS \qquad (9)$$

Equations (8) and (9) can be solved for dP_f and dP_m, given e_s, e_d, P_m, P_f, and dS

We used unweighted season-average prices and monthly prices received by Texas farmers (*14*) and Texas mills (*12*) for 1960-82 crop years to evaluate price variability. A continuous monthly series is not available for retail prices We estimated the missing data in the monthly Prices Recieved by Texas Farmers (September 1976-July 1979) by regressing the Texas price on the monthly prices received by U S farmers (January 1960-July 1982)

We used annual Texas mill price (adjusted to a rough rice equivalence by a factor of 0 71) and annual Texas farm prices to calculate the margins We estimated the supply of marketing services by regressing the margins against quantity and shifters of the supply of marketing services Annual quantity milled in Texas was used as the quantity moving through the marketing channel (*13*) This quantity is assumed to be exogenously determined The coefficient of variation of monthly Texas mill prices within each marketing year was used to represent price variability Mills usually maintain short-term inventories (1-2 months) and should, therefore, be influenced by short-term price variation. Milling costs were used to represent the other shifters of the supply of marketing services. Data on milling costs were available only for 6 years during 1960-82 (*8*) The available data were regressed against an unpublished data series on the cost of milling wheat flour, and the missing rice mill costs were then estimated from this equation

The elasticity of rice production with respect to farm price ranged from 0 15 in Texas to 0 50 in Arkansas and averaged 0 35 for the United States in 1975 (*7*). The U S elasticity of demand with respect to the Texas long grain mill price was -0.83 Brorsen has shown that rice prices in different locations nationwide follow each other very closely (*2*) So demand response in Texas should be similar to that in other areas of the Nation The low elasticity of production for Texas relative to that for other States, however, indicates the possibility of a differing response to price changes Given these elasticities and the estimated supply of marketing services, the portion of the increased margin that would be shifted to the producer can be calculated from equations (8) and (9).

Results

In accordance with Gardner's model, we attempted to associate the observed widening of the Texas mill-farm marketing margin during the seventies with the respective factors of importance—that is, quantity of rice milled, milling cost, and a measure of the increased rice price variability. The estimated inverse supply of marketing services was

$$\begin{aligned} MAR = & -0.3820 + 0.0149\,QM + 0.1132\,VARTX \quad (10) \\ & \quad (.43) \qquad (.26) \qquad\quad (2.24) \\ & + 2.1614\,MILLC \\ & \quad (2.50) \end{aligned}$$

where MAR (for example, marketing margin) is the Texas mill price adjusted to a rough rice equivalence minus the Texas farm price (dollars per hundredweight (cwt)), QM is the annual quantity of rice milled in Texas (million cwt rough rice), VARTX is the annual coefficient of variation of monthly milled prices in Texas, and MILLC is an estimate of annual milling costs (dollars per cwt rough rice) R-square for equation (10) equals 0 694 The t-statistics are in parentheses under their respective regression parameter estimates. The variable representing price variability over the data period, VARTX, is significant and positive, indicating mills are risk averse In his analysis of mill buying response in bid/acceptance markets, Meyer also found that rice mills were risk averse, that is, they reduced their bids for rough rice when faced with a higher level of price volatility (*9*) The variable representing rice milling cost over the data period, MILLC, is positive and significant as expected. The effect of quantity milled was insignificant.

These results show the widening in the farm-mill price margin is significantly associated with the increase in price variability accompanying the economic changes and market-oriented farm policy emphasis of the seventies The increased variability in Texas mill prices (average coefficient of variation shifting from 1 57 in 1960-71 to 8.97 in 1976-82) implies an increase mill-farm margin of 0 84.[3] The average farm price in 1976-82 was $9.71 per cwt, whereas the average Texas mill price for the same period was $20 35 per cwt Use of these price levels and the earlier discussed elasticities (production at 0 15 and demand at -0.83) in equations (8) and (9) shows that increased price variability increases retail prices by $0 23 per cwt and decreases farm prices by $0.61 per cwt. Substitution of the U S elasticity of production (0 35) for the Texas elasticity (0.15) shows the increased price variability for the United States increases retail price by $0.39 per cwt and decreases farm price by $0 45 per cwt, that is, mills in non-Texas rice areas tend to pass more of the margin change to the consumer

Increased market price variability and wider mill-farm marketing margins suggest rice producers are

[3]Estimating the margin equation with price/cost variables deflated by the Consumer Price Index results in an even higher impact on mill farm margins ($1 11 when reinflated to the average price level of the 1976-82 period)

confronted with major marketing and production problems under the current Government program One needs to focus on production costs, marketing margins, and alternative land tenure arrangements to address the issue of which parties (owner-operator producers, tenants, or landlords) are most adversely affected by increased rice price variability In addition to reducing farm prices, the shift in policy emphasis and economic changes have increased farm price variability and may significantly reduce producers' chances of survival.

Impact of Policy and Economic Changes on Producer's Viability

We now examine how increases in the price variability of rice and marketing margins affect producer viability [4] We evaluate the ability of gulf coast rice producers in Texas to internalize increased price risk and marketing margins by stochastically simulating a typical size rice farm under the policy provisions of both the sixties and seventies Because the impacts of price risk are hypothesized to depend on tenure arrangements, we evaluated three tenure arrangements (1) full owner, (2) part owner, and (3) tenant.

Method

We used the Firm Level Income Tax and Farm Policy Simulator (FLIPSIM V) to analyze a typical size rice farm in Texas The computer model is a firm-level, recursive, Monte Carlo simulation model which simulates the annual production, farm policy, marketing, financial management, and income tax aspects of a typical farm over a 10-year planning period The model simulates the farm operation recursively by using the ending financial position for 1 year as the beginning financial position for the next year The Monte Carlo aspect of the model comes from repeating the 10-year planning period for 50 iterations using random crop prices and yields drawn from empirical probability distributions

Richardson and Nixon have described and documented an earlier version of FLIPSIM (*11*) The version of FLIPSIM used for this study was revised to include the provisions of both the 1982 income tax act and the 1981 farm bill We used the model to simulate typical full owner, part owner, and tenant-operated rice farms in Texas under two scenarios: (1) the farm program and economic environment during 1960-71, and (2) the farm program and economic environment during 1976-82 We used the same assumptions about machinery depreciation (cost recovery), family size, family consumption, income tax and social security schedules, machinery replacement, interest rates, growth, and inflation rates for both scenarios

Gerlow provided the necessary information to model a typical gulf coast rice farm in FLIPSIM (*5*) The typical farm has 1,700 acres Rice is planted on the same cropland every other year and idle cropland is cash leased for grazing This crop mix yields 850 acres of rice each year [5] The operator has an initial debt-to-asset ratio of 40 percent The part owner owns 412 acres of cropland and leases the remaining cropland on a share lease Landowners typically receive 10 percent of the crop and pay 10 percent of the total grain-drying cost (*5*)

The simulation model was run assuming all costs, mean prices, and policy parameters were held constant throughout the planning period Long-term interest rates were 10 percent and intermediate interest rates were 12 percent Given these assumptions of real prices, land values were held constant at their 1982 levels

A bivariate probability distribution for rice yield (first crop and second crop) was developed from producer yields in the Texas gulf coast. We used Gerlow's actual farm yields for 5 years (1977-81) to develop empirical distributions for first and second crop rice yields [6] Table 1 summarizes the empirical probability distribution for rice yield regarding the

[4]Viability in this case refers to the probability the farm will be economically successful and will be able to survive 10 years Probability of success is measured as the probability the farm will generate sufficient income and retained earnings to have a positive after-tax present value of net family withdrawals and change in net worth If one assumes a real discount rate equal to 4 percent the probability of success indicates the chance a farm will provide a 4-percent (or greater) real return to initial equity Survival in this case is defined as the farm's remaining solvent for 10 years, maintaining equity ratios greater than the minimums established by local financial institutions (0 33)

[5]The 1978 Census indicates farms harvesting 500 or more acres of rice harvested 64 percent of rice total acres This group of farms averaged 853 acres of rice harvested, only 3 acres more than our typical size farm

[6]Actual yields for farms in the study area are not available prior to the 1977 crop year The empirical distributions generated using data from 1977-81 are consistent with producers' subjective distributions for 1983 rice yields

Table 1—Probability distribution of rice yields and prices for Texas gulf coast rice producers

Item	Rice yields		Rice prices			
	First crop	Second crop	1960-71		1976-82	
			July	January	July	January
	-- *Cwt* --		-------- *Dol/cwt* --------			
Mean	45 82	11 36	5 09	4 77	9 28	8 89
Ranked deviation from the mean						
1	-4 89	-11 36	-0 74	-0 75	-2 76	-2 83
2	-3 82	-4 56	- 41	- 29	-2 64	-2 65
3	-3 12	-2 47	- 21	- 10	-2 53	-2.47
4	-2 00	39	- 11	- 02	-1 23	-1 91
5	- 87	85	- 09	00	- 39	- 77
6	83	2 96	10	09	- 20	15
7	2 37	3 52	16	09	43	1 29
8	3 02	4 41	20	10	2 05	2 81
9	4 92	5 32	31	20	3 18	3 29
10	6 50	5 71	40	37	4 32	3 79
			Coefficients			
Correlation coefficient—						
For first and second crop price	0 44					
For sixties' July and January price			0 54			
For seventies' July and January price						0 90

means and ranked deviations from the means Yield for the second crop is correlated (0 44) to yield for the first crop in the simulation model We used the bivariate yield distribution reported in table 1 for both policy scenarios

Rice producers in the Texas gulf coast have many marketing strategies It was assumed operators do not change their marketing practices between the two scenarios despite increases in price risk and marketing margins The typical strategy is to sell after harvest Thus, the first crop is sold in July and the second crop is sold in January (*5*) To simulate this practice, we developed an empirical bivariate probability distribution for July and January rice prices for 1960-71 and 1976-82 (table 1) We used averaged January and July rice prices received by Texas producers for the two periods to develop price distributions January prices were reduced 7 percent as the second crop (sold in January for this study) is of poorer quality than the first crop (*5*)

Under the policy and economic scenario of the sixties, farmers have a 688-acre rice allotment and it is assumed they cannot plant rice in excess of this allotment—that is, an effective marketing quota based on acreage Grain sorghum is assumed to be planted on the cropland without a rice allotment (162 acres)[7] The acreage allotment under the farm policy of the seventies is 748 acres of rice, and the allotment determines only the portion of the crop eligible for price supports and deficiency payments These allot-

[7]Budgets developed by the Texas Agricultural Extension Service for the gulf coast area were used in the model Prices and yields for sorghum were assumed to be random and to follow their historical distribution We developed distributions for sorghum yields and prices in the same manner that rice distributions were developed

ments were estimated based on Texas allotments for rice between 1960 and 1980, acres of rice planted, and acres of cropland for a typical farm [8]

The average nominal loan rate in 1960-71 was $4 68 per cwt (91 9 percent of the average price in July) In 1976-82, the average nominal loan rate was $6 98 per cwt and the average nominal target price was $9.30 per cwt (71 7 and 95.6 percent of the average price in July, respectively) To compare the typical farm under the two scenarios, we scaled both the price distribution and the average loan rate for the old policy to levels comparable to the 1976-82 rice program. The empirical price distribution for 1960-71 (table 1) was scaled to yield the same mean as the new policy ($9 28 for July and $8.89 for January) plus the marketing margin adjustment for Texas producers ($0.61 per cwt). We adjusted for marketing margin because returning to the old scenario would reduce both the price variability and the marketing margin, thus increasing the mean price received by Texas rice producers. Given this price adjustment, we increased the loan rate for the old rice policy to $9 09 per cwt, or 91 9 percent of the adjusted mean price ($9 89 per cwt). The average rice price (table 1) and the average loan rate and target price for 1976-82 were used in the simulation model for the latter policy and economic environment.[9] All mean prices (January and July) and policy variables (loan and target prices) were held constant over the 10 years simulated for both farm policies

Simulation Results

Simulation results for three tenure arrangements show that lower price variability and smaller marketing margins under conditions in the sixties generally resulted in greater producer viability (success and survival) than under conditions in the seventies (table 2). For a tenant rice producer with 1,700 acres of cropland, conditions in the latter period provide a 94-percent chance of economic success (providing a 4-percent (or greater) return to initial equity) compared with a 100-percent chance in the earlier period A part owner has an 82-percent chance of success under the new scenario versus a 100-percent chance under the old scenario Because of the high debt level on cropland ($600,000), the full owner has a low probability of receiving a positive net present value under both scenarios

The probability that tenant farm operators will remain financially solvent (survive) for 10 years is reduced from 86 percent under the scenario in the sixties to 56 percent under the scenario in the seventies. The probability of survival decreased from 98 percent to 82 percent for the part owner-operator. The probability of survival was about 100 percent for the full owner under both scenarios because of the high initial net worth of the operator (60 percent equity in 1,700 acres of cropland) The part owner's equity in 412 acres of cropland similarly contributed to a higher probability of survival relative to the tenant-operated farm.

Average after-tax net present value for tenant rice farmers is about $120,000 less under the condition in the seventies (table 2) [10] For part owners, average after-tax net present value is greater by $98,000 under the conditions in the seventies This value is also greater for full owners. The scenario of the seventies is associated with greater average after-tax net present values for part and full owners because these operators receive all or most of the benefits from deficiency payments, whereas the tenant shares the benefit of the farm program with the landlord

Conditions in the seventies resulted in greater absolute and relative variance in after-tax net present value (table 2). The relative variance in after-tax net present value for part owners more than doubled as a result of policy and economic changes The other tenure arrangements produce similar results

[8]Under the sixties program, planted acreage of rice in Texas was 88 4 percent of the Texas rice allotment (*6*) Under the seventies' program, Texas producers overplanted their allotment by 14 7 percent on average Given that farmers produce 850 acres of rice under the seventies' policy, their allotment is 748 acres Prorating the 748 acre base under the seventies' program by the ratio between the average rice allotment for Texas under the sixties' program (460,300 acres) and the seventies' program (500,000 acres) yields the farmer's rice allotment of 688 acres under the policy of the sixties

[9]The national loan rates were converted to a long grain loan rate consistent with the actual loan rate for Texas rice

[10]After-tax net present value is the discounted stream of family withdrawals and changes in the net worth for the farm operation over the 10 year planning period

Examining the extremes of the after-tax net present value and ending net worth distributions reveals that these distributions are skewed much more to the right in the seventies than in the sixties For a part owner, the minimum after-tax net present value is $93,000 less than for the environment in the seventies, while the maximum is about $385,000 greater Results for the tenant and the full owner are similar These distributions were shifted to the right because of the benefits of the rice policy in the seventies (deficiency payments and price supports) and the increased price variability from changes in the policy and economic situation The farm program benefits provided income and price protection from the increased price variability, whereas the increased price variability provided an opportunity for high prices and returns. Reduced probabilities of success and survival for tenants and part owners suggest, however, that the farm program benefits were not sufficient to compensate tenants and part owners for the increased price variability and the marketing margin change

The financial well-being of part owners and tenants in Texas gulf coast rice-producing areas has worsened Given the same interest costs, credit availability rules, and income tax schedules, the environment of the seventies is associated with higher average ending leverage (debt/equity) ratios for these farm operators (table 2) The average ending leverage

Table 2—Effects on Texas rice farmers of policy and economic environments of 1976-82 and 1960-71

Item	Full owner		Part owner		Tenant	
	1976-82	1960-71	1976-82	1960-71	1976-82	1960-71
			1,000 dollars			
After tax net present value [1]						
Mean	5 04	– 156 19	356 48	258 45	460 39	580 68
Standard deviation	208.56	107 04	235 89	89 32	393 77	217 74
Minimum	– 438 39	– 429 10	– 84 48	8 39	– 35 42	38 68
Maximum	533 33	104 45	856 25	471 16	1,208 79	837 40
Present value of ending net worth in year 10						
Mean	976 18	814 61	570 72	451 94	480 26	553 29
Standard deviation	207 84	107 04	200 68	88.38	315 32	159 01
Minimum	540 56	541 73	202 70	218 44	90 91	165 01
Maximum	1,504 12	1,075 25	1,049 40	664 32	1,156.38	784.99
			Percent			
Leverage ratio in year 10						
Mean	0 65	0 78	0 69	0 46	1 36	0 45
Standard deviation	37	26	81	39	1 46	77
Minimum	23	33	.09	13	02	03
Maximum	2 00	1 51	2 65	2 40	4 00	2 42
Probability of success [2]	54	10	82	1 00	94	1 00
Probability of survival [3]	98	1 00	82	98	56	86

[1]Net present value is the present value of net annual family withdrawals plus the present value of change in net worth over the 10-year planning period After tax net present value is largest for the tenant and smallest for the full owner because of the amount of initial equity each has invested, the amount of net gains each has from leasing idle land for pasture (none for the tenant), and the amount of retained earnings for each farm Annual interest and principal payments on cropland for the full owner exceed the annual crop share rental cost of tenants who have greater annual retained earnings

[2]Probability of success is the probability that net present value will be greater than or equal to zero, assuming a discount rate of 4 percent

[3]Probability of survival is the probability that the farm will remain solvent for 10 years

Table 3—Effects on Texas rice farmers of changes in the marketing margin due to an increase in price variability

Item	Full owner		Part owner		Tenant	
	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted
			1,000 dollars			
After tax net present value:[1]						
Mean	- 156 19	- 368.90	258 45	67 94	580 68	425 63
Standard deviation	107 04	102 10	89.32	91 26	217 74	200.43
Minimum	- 429 10	- 552 98	8 39	- 116 67	38 68	19 47
Maximum	104 45	- 96 59	471 16	302 79	837 40	699.45
Present value of ending net worth in year 10:						
Mean	814 61	603 95	451 94	275 88	553 29	408 51
Standard deviation	107.04	99 69	88 38	78.78	159 01	135 34
Minimum	541 73	417 81	218 44	142 48	165 01	145 80
Maximum	1,075 25	874 20	664.32	495 95	784 99	647.05
			Percent			
Leverage ration in year 10						
Mean	0 78	1 39	0.46	1 31	0 45	0.59
Standard deviation	26	40	39	77	77	.91
Minimum	.33	56	13	17	03	.02
Maximum	1 51	2 43	2 40	3 14	2 42	2 63
Probability of success[2]	10	0	1 00	76	1 00	1 00
Probability of survival[3]	1 00	88	98	70	86	80

[1]Net present value is the present value of net family withdrawals plus the present value of change in net worth over the 10 year planning period After tax net present value is largest for the tenant and smallest for the full owner because of the amount of initial equity each has invested, the amount of net gains each has from leasing idle land for pasture (none for the tenant), and the amount of retained earnings for each farm Annual interest and principal payments on cropland for the full owner exceed the annual crop share rental cost of tenants who have greater annual retained earnings

[2]Probability of success is the probability that net present value will be greater than or equal to zero, assuming a discount rate of 4 percent

[3]Probability of survival is the probability that the farm will remain solvent for 10 years

ratio for tenant operators increased 200 percent because of policy and economic changes, the increase was 50 percent for part owners

To isolate the impact of the marketing margin change on Texas rice producers, we simulated the typical farms under the provisions of rice policy in the seventies, but without the $0 61 per cwt marketing margin adjustment The change in the marketing margin alone decreased the probability of survival for Texas rice producers (table 3) The increase in the marketing margin reduced probability of survival for tenant farmers 6 percentage points, from 0 86 to 0 80 For part owners, the decreased probability of survival was due to the increase in marketing margin of 28 percentage points, and the probability of survival for the full owner decreased 12 percentage points (table 3)

Average after-tax net present value for tenant farmers decreased 26 percent because of the increase in the marketing margin (table 3) Average after-tax net present value decreased more for the full owner and part owner than for the tenant Average after-tax net present value decreased more for full owners because these operators pay the full per-unit production cost for sorghum and rice, whereas the tenant shares these costs and risk with the landlord Net present value decreased because of the higher marketing margin for all three tenure arrangements

The simulation results indicate the new rice policy and economic environment of the seventies is not structurally neutral The new environment reduces the chances of survival for tenant rice farmers more than it reduces the chances of survival for full owners and part owners Because 57 percent of the rice farmers in the Texas gulf coast were tenant operators in 1979 (*10*), the new policy environment will likely contribute to a structural change among rice producers in Texas. Mullins, Grant, and Krenz indicate that approximately 47 percent of all U.S rice farmers were tenant operators in 1979, so the new policy environment may cause similar changes in the structure of U S rice production

Conclusions

The shift in the policy and economic environment between 1960-71 and 1976-82 significantly affected the U S rice industry in the following ways

1 The industry had to contend with increased price variability Coefficients of variation for Texas farm and mill prices increased fourfold or more

2 The margin increase was related to the increased price variability Changes in quantity milled had an insignificant effect on the margin increase The amount of the margin change passed back to the Texas producer through a discounted price between the two periods was $0.61 per cwt

3 The increased price variability plus a discounted farm price decreased the probability of survival from 98 percent to 82 percent for part owners and from 86 percent to 56 percent for tenant farmers in Texas

4 The increased marketing margin for rice resulting from the policy and economic changes reduced the probability of survival 28 percentage points for part owners and 12 percentage points for full owners

5 The new environment increased the absolute and relative variance in after-tax net present value for Texas rice producers

6 Program benefits under the farm policy of the seventies were not sufficient to fully compensate part owners and tenant rice farmers in Texas for the increased price variability and the marketing margin change associated with the environment created by policy and economic changes

7 The shift in policy during the seventies was biased against tenant rice farmers in Texas and will likely lead to structural changes among all rice producers.

8 Future policymakers should consider the impacts of alternative farm policies and economic actions on price variability and farm structure

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In Earlier Issues

Most studies of portfolio or cropping program selection under uncertainty implicitly assume that the investor or manager is constrained only by propensity or aversion to risk. We argue that this is in fact not the case, but that the investor's capital limitations impose real restrictions on his admissible alternatives

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