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4 Farm Tenancy in the Antebellum North

Donghyu Yang

Economic historians and theorists have made contributions to the literature on agricultural tenancy, including theoretical models of the causes and consequences of farm tenancy and empirical tests using historical data.[1] Sharecropping in the postbellum South has received special attention as part of the general reinterpretation of the economic history of that region. The most widely accepted view of sharecropping now favorably interprets the relationship between landlord and tenant as an "understandable market response," using Joseph Reid's phrase. According to this view, sharecropping minimized risk and transactions costs but did not necessarily depress productivity or cause soil depletion.[2] But the notion that sharecropping was the source of numerous long-term problems in the South still has many supporters.

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1. Some of the important works in the earlier literature are D. Gale Johnson, "Resource Allocation under Share Contracts," *Journal of Political Economy*, 58 (Apr. 1950), pp. 111–23; Steven N. S. Cheung, *The Theory of Share Tenancy: With Special Application to Asian Agriculture and the First Phase of Taiwan Land Reform* (Chicago, 1969); Joseph D. Reid, Jr., "Sharecropping as an Understandable Market Response: The Postbellum South," *Journal of Economic History*, 33 (Mar. 1973), pp. 106–30.

2. See, among others, Robert Higgs, "Race, Tenure, and Resource Allocation in Southern Agriculture, 1910," *Journal of Economic History*, 33 (Mar. 1973), pp. 149–69; "Patterns of Farm Rental in the Georgia Cotton Belt, 1880–1900," *Journal of Economic History*, 34 (June 1974), pp. 468–82; *Competition and Coercion: Blacks in the American Economy*, 1865–1914 (Cambridge, Mass., 1977); "Sharecropping as an Understandable Market Response"; "White Land, Black Labor, and Agricultural Stagnation: The Causes and Effects of Sharecropping in the Postbellum South," *Explorations in Economic History*, 16 (Jan. 1979), pp. 31–55; Roger L. Ransom and Richard Sutch, *One Kind of Freedom: The Economic Consequences of Emancipation* (Cambridge, Mass., 1977); Lee J. Alston, "Tenure Choice in Southern Agriculture, 1930–1960," *Explorations in Economic History*, 18 (July 1981), pp. 211–32; Alston and Higgs, "Contractual Mix in Southern Agriculture since the Civil War: Facts, Hypotheses, and Tests," *Journal of Economic History*, 42 (June 1982), pp. 327–53; Gavin Wright, "Cheap Labor and Southern Textiles before 1880," *Journal of Economic History*, 39 (Sept. 1979), pp. 655–68.

The modern debate is a reformulation of an older one between those who supported "the speculator thesis" and those who supported the "agricultural ladder thesis." The speculator thesis held that speculators and large estate-holders took advantage of federal land policies to concentrate landholdings and exploit tenants. The agricultural ladder thesis viewed tenancy as a viable and efficient economic institution, a rationally chosen rung on the ladder from farm laborer to farm owner. The ladder thesis dates back to the nineteenth century and was subsequently espoused in studies by the U.S. Department of Agriculture in the 1910s and the 1920s.[3] During the Great Depression, however, the speculator thesis gained adherents whose opinions filled the pages of the report of the Special Committee on Farm Tenancy in 1937.[4] The speculator view also dominates works by noted agricultural historians, such as Paul Gates and Fred Shannon. The ladder thesis, however, was rejuvenated by two other well-respected historians of America's farmlands, Allan Bogue and Clarence Danhof.[5] Traditional studies relating to either thesis focused on the resource endowments of landlords and tenants. Recent research on postbellum southern sharecropping enrich the analysis by affording greater attention to other variables such as risk and transactions costs.

A second debate concerning the efficiency of production under different types of landholding has also received considerable attention. According to one economic theory, a share renter will not supply the efficient amount of inputs (except when the contract stipulates the exact amount to be supplied) since the share renter chooses an outlay on inputs at which the share of marginal revenue equals marginal cost. This is the famous doctrine of inefficiency of sharecropping espoused by economists from Adam Smith to Alfred Marshall.[6] A farmer on a short-term lease, moreover, will have no interest in the long-term condition of the property (unless given a compensatory payment) and will concentrate on activities that yield immediate benefits. Economists more recently have endeavored to formalize the conditions under which share renters behave as efficiently as owner-operators. Beginning with D. Gale Johnson's influential work, Steven Cheung, Joseph Reid, and others have ar-

3. For an early statement of the speculator thesis, see William Kent, "Land Tenure and Public Policy," *American Economic Review,* 9 suppl. (Mar. 1919), pp. 213–25; however, see also papers by W. J. Spillman, and by Richard T. Ely and Charles J. Galpin, and the discussions of them that appeared in the same issue, pp. 170–212, 226–32.

4. U.S. Special Committee on Farm Tenancy, *Farm Tenancy: Report to the President's Committee,* prepared under the auspices of the National Resources Committee (Washington, D.C., 1937).

5. Paul W. Gates, *Frontier Landlords and Pioneer Tenants* (Ithaca, 1945); and essays contained in Gates, *Landlords and Tenants on the Prairie Frontier: Studies in American Land Policy* (Ithaca, 1973); Fred A. Shannon, *The Farmer's Last Frontier: Agriculture, 1860–1897* (New York, 1945); Allan G. Bogue, *From Prairie to Corn Belt: Farming on the Illinois and Iowa Prairie in the Nineteenth Century* (Chicago, 1963); Clarence H. Danhof, *Change in Agriculture: The Northern United States, 1820–1870* (Cambridge, Mass., 1969).

6. For a good summary of the history of thought on farm tenancy, see William B. Bizzell, *Farm Tenancy in the United States,* Texas Agricultural Experiment Station, Bulletin No. 278 (College Station, 1921), chaps. 3–6; or Johnson, "Resource Allocation under Share Contracts."

gued that if landlords set their tenants' intensity of effort, then the productive efficiency of share tenants need not be below that of owner-operators. Reid, moreover, provided impressive evidence that a variety of devices were used in the postbellum South to specify the tenants' labor inputs, crop outputs, and other details of the production process.[7]

Most of the discussion regarding tenancy in American economic history has focused on the South, and until recently tenant farming in the North was relatively neglected. In separate studies, Seddie Cogswell and Donald Winters tried to support the agricultural ladder thesis by analyzing a carefully collected micro-data set for northern farms, but their work lacks the theoretical rigor of the studies on southern tenancy.[8] Further, both Cogswell and Winters concentrated on only one state, Iowa, and gave far less attention to the antebellum era. Studies by Jeremy Atack and Fred Bateman, published after most of my work was completed, also investigated northern tenancy. While we use the same data set, I use a simultaneous model to explain tenure choice, and I examine the relationship between productivity and tenure.[9]

This essay explores the determinants of tenancy, and thus the speculator and ladder hypotheses, and the determinants of productivity, and thus the possibility of Marshallian inefficiencies.

4.1 The Data

My data come from a sample of 21,118 rural households taken from the manuscript census of 1860 under the direction of Fred Bateman and James D. Foust.[10] The sample includes all households in a single township from each of 102 randomly selected counties, scattered across 16 northern states, and contains agricultural production data linked to demographic and economic information about the farm operators.

As I have discussed elsewhere, one can distinguish tenant farmers from owner-operators in this sample, even though census takers were not required until 1880 to ask farmers if they owned or rented their farms. Farmers enu-

7. Johnson, "Resource Allocation under Share Contracts"; Cheung, *The Theory of Share Tenancy;* Reid, "Sharecropping as an Understandable Market Response."

8. Seddie Cogswell Jr., *Tenure, Nativity and Age as Factors in Iowa Agriculture, 1850–1880* (Ames, Iowa, 1975); Donald L. Winters, *Farmers Without Farms: Agricultural Tenancy in Nineteenth Century Iowa* (Westport, 1978). For an historiographical survey see Winters, "Agricultural Tenancy in the Nineteenth Century Middle West: The Historiographical Debate," *Indiana Magazine of History,* 78 (June 1982), pp. 128–53.

9. See Jeremy Atack and Fred Bateman, *To Their Own Soil: Agriculture in the Antebellum North* (Ames, 1987); Atack, "Tenants and Yeoman in the Nineteenth Century," *Agricultural History,* 62 (Summer 1988), pp. 6–32; "The Agricultural Ladder Revisited: A New Look at an Old Question with Some Data for 1860," *Agricultural History,* 63 (Winter 1989), pp. 1–25.

10. Fred Bateman and James D. Foust, "A Sample of Rural Households Selected from the 1860 Manuscript Censuses," *Agricultural History,* 48 (Winter 1974) pp. 75–93; Yang, "Notes on the Wealth Distribution of Farm Households in the United States, 1860: A New Look at Two Manuscript Census Samples," *Explorations in Economic History,* 21 (Jan. 1984), pp. 88–102.

merated together with full production data in the agricultural schedules and no real property in the population schedules were considered tenants.[11]

Out of 11,940 households with agricultural production information in the sample, 3,382 were excluded from the analysis for one or more of the following reasons: (1) the household was in a slave state, Missouri or Maryland; (2) the head of the household had a nonfarm occupation;[12] (3) the information needed to estimate the farm's labor input was missing, owing to an inability to match the household in the population schedule with the household in the agricultural schedule, or for some other reason; (4) the size of the household given in the population schedule differed by more than one person from the size of the household coded as a separate variable in the sample; (5) improved acreage or the value of the farm was not reported; (6) the value of farm implements was not reported; (7) there was no farm output; and (8) there were obvious recording errors for key variables. After removing these observations, 7,740 owner-operated farms and 818 tenant farms remained.

Tenant farms might be further classified, for instance as sharecropping, share renting, and cash renting.[13] Because these lease arrangements cannot be identified from the census data of 1860, I treat tenants as a single group. Neglecting the composition of the tenantry could impart a bias if the type of contract varied with the principal crop in an area. Typically, however, the terms of share contracts do not appear to have differed very much across regions.[14]

Characteristic features of tenants and tenant farms in comparison with owner-operated farms are summarized in Tables 4.1–4.3. Table 4.1 reaffirms

11. These are the type A and type B farmers, respectively, as defined in Yang, "Notes on the Wealth Distribution," table 1. For geographic variations in the tenancy rate see ibid., table 2; and Atack and Bateman, *To Their Own Soil*, chap. 7.

12. This criterion was absent in my previous work, see Yang, "Agricultural Productivity in the Northern United States, 1860," in Robert W. Fogel and Stanley L. Engerman, eds., *Without Consent or Contract: Technical Papers on Slavery* (New York, 1991). There the objective was to explain total agricultural production, whether the farm operator was an owner-operator, tenant, or non-farmer by occupation. Here eliminating the non-farmer–headed farms will help distinguish tenant farmers from owner-operator farmers.

13. Studies by the Department of Agriculture during the 1910s and 1920s reported a variety of terms under which farms were leased. In the northwestern wheat belt at least six major classes of renting were identified; for the dairy farms in Wisconsin and Illinois, two important types of tenure were described.These and other studies are summarized in E. A. Goldenweiser and Leon E. Truesdell, *Farm Tenancy in the United States*, U.S. Bureau of the Census, Census Monograph No. 4 (Washington, D.C., 1924). Generally, cash renters were responsible for supply of labor and all working capital. The contribution of productive factors by landowner increased with the share of the crop he received.

14. A Department of Agriculture bulletin in 1918, based on the study of 258 lease contracts and the survey records of 2,907 tenant farms, reported the pattern of renting farms according to crops. Although there was considerable variation, the most frequent share of the landlord (when the work stock, machinery, and labor were furnished by tenants) was one half for corn, hay, and potatoes and one third for wheat, peas, and beans. The products of breeding and milking dairy cattle and of raising beef cattle and hogs were divided half and half when the expenses for working capital were shared equally (E. V. Wilcox, *Lease Contracts used in Renting Farms on Shares*, U.S. Department of Agriculture, Bulletin No. 650 [Washington, D.C., 1918]). This description, however, may not apply to 1860.

Table 4.1 Percentage Tenant by Age and Region, 1860

Age	Percentage Tenant		
	North	Northeast	North Central
29 and under	20.3%	18.2%	21.1%
30–39	12.0	8.4	13.5
40–49	8.0	7.2	8.4
50–59	5.3	3.8	6.4
60–69	4.5	2.6	6.3
70 and over	0.3	0.0	1.3
Number of farms (tenant and non-tenant):	8,558	3,175	5,383

Source: Computed from the Bateman-Foust sample.

Table 4.2 Tenancy Rates by Place of Birth in the Rural North, 1860

Birthplace	North			Northeast			North Central		
	Owner	Tenant	Tenancy Rate	Owner	Tenant	Tenancy Rate	Owner	Tenant	Tenancy Rate
Total	7,740	818	9.56%	2,959	216	6.80%	4,781	602	11.18%
Born in state	3,075	290	8.62	2,364	185	7.26	711	105	12.87
Born out of state	3,393	402	10.59	437	11	2.46	2,959	391	11.68
Foreign-born	1,267	124	8.91	158	20	11.24	1,109	104	8.57
English-speaking	599	48	7.42	109	14	11.38	490	34	6.49
British Isles	289	18	5.86	63	2	3.08	226	16	6.61
Ireland	274	24	8.05	40	9	18.37	234	15	6.02
Canada	35	6	14.63	6	3	33.33	29	3	9.38
Others	1	0	0.00	0	0	—	1	0	0.00
Low countries	122	2	1.61	0	0	—	122	2	1.61
France	30	3	9.09	4	0	0.00	26	3	10.34
Germany	403	39	8.82	30	4	11.76	373	35	9.38
Switzerland	31	4	11.43	14	2	12.50	17	2	10.53
Northern Europe	75	27	26.47	0	0	—	75	27	26.47
Others	7	1	12.50	1	1	50.00	6	0	0.00
At sea	1	0		0	0		1	0	
Unknown	4	2		0	0		4	2	

Source: Computed from the Bateman-Foust sample.

an observation found in numerous sources that tenant farmers were younger than owner-operators. This finding was frequently used to support the agricultural ladder thesis, because it was presumed that young renters eventually became older owner-operators.[15] The phenomenon is more conspicuous in the

15. For recent examples, see Winters, *Farmers Without Farms;* and Reid, "White Land, Black Labor."

Table 4.3 Average Measures by Land-Tenure Status in the Rural North, 1860

	North		Northeast		North Central	
	Owner	Tenant	Owner	Tenant	Owner	Tenant
Number of farms	7,740	818	2,959	216	4,781	602
Age (years)	44.7	37.6	47.4	38.4	43.1	37.3
Percentage born:						
In state	39.7	35.5	79.9	85.6	14.9	17.4
Out of state	43.9	49.3	14.8	5.1	61.9	65.3
Foreign	16.4	15.2	5.3	9.3	23.2	17.3
Length of residency (years)	29.7	22.5	42.3	35.5	22.0	17.9
Real property	$3,315	0	4,052	0	2,859	0
Personal wealth	$941	497	1,260	864	744	365
Acreage:						
Improved (I)	74.4	58.8	84.8	80.5	67.9	51.0
Unimproved (U)	55.5	53.0	33.9	41.4	68.9	57.2
Value ($) of:						
Farm (F)	$3,126	2,342	3,897	4,199	2,649	1,676
Farm adjusted for location (T)	2,746	2,039	3,277	3,562	2,418	1,493
Machinery (K)	117	85	142	141	102	64
Livestock (V)	481	344	555	514	434	283
Labor (L): equivalent hands	1.58	1.44	1.54	1.48	1.60	1.43
Output (Q)	$588.3	527.2	582.3	561.3	592.0	515.0
Q/I	7,907	8,966	6,867	6,973	8,719	10,098
Q/T	.2141	.2585	.1776	.1575	.2448	.3449
Q/K	5.025	6.226	4.099	3,975	5.827	7.997
Q/L	372.3	366.1	378.1	379.3	370.0	360.1
Total factor productivity index (owner = 100)	100.0	106.2	94.1	90.6	104.7	116.8
Value ($) of:						
Beef	$ 75.4	49.3	83.2	71.5	70.7	41.4
Dairy	117.2	78.8	200.6	183.4	65.5	41.3
Pork	114.5	98.7	53.6	81.6	152.2	104.9
Corn	161.4	231.2	53.0	73.7	228.6	287.7
Wheat	84.2	68.7	35.2	58.5	114.5	72.3
Corn/Q	.274	.439	.091	.131	.386	.559
Wheat/Q	.143	.130	.060	.104	.193	.140
Animal products/Q	.536	.436	.602	.612	.496	.368
Pork/animal products	.373	.435	.159	.242	.528	.559

Note: Total factor productivity was computed by taking the geometric average of Q/L, Q/K, and Q/T with the weights of .63, .05, and .32, derived from the factor shares in total cost. See Yang, "Aspects of United States Agriculture circa 1860" (Ph.D. diss., Harvard, 1984), chap. 2; and "Agricultural Productivity in the Northern United States, 1860," in Robert W. Fogel and Stanley L. Engerman, eds., *Without Consent or Contract: Technical Papers on Slavery* (New York, 1991), for more detail.

Source: Computed from the Bateman-Foust sample.

long-settled Northeast. But, as I will show, age was actually more significant in the North Central region, where tenancy was, in fact, a more effective route to ownership because settlement was still in progress.

As Table 4.2 shows, foreign-born farmers were more likely to be tenants in the Northeast than in the North Central region, in part because in the North Central region foreign-born farmers tended to be older than native farmers. Immigrants from English-speaking countries had lower tenancy rates than other foreign-born farmers.[16]

Table 4.3 reports the length of in-state residence, another measure relevant to the agricultural ladder thesis. The census schedules did not include a question on the years of residency, but one can generate a range for the length of time a farm operator could have resided in-state from the age and birthplace of his children. In most cases, one can use the age of a farmer born in a state as his length of residence. If the head of the household was not born in the state, then the age of the oldest child born in-state generally sets a lower bound on his years of residency, and the age of the youngest child born out of the state sets an upper bound.[17] If no children were born in-state, then the minimum residency is zero. Averaging the maximum and minimum gives the probable period of residency. Since the range is fairly wide (averaging about fourteen years) and family relationships had to be reconstructed (the census did not collect information on relationships among members of a household before 1880), the measure is subject to a substantial error.[18] Even so, it is clear that length of residency was shorter for tenants than owners, a finding consistent with the idea that tenants eventually worked their way up to become owners.

Output, input, and productivity (measured according to the procedures described in my study of northern agricultural productivity) are also reported in Table 4.3.[19] A brief description, however, may clarify the meaning of the productivity measures. Physical units of crop outputs reported in the agricultural schedules were converted into dollar amounts (after adjusting for seed and feed allowances) by using 1860 national prices. Meat output was computed

16. Female-headed households were minimal, about 4 percent, and there were almost no black farmers, so we cannot shed any light directly on the racial issues that are the focus of attention in the study of postbellum southern tenancy.

17. There are very few odd cases in the Bateman-Foust sample, such as intermediate children born in-state but first and last born out of state.

18. A similar measure was employed by Cogswell, *Tenure, Nativity and Age*, chap. 6. The family relation was reconstructed by following the methods (with some minor variations) of Richard A. Easterlin, George Alter, and Gretchen A. Condran, "Farms and Farm Families in Old and New Areas: The Northern States in 1860," in Tamara K. Hareven and Maris A. Vinovskis, eds., *Family and Population in Nineteenth-Century America* (Princeton, 1978). Households were classified into three headships: husband-wife headed, other male headed, and female headed. The recognition that all the property-holding members of a household were listed before the nonproperty holders saved many unnecessary steps, such as identifying grandparents and stepchildren. Restrictions on the age differentials between spouses and between mother and children were slightly loosened.

19. Yang, "Agricultural Productivity."

by multiplying the number of head of each type of animal by their slaughter-to-live-weight ratio, their average live weight, and their price per pound of live weight. Capital was measured by the value of implements and machinery; land was measured by the value of the farm. Capital and land values were taken directly from the agricultural schedules. The locational component of the land value was estimated as the difference between the coefficients from a linear regression of the value of the land on improved acreage and unimproved acreage. The locational component was removed from the value of the farm (F) to create an adjusted land input (T). The labor input was estimated in equivalent full hands using the information in the population schedules. To convert the farm population into full hands, I used the same age-sex weights employed in related work for southern labor. These weights were obtained from slave hire-rate profiles, and in turn multiplied by the assumed labor force participation rates of 1.0 for males and 0.25 for females. Labor input estimates are likely to be downwardly biased (as much as 25 percent) because hired hands were not counted, but the bias may not be very serious when comparing owner-operated with tenant farms.[20]

Looking at the input mix and output mix by tenure in Table 4.3, one may be surprised by the differences between the two regions. The scale of farming (improved acreage) was smaller for tenants than owners in the North Central region, as might be expected from the agricultural ladder thesis, but it was higher in the Northeast. Indeed, the average value of tenant farms was actually greater than that of owner-operated farms in the Northeast. Similarly, the investment in machinery and livestock on tenant farms was far less than on owner-operated farms in the North Central region but was about equal in the Northeast. As a consequence, North Central tenants had higher capital and land productivity and lower labor productivity than owners, while just the reverse held in the Northeast. Tenants had 11 percent higher total factor productivity than owners in the North Central region, but 4 percent lower total factor productivity than owners in the Northeast. Crop mix was also different. Tenants grew a greater proportion of corn, a smaller proportion of wheat, and produced a smaller share of animal products than owners in the North Central region, but again these comparisons are reversed in the Northeast.[21] These figures suggest that the institution of tenancy operated very differently in the two regions.

20. If we allocate hired hands available outside farms proportionally to the improved acreage of each farm, the downward bias of the labor input appears to be about 20 percent for owner-operated farms and 18 percent for tenant farms. The influence of the differential bias on the productivity comparison between owner and tenant turns out to be negligible.

21. It is noteworthy that the Bateman-Foust sample does not cover urban townships, where the growth of labor-intensive market gardening led to an increase in tenancy, especially in the Northeast. "High land values in connection with ready markets produced tenancy near the large cities, a condition of land tenure almost unknown elsewhere in the North. Many of the truck farms were leased by immigrants, who had learned gardening in Europe" (Percy W. Bidwell and John I. Falconer, *History of Agriculture in the Northern United States, 1620–1860* [Washington, D.C., 1925], p. 242).

Differences in crop mix and input composition by tenure status have been observed in other contexts, and explanations have been offered for them. Lower livestock investment, emphasis on swine within the livestock category, and a higher share of corn in the total output of tenants have all been interpreted as rational utility maximizing behavior. The following interpretation is typical of the literature: "Since tenants were generally in a poorer capital position, they were unable to invest in livestock to the same extent as owner-operators. Moreover, meat production provided a slower turnover on investment than did grain production. It took two to three years to fatten a steer for a market and about half the time for a pig. . . . Renters were likewise reluctant to make investments in dairy cattle or sheep that would be difficult to liquidate if their leases were not renewed."[22] This statement is based on implicit assumptions about the state of the capital market, terms of the lease contract, and attitudes toward risk. This is especially clear in our case since the Northeast showed a pattern almost contrary to what the quotation would predict. Accounting for the behavior of farmers in the Northeast requires a more elaborate theoretical model and a reevaluation of the farm-level data.

4.2 A Model of the Farm-Rental Market

The economic theory of farm tenancy was developed from various perspectives. Some writers have emphasized relative resource endowments, while others have given more weight to risk and transactions costs. All have assumed that the contractual form is determined by a market process of interacting demand and supply, not merely by custom or unilateral pressures from landowners. Thus, they provide not competing, but complementary explanations of tenure choice. Most previous empirical tests, however, have focused on a particular aspect of the market within the confines of a specific theory.[23] I develop and test a market-equilibrium model that simultaneously incorporates many of the explanatory variables identified in previous research.

Transactions in the rental market involve bilateral contracts whereby the landowner transfers to a tenant the right to use a unit of land in return for an agreed rental payment. We may assume that each owner has some "reservation rent," defined as the minimum rent he is prepared to accept for leasing his unit, and that each prospective tenant farmer has some "limit rent," defined as

22. Winters, *Farmers Without Farms*, p. 40.

23. For a survey of the literature, see Alston and Higgs, "Contractual Mix in Southern Agriculture." The recent empirical tests emphasizing the tenure ladder are Reid, "White Land, Black Labor"; Wright, "Cheap Labor and Southern Texiles"; and Winters, *Farmers Without Farms*. Risk sharing is emphasized in Higgs, "Race, Tenure, and Resource Allocation; "Patterns of Farm Rentals"; and *Competition and Coercion*. Enforcement and supervision costs are emphasized in Alston, "Tenure Choice in Southern Agriculture"; and Alston and Higgs, "Contractual Mix in Southern Agriculture." The balance between transaction costs and risk is emphasized in Phillip T. Hoffman, "The Economic Theory of Sharecropping in Early Modern France," *Journal of Economic History*, 44 (June 1984), pp. 309–19.

the maximum rent he would be prepared to pay for a unit of land.[24] The lower the reservation rent of the owner and the higher the limit rent of the prospective tenant, the greater the number of transactions that will take place in the rental market. The precise contract rent will be set at market-clearing level. In other words, the two-equation system,

$$T^d = T^d(R - R_r),\ T^{d\prime} > 0 \tag{1}$$

$$T^s = T^s(R_l - R),\ T^{s\prime} > 0 \tag{2}$$

can be solved for a reduced form,

$$T = T(R_r, R_l) \tag{3}$$

where T denotes the extent of tenancy (expressed as a probability at the individual level), R_r the reservation rent, R_l the limit rent, R the actual contract rent, and the superscripts d and s denote the demand for and supply of tenant farmers respectively, with $\partial T/\partial R_r < 0$ and $\partial T/\partial R_l > 0$.

The problem now reduces to identifying the determinants of the reservation and limit rents. The landowner's reservation rent reflects his choice between leasing the land and hiring farm laborers. It will depend on his resource endowments and on the specific nature of the farming unit. The amount of agriculture-specific human capital the owner has, holding other variables constant, determines how likely the owner is to operate the farm or to rent it. The reservation rent must be higher to compensate for the lower earnings of the owner's human capital in alternative employment. The accumulation of managerial expertise, work stock, and tools were the most frequently cited forces enabling a farmer to move up the tenure ladder from wage hand to cropper, to share tenant, to fixed-payment renter, to owner-operator. The proxies for human capital chosen from the manuscript census data are age, literacy, nativity, and length of residency. Physical capital was measured by the personal property variable, since it consisted mainly of livestock and implements.

The nature of the farming unit influenced the landlord's demand for tenant farmers through two major channels: risk and transactions costs. Assuming risk-aversion, the higher the risk attached to the operation of the farm, the lower the reservation rent. When the owner works his own farm, he bears all the risk. But he bears only a part of the risk when he rents out the farm. Variance of yields and prices provide a good measure of the risk, but the cross-sectional variance of farm income is not readily available. Crop mix may serve as a proxy. Corn was long regarded as less risky than wheat, its major alternative. Wheat was vulnerable to disease, insects, and harsh weather, and had a shorter harvest period. As early as 1843, an English pamphlet to emigrants noted that corn "is not like other grain easily injured; but once ripe, there it stands, setting at defiance rain, frost, snow, and avery [sic] vicissitude of cli-

24. The model below follows the spirit of J. M. Currie, *The Economic Theory of Agricultural Land Tenure* (Cambridge, 1981).

mate, often through great part of winter."[25] While the price of corn fluctuated widely (usually along with the price of hogs), it fluctuated no more than the price of wheat. Major declines in the price of corn did not occur until 1861. Thus, the proportion of corn acreage in total cropland can be taken as an index of risk. The estimated value of corn divided by the value of total farm output was used, however, because the 1860 census did not collect crop acreage.[26]

The costs of hiring, enforcing, and supervising wage labor probably increased disproportionately with the size of the work force, because the supply of enforcement and supervision was probably inelastic. "Tenant farming tends to increase where the average acreage per farm is large, and methods of cultivation relatively simple."[27] The size of a farm (improved acreage) provides a measure of the cost of using hired labor.

Thus, the reservation rent should be positively related to age, literacy, length of residency, personal property, and share of corn in output, and inversely related to improved acreage per farm. The effect of nativity is uncertain.

The limit rent of a prospective tenant is more difficult to analyze, because the tenant's alternatives to renting a farm include being hired as a farm worker, working outside agriculture, and buying a farm. I will confine my attention to the choice between renting and buying a farm, because I can only compare owners with tenants. This limitation does not create problems if the labor market is similar across geographic regions, but may when explaining spatial variation in the tenancy rate (see the discussion below of Table 4.5).

Relative resource endowments and the nature of a farm also play a role in determining the limit rent. Potential farmers who were well endowed with managerial expertise, work stock, and implements would have a lower limit rent, while those with less human capital would desire advice and supervision from the landlord. The willingness of potential tenants to pay for these services would increase their limit rent. Assuming risk-aversion, the limit rent will be lower for the farm that involves riskier operations. Therefore, all the variables representing resource endowments and risk enter as arguments influencing the limit rent.

25. William Oliver, *Eight Months in Illinois: With Information to Emigrants* (New Castle Upon Tyne, 1834), p.85, cited in Bogue, *From Prairie to Corn Belt*, p. 129.

26. Corn production includes raising of feed for animals. However, since the share of animal products in the total output will enter the regression equation, the estimated coefficient of the corn share variable will reflect the marketed corn crop only. Table 4.3 above shows that the proportion of marketable corn in gross corn output was higher for tenant farms than for owner-operated farms. Alternatively, the corn product net of animal feed can be used in the regression instead of the gross value of the corn output but the results would not be very different.

27. Bizzell, *Farm Tenancy in the United States*, p. 175. This relation is discussed at some length in ibid., chap. 14. Lee Alston, Samar K. Datta, and Jeffrey B. Nugent, "Tenancy Choice in a Competitive Framework with Transactions Costs," *Journal of Political Economy*, 92 (Dec. 1984), pp. 1121–33, suggest, however, that there may be economies of scale in supervision up to a point. Lee Alston pointed out to me in a letter that the Midwest was characterized by higher percentage of kin-tenants. This would surely affect supervision costs but it is not clear how or if it influenced contractual mix. It is hoped that regressions for separate regions may circumvent this problem.

Because leases had limited terms, the limit rent of a prospective tenant will be lower for the farm where the principal operation needed long-term investment, for example building and maintaining the barns, silos, cribs, and fences necessary for stock farming. I chose two variables to measure the impact of long-term investment requirements, namely, the share of beef in the total value of output and the share of total animal products (beef, pork, and dairy) in total production. The share of beef captures the longer time it takes to raise cattle than swine, and the share of total animal products captures the longer time involved in raising livestock compared with other food crops.[28]

To sum up, the limit rent is expected to be negatively related to age, literacy, length of residence, value of personal property, and share of beef and animal products in output, and positively related to the share of corn. Nativity is again of uncertain significance.

Other forces affected the rental market that did not work directly through the demand or supply of tenant farmers. Among those discussed in the literature are the price of land per acre and the availability of public lands. The relation between land prices and tenancy is somewhat complicated to analyze, although the positive correlation between the two has been observed and discussed for some time.[29] To the extent that farm value capitalizes the productivity of land and its proximity to market, and that prospective tenants perceive these facts, the limit rent will be higher. However, the reservation rent of the owner will also be higher. Thus, farm value per acre should enter both the limit rent and the reservation rent equations. These two impacts will offset each other if the subjective evaluation of land productivity and proximity to market are the same for owner and tenant.

If, for speculative or other reasons, the price of a farm stays above its equilibrium level, the farm will not be purchased or maintained by a bona fide owner-operator who will compare the land price to the prospective income stream. This implies that the speculator may have a lower reservation rent than an owner-operator. Because the rental market is not likely to be motivated by concerns about capital gains or the prestige of landownership, one would expect higher tenancy rates on overvalued farms. I used farm value per acre to capture this effect.

28. When interpreting the estimated coefficients, these two variables should be considered together, since they are closely related to each other.

29. Early writers correctly identified the relationship, but their discussion frequently was limited to a single aspect. For example, W. J. Spillman and E. A. Goldenweiser, "Farm Tenantry in the United States," in U.S. Department of Agriculture, *Yearbook of Agriculture, 1916* (Washington, D.C., 1917), p. 335, tried to explain it with a version of the agricultural ladder hypothesis, stating that "where the value of farm land is high a longer time is required for the tenant to accumulate the capital necessary for making a first payment on a farm than where it is low." See also Goldenweiser and Truesdell, *Farm Tenancy in the United States*, chap. 6. Recently, Alston and Higgs, "Contractual Mix in Southern Agriculture," contended that the more valuable the land, the more numerous would be wage workers relative to tenants. This is because, they argue, more valuable lands were given more supervision, and because the marginal cost of supervising wage labor is decreasing. However, this influence, if it existed, would have been dominated by other forces that are discussed below.

Availability of public lands is another factor claimed to influence tenancy. Where the settlement of desirable new land was in rapid progress, it has been argued, the opportunity for acquiring land was so great that there was little reason for the rental market to develop. On the other hand, speculators and landlords who took advantage of the federal land policy leased out their lands to tenants.[30] The direction of influence of the settlement level, thus, cannot be determined a priori, but the sign of the estimated coefficient may discriminate between the two opposing views. I took the proportion of farm land improved by 1860 to the ever-improved agricultural land in the county as the measure of farm settlement.[31]

Solving the demand and supply equations and adding the two variables considered separately yields a reduced-form equation which predicts that the rate (or probability) of tenancy varies negatively with the age, literacy, length of residency, and personal property of the farm operator, negatively with the share of beef and animal products in output, and positively with improved acreage. The effects of nativity, share of corn, value of farm per acre, and settlement level are more difficult to determine. The expected sign of the share of corn is ambiguous because risk decreases both the limit rent and the reservation rent. If tenants were more risk averse than owners because they were less wealthy and had less access to credit, then the limit effect would dominate and a positive sign would be expected.[32] The value of the farm also affects both the limit rent and reservation rent in the same direction. If speculators were the key players, the sign of value per acre would be positive and the sign of settlement negative.

4.3 Northern Tenancy Decisions in 1860

Farm-level regressions are shown in Table 4.4. The equations were estimated using the binary logit technique, with the dependent variable equal to zero if the farm was owner-operated and one if tenanted. Human capital variables were specified in logarithms to allow for diminishing returns and, for the same reason, the settlement variable was entered as a quadratic.[33] The interaction terms of age and residency with settlement were added to capture any differential in the effect of human capital over the settlement stage.

In the regression for the North as a whole, every variable, except stock farming (beef share and the share of animal products) and nativity, is significant at the .05 level and has the expected sign. The sign of the interaction terms shows that age gained importance over the settlement stage, but length

30. See the introductory part of the text for a related discussion.

31. This measure is based on the procedure used by Easterlin et al., "Farms and Farm Families." The index was constructed from decennial census data by dividing the improved acreage in 1860 by the improved acreage of 1870, 1880, 1890, 1900, 1910, whichever was largest.

32. For a similar argument, see Higgs, "Patterns of Farm Rental."

33. It was not entered in logarithms because it is already a ratio variable constrained to fall between zero and one.

Table 4.4 Logit Regression of Farm-Level Tenancy

	North	Northeast	North Central
Intercept	2.0390*	−0.8748	2.1903*
	(1.2230)	(6.1490)	(1.2602)
Log (age)	−0.8752***	−2.9276	−0.8574**
	(0.3101)	(2.0814)	(0.3481)
Dummy for literacy	−0.6198***	−1.0544***	−0.5290***
	(0.1347)	(0.4053)	(0.1472)
Dummy for born in state	0.0594	0.4766	−0.1642
	(0.1178)	(0.3777)	(0.1468)
Dummy for foreign-born	−0.0066	1.2186**	−0.1769
	(0.1413)	(0.5583)	(0.1506)
Dummy for born in English-speaking countries	−0.3423*	−0.3372	−0.5087**
	(0.2000)	(0.5526)	(0.2272)
Log of length of residency	−0.4985***	0.6339	−0.4087***
	(0.0984)	(1.4825)	(0.1077)
Personal property	−0.001006***	−0.000345***	−0.002300***
	(0.000106)	(0.000109)	(0.000189)
Log (age) × settlement	−1.2415**	0.8589	−0.9284
	(0.5046)	(2.3272)	(0.6836)
Log (residency) × settlement	0.6158***	−0.6845	0.3860
	(0.2047)	(1.5821)	(0.2402)
Settlement	4.1890**	15.1011*	3.6939
	(1.8314)	(8.5417)	(2.5277)
Settlement^2	−1.3907**	−10.3441***	−1.7689**
	(0.5930)	(3.5747)	(0.7221)
Corn share	1.2030***	2.4151***	1.4535***
	(0.1514)	(0.5516)	(0.1773)
Improved acreage	0.001633**	0.003799***	0.001888**
	(0.000718)	(0.001435)	(0.000915)
Beef share	−0.6018	−3.7532***	−0.1545
	(0.4438)	(1.1703)	(0.4470)
Animal-product share	0.1982	1.2067***	0.0493
	(0.1373)	(0.3329)	(0.1513)
Value per acre	0.004794***	0.003047*	0.012119***
	(0.001283)	(0.001663)	(0.003659)
N	8,558	3,175	5,381
Log likelihood	−2,406.76	−702.39	−1,623.09

Notes: Standard errors are in parentheses. Dependent variable = 0 if owner, = 1 if tenant.
Source: Computed from the Bateman-Foust sample.

*Significant at the .10 level.

**Significant at the .05 level.

***Significant at the .01 level.

of residency did not. The North Central region follows the same pattern as the North as a whole, except that the interaction terms between human capital and settlement lose their significance. For the Northeast, however, the results are generally poor. All the human capital variables except literacy are insignificant, and the size of the coefficient for the physical capital variable (personal property) is very small compared with that of the North Central region. The share of animal products has a positive sign, indicating that raising livestock other than beef cattle (probably swine) attracted tenants.

The lack of significance for the stock farming variables indicates that the limited length of lease contracts may not have greatly influenced the demand by tenants for rental farms. A Department of Agriculture bulletin published in 1918 observed: "The landlord almost universally furnishes all materials needed in repairing buildings and fences, and in making other permanent improvements as required, while the tenants furnishes all labor except skilled labor necessary for making the required repairs and improvements. The tenant, however, is commonly paid wages for work on extensive improvements, such as ditching, tile draining, building silos, etc. . . . In the case of extensive improvements the landlord may supply all labor while the tenant is required to board the laborers."[34] The same source reported that annual lease contracts were generally renewed repeatedly.

Except for the apparent differences in the age distribution and length of residency, there does not seem to be much evidence for an agricultural ladder in the Northeast. Once farm characteristics are controlled, the relative resource endowment variables lose their explanatory power. One may infer that the tenure ladder was meaningful only in the North Central region, where settlement was still in progress, and that in the Northeast, where agriculture was already declining, farmers on the lower rung of the ladder were constantly drawn off by the increasingly attractive industrial labor market and by the lure of westward migration.[35] The average age of farm operators, given in Table 4.3, shows that there were fewer young farmers in the Northeast than in the North Central region.

The value of farm per acre has a larger and more significant coefficient in the North Central region than in the Northeast. This variable may have captured the prevalence of land speculation in the newly settled area of the North Central region. The squared settlement variable has a significant positive sign in the equation for the North Central region. This result, together with the significant positive sign of the land price variable, indicates that the speculator

34. Wilcox, *Lease Contracts used in Renting Farms on Shares*, p. 21. See also Bizzell, *Farm Tenancy in the United States*, pp. 195–96; and Spillman and Goldenweiser, "Farm Tenantry in the United States," pp. 343–46. This may not apply to the period around 1860.

35. For related discussions, see Alexander Field, "Sectoral Shifts in Antebellum Massachusetts: A Reconsideration," *Explorations in Economic History*, 15 (Apr. 1978), pp. 146–71; and Wright, "Cheap Labor and Southern Textiles."

thesis cannot be easily rejected.[36] In the North Central region, tenancy, it appears, is hard to explain with a monocausal theory.

I now use the model of the farm-rental market to explain geographic variation of the tenancy rate across townships. Excluding townships with fewer than five farms, the rate of tenancy varied from zero to a high of 74 percent. Table 4.5 shows the results of the township-level regressions.[37] Coefficients of practically all variables have the expected signs, and together they explain more than a half of the spatial variation in the tenancy rate. As noted previously, this specification assumes a uniform state of the labor market across geographic areas.

The second equation of Table 4.5 takes into account variation in the labor market by including the wage rate.[38] The higher the wage rate, the lower the limit rent of a prospective tenant will be, because the value of his labor in the alternative employment is higher. Likewise, the reservation rent of a landlord will be lower, because the costs of hiring and keeping wage laborers will be higher. Thus, the direction of influence on the tenancy rate is ambiguous and will be determined by the relative sensitivities of demand and supply in the rental market.[39]

The inclusion of wages decreases the residual variance by about 6 percentage points. The highly significant negative coefficient of the wage variable indicates that the tenant's response was more sensitive to labor market conditions than the owner's.

4.4 The Productivity of Tenants and Owner-Operators

The empirical literature has not yet produced a consensus concerning the economic performance of tenant farming. Among others, Winters reported that grain yields were not less for tenants than owners in postbellum Iowa. Lewis Gray, echoing others, noted that "the question whether tenants or owner

36. The role of speculators can also be viewed in a more sanguine light. "We can rightly regard the operations of the speculator as a means of sending capital to regions that were desperately in need of it" (Bogue, *From Prairie to Corn Belt,* p. 45).

37. Since the dependent variable is a proportion bounded by zero and one, I transformed it into the log of the odds ratio, log [tenancy rate/(1 − tenancy rate)], and ran weighted regressions to correct for heteroscedasticity. The weight was (tenancy rate) × (1 − tenancy rate) × (number of farms in the township).

38. Agricultural wage rates for 1860 by state were taken from Stanley Lebergott, *Manpower in Economic Growth: The American Record Since 1800* (New York, 1964), p. 539.

39. The model of P. K. Bardhan and T. N. Srinivasan, "Cropsharing Tenancy in Agriculture: A Theoretical and Empirical Analysis," *American Economic Review,* 61 (Mar. 1971), pp. 48–64, derives a positive relation between wage and tenancy rate. This came from an unusual property of their equilibrium solution: zero marginal product of land is retained with the concave production function of share tenants. David Newberry pointed out that their equilibrium is not only noncompetitive but also unstable. Modified to meet the existence problem, "the final outcome will depend on the relative strength of the two effects and cannot be predicted a priori" (David M. G. Newberry, "The Choice of Rental Contract in Peasant Agriculture," in Lloyd G. Reynolds, ed., *Agriculture in Development Theory* [New Haven, 1975], p. 126).

Table 4.5 Township-Level Regression of Tenancy Rate

	Equation 1	Equation 2
Intercept	37.9359**	71.9157***
	(18.6784)	(21.6249)
Log (age)	−9.7646*	−14.1596***
	(5.1927)	(5.1489)
Literacy	−0.9632	−0.0379
	(1.8728)	(1.7991)
Born in state	1.0655	−0.8163
	(1.3727)	(1.4605)
Foreign-born	2.2637**	1.7901**
	(0.9018)	(0.8681)
Born in English-speaking countries	−4.2391**	−3.3816**
	(1.6994)	(1.6336)
Log of length of residency	−1.8084**	−1.2696
	(0.7902)	(0.7706)
Personal property	−0.000240	−0.000249
	(0.000371)	(0.000350)
Log (age) × settlement	2.7364	7.5842
	(8.3375)	(8.0610)
Log (residency) × settlement	4.2526	5.3079**
	(2.2696)	(2.1760)
Settlement	−15.4744	−39.0416
	(28.5745)	(28.2669)
Settlement^2	−7.6150***	−6.0746**
	(2.6685)	(2.5791)
Corn share	1.7729*	2.1689**
	(0.9048)	(0.8659)
Improved acreage	0.001596	0.002492
	(0.007087)	(0.006699)
Beef share	0.1890	2.2931
	(4.8503)	(4.6411)
Animal-product share	−1.5284	−1.3905
	(1.5061)	(1.4229)
Value per acre	0.01297*	0.00807
	(0.00727)	(0.00709)
Log (wage)		−7.4822***
		(2.6767)
Degrees of freedom	56	55
R^2	.503	.564
F-ratio	3.53	4.19

Notes: Standard errors are in parentheses. Dependent variable = log of the odds ratio of the tenancy rate. Weight = tenancy × (1 − tenancy) × number of farms.

Source: Computed from the Bateman-Foust sample.

*Significant at the .10 level.

**Significant at the .05 level.

***Significant at the .01 level.

farmers are the more efficient as measured by crop production per acre can not be conclusively answered except with reference to the particular locality under consideration." Roger Ransom and Richard Sutch claimed lower labor productivity, while Jon Moen calculated that the total productivity measure of tenants was greater than that of owners in 1880 in the cotton South.[40]

As Table 4.3 above shows, tenants had lower labor productivity and higher land, capital, and total factor productivity in the North as a whole and in the North Central region in 1860, while the opposite was true in the Northeast. In the North, total factor productivity of tenants was 6 percent higher than total factor productivity of owner-operators. In the North Central region tenants were 11 percent more productive, but in the Northeast tenants were 4 percent less productive. Was it because northeastern tenants were subject to static Marshallian inefficiencies, while the North Central tenants enjoyed productive efficiency in the sense of Cheung and Reid? Paradoxically, the similar pattern of input mix and output mix of owners and tenants in the Northeast suggests direct supervision by landlords, yet it is here that tenants are less efficient.

Agricultural productivity calculations have been widely employed to trace technological change over time or to compare the performance of different agricultural regions. Whether in temporal or spatial comparison, differences in total factor productivity call for an explanation, which usually turns on the existence of unmeasured inputs, changes in resource allocation, economies of scale, and so on. One way to approach the issue is to specify a production function containing more inputs. For example, Zvi Griliches introduced an education variable to represent labor-quality differentials and variables reflecting the output mix of different regions.[41]

Table 4.6 reports the results of production-function estimates. In addition to the conventional inputs of labor, land, and capital, the personal characteristics of farm operators were added to capture labor quality and managerial experience. The nature of the farm was represented by output-mix variables (shares of corn, beef, and animal products), scale of operation (improved acreage), and the settlement stage.

The effect of length of residency is not significantly different from zero in all three equations, probably because of measurement errors. Personal characteristics generally have significant coefficients of expected sign in the regressions for the North as a whole and for the North Central region. Again, this is not true of the Northeast. The most important human capital variables,

40. Winters, *Farmers Without Farms*, chap. 5; Lewis C. Gray et al., "Farm Ownership and Tenancy," in U.S. Department of Agriculture, *Yearbook of Agriculture, 1923* (Washington, D.C, 1924), pp. 574–75; Ransom and Sutch, *One Kind of Freedom;* Jon R. Moen, "Changes in the Productivity of Southern Agriculture, 1860–1880," in Robert W. Fogel and Stanley Engerman, eds., *Without Consent or Contract: Technical Papers on Slavery* (New York, 1991). I have reservations concerning the latter two citations, because the samples do not have adequate information to measure productivity by tenure.

41. Zvi Griliches, "Estimates of the Agricultural Production Function from Cross-Sectional Data," *Journal of Farm Economics*, 45 (May 1963), pp. 419–28.

Table 4.6 Production-Function Estimates with Tenure Dummy

	North	Northeast	North Central
Intercept	3.5487***	2.8343***	3.2952***
	(0.1026)	(0.2400)	(0.1212)
Log (labor)	0.1874***	0.1814***	0.1771***
	(0.0122)	(0.0167)	(0.0174)
Log (capital)	0.2522***	0.3354***	0.1814***
	(0.0084)	(0.0143)	(0.0104)
Log (land)	0.1925***	0.1809***	0.2391***
	(0.0075)	(0.0106)	(0.0107)
Log (age)	0.0703***	0.0274	0.1226***
	(0.0234)	(0.0503)	(0.0294)
Dummy for literacy	−0.0754***	−0.1029	−0.0768***
	(0.0273)	(0.0695)	(0.0295)
Dummy for born in state	−0.0416**	−0.1014***	0.0309
	(0.0190)	(0.0359)	(0.0246)
Dummy for foreign-born	−0.0834***	−0.1357*	−0.0382**
	(0.0235)	(0.0769)	(0.0250)
Dummy for born in English-speaking countries	0.1067***	0.0898	0.0626*
	(0.0306)	(0.0864)	(0.0330)
Log length of residency	0.0053	0.0200	0.0079
	(0.0103)	(0.0370)	(0.0108)
Personal property	5.858×10^{-5}***	3.617×10^{-5}***	7.907×10^{-5}**
	(0.504×10^{-5})	(0.610×10^{-5})	(0.845×10^{-5})
Settlement	0.1780*	2.7224***	−0.1082
	(0.1011)	(0.4619)	(0.1167)
Settlement^2	−0.5015***	−2.0982***	−0.2294**
	(0.0850)	(0.3032)	(0.1069)
Corn share	0.1341***	−1.6376***	0.3434***
	(0.0488)	(0.1761)	(0.0527)
Improved acreage	0.00161***	-4.024×10^{-5}	0.00116***
	(0.00029)	(46.498×10^{-5})	(0.00038)
Beef share	−1.0717***	−3.3514***	−0.3198**
	(0.1114)	(0.3343)	(0.1248)
Animal-product share	−0.2822***	0.1863	−0.7022***
	(0.0630)	(0.1348)	(0.0781)
Dummy for tenant	−0.0397*	−0.0207	−0.0672***
	(0.0210)	(0.0379)	(0.0248)
Dummy for Northeast	−0.1106***		
	(0.0560)		
Number of farms	8,556	3,175	5,381
R^2	.450	.509	.456
F-ratio	388.69	192.47	264.84

Notes: Standard errors are in parentheses. Dependent variable = log of value of farm output.

Source: Computed from the Bateman-Foust sample.

*Significant at the .10 level.

**Significant at the .05 level.

***Significant at the .01 level.

age and residency, lack significance in the regression for Northeast. It may be that younger farmers in the region shifted to the industrial sector or migrated westward and did not stay on the farm during the costly process of learning by doing.

The size and sign of the coefficients of the settlement variables indicate that the productivity of a farm increased in the initial stage of settlement but slowly declined thereafter. This may have reflected changing external economies. The sign of the size of a farm (improved acreage) is positive and significant for the North Central region and negative but insignificant for the Northeast. The sign on corn share is negative in the Northeast and positive in the North Central region, but the sign on animal-product share is positive in the Northeast and negative in the North Central region. These results reflect the pattern of the comparative advantage by region (corn for the North Central, dairy for Northeast); specialization raises efficiency.

It appears that the paradox of relatively low tenant productivity in the Northeast and high tenant productivity in the North Central region can now be resolved. The coefficients on the tenant dummy all have negative signs, which are statistically significant for the North Central region and for the North as a whole. In the North Central region, where the crude total productivity measures gave tenants 11 percent higher productivity than owner-operators, tenants seem to have been, other things equal, less productive than owners by about 7 percent. Tenants in the North Central region appeared more productive because they operated farms which produced a higher proportion of corn. This finding is hard to dismiss as a mere statistical artifact because the characteristics of the tenant farmer, such as age, length of residency, and the value of personal property, all imply lower agricultural productivity, unless fully supplemented by the landlord's supervision. According to Allan G. Bogue, "In general, tenants were most common where the soils were highly productive," and from a census monograph by Goldenweiser and Truesdell, published in 1924, "tenants are likely to lease farms situated on better land, while the farms on poor soil are most likely to be operated by their owners."[42] Likewise, tenants in the Northeast appeared less productive because they operated farms that produced a higher proportion of corn and a lower proportion of dairy product which went against the comparative advantage of the region.

If we rely on the results of the production-function estimates, then, other things being equal, the tenants in the Northeast were as productive as owners, and those in the North Central region were approximately 7 percent less productive than owners. My conclusion is that the substantial difference in the input mix in the North Central region suggests the possibility of a Marshallian misallocation, while the almost identical input and output mix of owner-operators and tenants in the Northeast suggests that in this region, supervision by landlords might have overcome any tendency toward inefficiency.

42. Bogue, *From Prairie to Corn Belt*, p. 66; Goldenweiser and Truesdell, *Farm Tenancy in the United States*, p. 65.

4.5 Conclusions

Generalizations about northern farming that do not take interregional differences into account are bound to be misleading. The characteristics of tenants compared with owners, and of tenant farms compared with owner-operated farms, were distinctly different in the North Central and Northeastern regions. In the North Central region tenants were generally younger than owner-operators and a higher proportion were migrants from out of state. Among those who were foreign-born, English-speaking countries were less represented among the tenantry. Tenant farms were smaller, more labor intensive, and produced relatively more corn than wheat or animal products. Within livestock husbandry, hog farming was more common among tenants than cattle raising or dairy farming. In the Northeast, on the other hand, almost none of these generalizations held.

The decision to lease a farm was largely determined by economic factors such as relative resource endowments, risk, and transactions costs, although in the Northeast the effect of resource endowments assumed less importance. A good part of the geographic variation in the tenancy rate can be explained by these forces. But, at the same time, some effect from speculation in the North Central region cannot be dismissed easily.

Ownership was a stage that could be reached only after accumulating a stock of human and physical capital. In the North Central region, where the capital market and the communication network of farm-management knowledge might not have operated well, tenancy served as a stepping stone to farm ownership. On the other hand, in the Northeast, where younger farmers were constantly drawn from the farm, the agricultural ladder hypothesis performs less well. Even six decades later, the pattern seems to have been intact. "In the United States as a whole [in 1920], 42 percent of the owner farmers reported no previous farm experience as wage hands or tenants. . . . The percentage is high in New England [59 percent], where tenancy is an unimportant step in the tenure ladder."[43] Thus, the institution of tenancy depended on the market environment where it operated.

Throughout the North, farm characteristics reflecting risk, transactions costs, and the condition of the market for land were important determinants of tenancy. The emergence and dispersion of tenancy can be explained fairly well by the market-equilibrium model. The model, moreover, can be extended to incorporate the influence of the labor market.

Tenants had lower labor productivity but approximately 6 percent higher total factor productivity than owner-operators. However, after adjusting for characteristics of farm and farm operators, the superiority of tenant farming disappears. In other words, tenants appeared more productive because they rented more productive farms. The finding is more apparent in the North Central region, where the apparent 11 percent superiority in total factor productiv-

43. Gray et al., "Farm Ownership and Tenancy," p. 554.

ity of tenants can be more than explained away by the characteristics of the farms. Tenants in this region may have been about 7 percent less productive than owner-operators, suggesting the possibility of Marshallian inefficiency. In the Northeast, on the other hand, the almost identical input and output mixes of tenants and owner-operators suggest that supervision by landlords may have been more effective. On the whole, the findings imply that, although the institution of farm leasing functioned reasonably well, the higher productivity exhibited by tenants in the crude comparisons originated in farm characteristics.