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The Distributional Effects of Contractual Norms: The Case of Cropshare Agreements

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Abstract:

Share contracts are common in principal-agent relationships when returns are uncertain and it is costly to measure the agent's contribution. Well-known examples of these types of arrangements include sales commissions for real estate agents, contingency fees for attorneys, and cropshare contracts used in agriculture. An empirical feature of these contracts is that the shares specified are often based on focal points or historical norms, and seem excessively uniform given large and observable differences among the contracting parties. Using extensive survey data on cropshare contracts in Illinois, I test the hypothesis that contractual norms have measurable effects on factor returns. I find that tenants on higher-quality farmland capture a sizable portion of the land rent, controlling for nonlabor inputs, differences in labor quality, assortative matching effects, and riskiness in returns. Because the existence of a contractual norm is a valuable form of social capital for the bargaining parties, I argue that these distributional effects do not necessarily imply economic inefficiency.

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The division of the produce is the result of two determining agencies: Competition and Custom. It is important to ascertain the amount of influence which belongs to each of these causes, and in what manner the operation of one is modified by the other.

John Stuart Mill (1848)

1. Contractual Conformity and Conformity Rents

A *share contract* is an arrangement in which a principal promises to give an agent a specified proportion of the value generated by their business relationship. Such contractual agreements are common when there is uncertainty regarding expected returns and it is difficult to monitor the extent of the agent's contribution. For example, someone selling a house typically pays the real estate agent a fixed percentage of the actual sales price. A client suing for damages may engage the services of an attorney by using a contingency fee, which offers the lawyer a fixed percentage of the damage award. Contractors and architects typically are paid by receiving fixed percentages of a building's construction costs. In the case of a cropshare lease, a landowner leases her farm to a tenant farmer who receives a fixed share of the crop in return for cultivating the land, while the landowner keeps the remaining portion of the crop as her rental payment.

According to principal-agent theory, the share contract strikes an optimal balance between risk-sharing and incentive provision when both parties are risk-averse and moral hazard is a concern. If contracts are competitively negotiated, one would expect the size of the share to vary in accordance with the mean (and variance) of the expected returns, how risk averse the two parties are, the agent's quality, and other relevant factors.[1] In practice, however, the size of the share seems to cluster around "usual and customary" levels even when there is substantial

[1]Alternatively, the existence of share contracts has been explained on the basis of transactions costs; see Allen and Lueck (1993) and Bhattacharyya and Lafontaine (1995). While these two approaches use different explanatory variables, both these approaches imply that the contractual shares adjust optimally to the relevant economic fundamentals. Bhattacharyya and Lafontaine note the lack of variation in franchise contracts relative to economic predictions, but argue that the resulting distortions are minor. In a subsequent paper, Allen and Lueck (2009) argue that the limited variation in sharing terms observed in agricultural contracts represents an optimal response to the problems of moral hazard that extend to multiple farming inputs.

heterogeneity among principal-agent pairs. In some cases these contractual customs are pinned to psychologically prominent focal points, such as an equal division of crop yields. In other cases the custom seems to have arisen through historical accident, such as the usual 6 percent commission paid to U.S. real estate agents.

In an earlier study (Young and Burke 2001) the author analyzed cropshare contracts being used in contemporary Illinois agriculture, and showed that the shares—for both farm inputs and crop yields—exhibit a high degree of conformity within specific regions of the state. This paper also showed that different customs—including shares that deviate markedly from equal division—prevail in different regions. This previous paper employed a dynamic model of contracting to explain the combination of local conformity and regional diversity, using techniques borrowed from statistical mechanics (Blume 1993, 1995; Brock and Durlauf 2001a, 2001b; Weisbuch, Kirman, and Herreiner 2000; Young 1998).

The present paper examines the economic consequences of a customary share once a customary division is established. In particular, I test whether existing share arrangements create distortions—what I term *conformity rents*—in dividing the surplus between the principal (landowner) and the agent (tenant farmer), or if these potential distortions are somehow preempted by adjustments along other contractual margins. Conformity rents represent returns to higher soil quality that are captured (unearned) by the tenant because a contract conforms to a regional norm. To the best of my knowledge, no one has previously attempted to estimate how large such distortions or implicit rents are in practice. In this paper I explore this issue using data on economic returns earned under contemporary cropshare leasing (or simply “cropshare” or “share”) contracts in Illinois. The question is whether the observed uniformity in share contracts is essentially illusory, or whether it has a measurable effect on the division of surplus between tenants and landowners.

These tests aim to elucidate an important distinction between economic models that admit a role for customary practices and those that do not. The neoclassical literature on contracts—which includes both principal-agent and transaction cost approaches—suggests that the parties will design a contract to fit their particular needs and circumstances. The soil productivity and other land attributes, the skill of the tenant, the parties’ risk preferences, and the ease of monitoring and enforcement will determine both the type of agricultural contract—cropshare or cash rent —and its specific terms (Cheung 1969; Roumasset and James 1979; Braverman and

Stiglitz 1982; Eswaran and Kotwal 1985; Allen and Lueck 1992, 1993, and 2009; Hayami and Otsuka 1993). The observed uniformity in contractual shares is typically reconciled with the competitive models in one of two ways: the uniformity either reflects an underlying uniformity in the economic fundamentals, or it is merely a superficial distinction and will be negated by adjustments in other contract terms.[2] If, on the other hand, the established custom effectively constrains competition in a meaningful way, distortions from competitive income distributions can be expected to persist as a result of the relative rigidity of the sharing arrangements.

Of course, the situation is different when contracts are not competitively negotiated due to labor immobility, lack of credit markets, and other constraining factors (see Bardhan 1976, 1984; Bardhan and Rudra 1980, 1981, 1986; Bliss and Stern 1982; Lanjouw and Stern 1998; Rudra and Bardhan 1986). In fact, some models of cropshare contracts, devised with reference to developing economies, have sought to reconcile the principal-agent model with contractual uniformity based on the presence of institutional constraints on competition (Agrawal 2002; Allen 1985; Bell and Zusman 1976). In the face of such limits, income distortions may be allowed to persist. Yet in Illinois, cropshare contracts are negotiated in a competitive setting, characterized by well-developed market institutions and substantial labor mobility, so the predictions of standard contract theory should operate with particular force. The evidence suggests, however, that even in this example from an advanced economy, there are substantial rigidities in contractual terms that require some explanation other than the presence of institutional constraints and a noncompetitive setting.

The literature on focal points in bargaining offers some insight into the phenomenon of contractual uniformity. The essential idea, pioneered by Schelling (1960), is that focal points reduce transaction costs by coordinating the players' expectations, thus resolving the indeterminacy inherent in many bargaining situations. The importance of focal points has been demonstrated repeatedly in laboratory situations (see Roth and Murnighan 1982; Roth and Schoumaker 1983; Roth 1985; Binmore et al. 1993), as well as in real-world situations such as bargaining over house prices (Pope, Pope, and Sydnor 2014). It seems reasonable to hypothesize

[2] Allen and Lueck (2009) develop a model within which optimal the cropsharing terms may cluster around a limited set of simple fractions even if fundamentals vary across farms. However, in their framework the resulting contractual uniformity is negated by competition and does not result in unearned conformity rents. I discuss this model in more detail in the following section.

that when contractual bargaining takes place "in the field," the potential transaction costs are even greater and the focal points are all the more valuable. First, if the bargaining process is protracted, this risks damaging the principal-agent relationship even if an agreement is eventually reached. This is costly for parties who must work together after the negotiations are concluded. Second, extended bargaining at the outset may signal the potential for difficulties further down the road when unforeseen contingencies arise. By adhering to a prevailing contractual norm, a party sends a signal that s/he is inclined to follow norms and therefore will be predictable and easy to deal with. Customary shares—and contractual norms more generally—can therefore be viewed as a form of social capital that reduces transaction costs within a given contractual domain (Murrell 1983; Schmid and Robison 1995).[3]

In sum, the various strands in the economic literature suggest two broadly different hypotheses about the effect that norms have on contractual terms. On the one hand, the contract literature predicts that when agreements are competitively negotiated, the terms will adjust to reflect economic fundamentals. Let this be called the *adjustment hypothesis*. On the other hand, the bargaining literature suggests that factor returns may not fully adjust, because such an adjustment would require individually tailored contracts that deviate from the norm and are therefore costly to negotiate. This is the *conformity hypothesis,* which implies that when agents earn a "usual and customary" share, those agents in relationships with high expected total returns will make more than agents in relationships with low expected returns, without having to exert additional effort. This effect will be termed the *rent-to-contractual conformity*, or simply the *conformity rent*.

Notice that the notion of conformity rent is perfectly consistent with rational bargaining. The conformity rent is simply the amount that a rational principal gives up to a rational agent—over and above the agent's marginal contribution to the outcome—in return for the reduced transaction costs that result from adhering to the norm. Note that norm theories do not assert that there is *no* adjustment in the contractual terms or the agent's performance, but merely states that *full* adjustment need not take place.

[3]On the role of fairness norms in labor markets more generally, see Akerlof (1982); Akerlof and Yellen (1990); Fehr, Gächter, and Kirchsteiger (1996); Fehr et al. (1998); Fehr and Schmidt (1999); Gächter and Fehr (2002).

2. Overview of the Illinois Data

The state of Illinois has two distinct regions with different geological histories and soil characteristics. The land in the northern two-thirds of the state (which I will refer to simply as the "North") is mostly flat, the topsoil tends to be thick with good natural drainage, and on average the soil is highly productive. In the southern third (which I will refer to as the "South"), the land is somewhat hillier, the topsoil is not as thick or well-drained, and on average this cropland is less productive. The dividing line between the North and South as defined here corresponds roughly to the southern boundary of the last major glaciation (Mausel, Runge, and Carmer 1975). In both agricultural regions, the farming techniques are similar and the same crops are grown—mainly corn, soybeans, and wheat. Within each region there is substantial variability in soil productivity across farms, but there is also some overlap in soil productivity between the two regions; effectively, many farms in the two different regions essentially have the same soil productivity. The main difference between the regions is that *on average* the land in the South is less productive than the land in the North.

In Young and Burke (2001) it was shown that, *within* each of these two regions, the contractual terms for cropshare agreements are remarkably uniform, but the terms differ markedly *between* these regions. In the North, nearly 95 percent of all share contracts specify an equal division of all crops between the tenant and the landlord. In the South only 14 percent of cropshare contracts use equal division; the vast majority have either three-fifths or two-thirds of all crop production going to the tenant. Significantly, these North-South differences hold up even after controlling for differences in soil quality. Hence, in the South more productive soils earn the same share as poorer quality soils in this region, not the share that is earned by similarly productive soils in the North.

Regional uniformity applies not only to the division of agricultural yields but to other terms in cropshare contracts as well. For example, there are four major classes of inputs needed to grow crops—seed, fertilizers, pesticides, and farm equipment (tractors, plows, harvesters, and so on). Thus, at a minimum, a cropshare leasing agreement can specify a share (or a payment) for each class of input, as well as a share for each of the three major crops. In other words there are at least seven major dimensions along which cropshare contracts can vary, and within each dimension the contractual split can involve any real number between 0 and 1. In fact, however, the vast majority of contracts take the following extremely simple form: the tenant gets a fixed share s_0 for all outputs, he provides another fixed share s_1 of the seed, fertilizer, and pesticides, and provides all of the farm equipment. Denote such a contract by (s_0, s_1). In the North, over 86 percent of the share contracts are (1/2, 1/2). In the South, over 79 percent of the contracts have s_0 = 3/5 or 2/3 and s_1 = 3/5, 2/3, or 1. Thus, the vast majority of all Illinois cropshare contracts use fractional shares with a denominator of 2, 3, or 5 and are structured very simply, considering the number of contractual variations that are theoretically possible.

These uniform features provide prima facie evidence that norms are at work in these arrangements. The question remains whether adhering to the customary share in a region distorts the competitive returns to labor and land. If so, how large is the effect on the bottom line? In this paper I attempt to answer this question by using more extensive data on Illinois farm returns between 1980 and 1994.

Uniformity in the terms of share contracts is scarcely a new observation; in fact it has long attracted the interest of economists (Mill 1848; Marshall 1920). The classical economists, particularly Marshall, tended to emphasize the inefficiency of share contracts compared to cash rent agreements. The modern literature views the problem as one of optimal contracting in the presence of incomplete information. Using this framework one can compare the benefits and drawbacks of share agreements with other types of contracts—such as cash rent, fixed wages, and contingent contracts—in the presence of risk aversion, monitoring costs, and other features of the bargaining environment. (See, among others, Cheung 1969; Stiglitz 1974; Eswaran and Kotwal 1985; Allen and Lueck 1992 and 2009). There have also been attempts to show why the same share division would apply to both inputs and outputs (Braverman and Stiglitz 1982; Allen and Lueck 1993 and 2009).

Allen and Lueck (2009) develop a model in which the terms of cropsharing contracts are designed optimally to solve moral hazard problems that arise in the context of tenant farming. Within this model, the optimal sharing terms may cluster around a limited set of simple fractions, even among a set of farms with various soil productivity ratings. However, this clustering relies on the assumption that competition will guarantee that the most productive tenants win contracts on the farms with the most productive land. If such assortative matching does not occur, in their model the optimal sharing terms are not pinned down and are not expected to cluster around simple fractions. Later in this paper I conduct tests to determine whether assortative matching actually occurs between the tenants and farms in the Illinois dataset; I find that the evidence does not support this outcome.

This paper does not focus on the choice among contract forms, or the contract's internal structure. It concentrates on the relationship between the shares and the consequent returns to labor and land *given that the parties have chosen a share contract*. (Share contracts are used on about half of all Illinois farms that rent land, so many market participants evidently prefer this type of agreement to alternative contract forms.) No prior study has attempted to empirically estimate the effect that uniformity in share contracts has on factor returns.

3. Details of the Illinois Data

The data for the analysis comes from over 6,000 Illinois farms, observed between 1980 and 1994 by the Illinois Farm Business Farm Management Association (IFBFMA). Farm operators enrolled voluntarily in the program, provided annual financial data, and received assistance in recordkeeping and business analysis.[4] Individual responses were anonymous, and there is no reason to suspect systematic misreporting. Although some farm operators supplied data in multiple years, each observation for a given operator occurred on the same farm, a fact that prevents the identification of individual fixed effects.

Table 1 lists the major types of information contained in the data. All of these items are reported at the farm level. "Total" values refer to the amounts for the entire farm operation with no concern for the distribution between tenant and landlord. "Tenant" values refer to the amounts accruing only to the tenant. The data come exclusively from farms operated under share contracts. Therefore the data provide some degree of control for unobserved factors, such as monitoring costs and risk aversion, that might determine selection into a cropsharing agreement as opposed to a cash rent agreement. Although the nominal share is not directly reported in the data, it can be estimated by dividing the tenant's gross income by the farm's total gross income. (Indeed, this formula would constitute an exact estimate of the output share except for the fact that the tenant and the landlord may sell some of their crops at different times for somewhat different prices.) These will be termed the *estimated shares*. In the North, over the 1980–1994

[4]Publication C1344. 70th Annual Summary of Illinois Farm Business Records. University of Illinois Extension Publications, Urbana-Champaign, Illinois, 1994.

period the average estimated share is 0.52 with a standard deviation of 0.11. In the South, the corresponding value is 0.58 with a standard deviation of 0.13.

4. Soil Productivity Rating

An important feature of the data is that it includes a measure of each farm's inherent productivity, meaning the farm's *soil productivity rating*, or *soil rating* for short. This rating system was devised by agronomists at the University of Illinois using the following methodology (Fehrenbacher et al. 1978). First, soils were classified into named *types* according to their color, texture, moisture content, and chemical composition. On a selected panel of farms with a given soil type, agronomists measured the average output per acre of each of the four major crops grown in Illinois—corn, oats, soybeans, and wheat. The inputs were controlled and held to a benchmark level referred to as *basic management practice*. This benchmark level involves the application of seed, fertilizers, and pesticides in specified amounts per acre while following standard procedures for tilling, planting, and harvesting. The *basic corn productivity index* of a given soil type serves as a linear predictor of the soil's expected yield (bushels per acre of corn), holding inputs at their respective benchmark levels. Productivity indexes for oats, soybeans, and wheat were constructed in similar fashion. The *soil productivity rating* θ of a given soil is an average of the indexes for these particular crops, weighted according to the proportions in which these crops are actually grown in the aggregate in Illinois. The survey data report the soil rating at the level of the individual farm, which represents an acreage-weighted average of the soil ratings of the various soil types on the given farm.[5] (This information comes from detailed soil maps.)

To illustrate how this system works, let Y_{corn} denote corn production in bushels per acre on soil with rating θ. Then the estimated relationship under basic management practice is

Basic: $$Y_{corn} = 1.04\,\theta - 0.86 \quad (1)$$

[5]The soil rating for a given soil type, as well as the soil rating for an entire farm, assumes that the various crops are grown in fixed proportions. Field studies show that soybean output is very nearly proportional to corn output on most farms—the ratio being about three bushels of corn per one bushel of soybeans (Mausel, Runge, and Carmer 1975). Moreover, these two crops account for about 90 percent of Illinois's total crop production. Hence, even if a given farm does not grow these crops in the assumed proportions, the farm-level soil index should be quite accurate given that most of the land is planted in a combination of corn and soybeans.

In effect, this equation predicts the expected increase in corn yield that can be attributed to differences in soil quality, holding all other inputs—including tenant expertise—at a pre-specified level. (The relationship is calibrated from controlled soil studies, and is not based on a regression equation, so there is no R^2 or standard error.) On the farms in the dataset, the soil productivity rating ranges from a low of 45 to a high of 100, with a median value of 88 and mean of 86.[6]

Yields for each crop were also measured using a different, higher-level package of inputs called *high management practice*. This involves more intensive cultivation, and a higher application rate of certain fertilizers and pesticides, compared to basic management practice. Under this higher package of inputs, corn production per acre Y^*_{corn} is estimated from the controlled plots to be

High: $$Y^*_{corn} = 1.40\,\theta + 16.82 \tag{2}$$

It is important to compare the benchmark relationships between soil quality and corn yields depicted in equations (1) and (2) to the actual relationship that exists on the farms in the dataset. The observed relationship is not necessarily expected to conform to either of the preceding equations, as the farming inputs and practices actually used may deviate from the controlled values embedded in those equations. To estimate the actual relationship in the data, the corn yield per acre is regressed against the soil rating by using ordinary least squares. Dummy variables for the year of observation are used as control variables. A separate regression also includes an interaction term between the soil rating and a time trend, in which the time trend is just the year of observation specified as a continuous variable.

The first two columns of Table 2 provide the coefficients from the benchmark productivity equations (1) and (2). The results of the simplest regression model, which only includes the soil rating and year dummies, are displayed in Table 2, column 3. The results of the model that includes the interaction between the soil rating and the time trend are shown in column 4. The estimated coefficient on the soil rating in column 3 indicates that the expected corn yield per acre increases by 0.94 bushels for each one-point increase in the soil rating. (The coefficient estimate

[6] A single farm with an outlying soil rating of 4 was discarded from the sample prior to conducting all the empirical analysis.

is significant at the 1 percent level.) The standard error on this estimate is 0.03, which indicates that, among the farms in the dataset, the rate of increase of the corn yield with an increase in the soil rating is significantly smaller than the predicted rate of increase under either the basic management practices (1.04 bushels) or the high management (1.40 bushels) practices.

Table 2, column 4 shows the estimated coefficient on the interaction between the year trend and the soil rating and indicates that the coefficient on the soil rating is increasing between 1980 and1994, presumably due to the adoption over time of improved farming techniques. Figure 1 compares the average estimated relationship between the soil rating and the corn yield during the early part of the data period (this is given by the average of the respective regression lines for the years 1980 through 1984) with the average estimated relationship during the latter part of the period (given by the average of the regression lines for the years 1990 through 1994), and, for reference, includes the basic and high management benchmark relationships. As is readily seen, the slope on the soil rating for the (average) regression line for the 1990–1994 period (at 1.03) is steeper than the slope of the (average) regression line for the 1980–1984 period (at 0.83), and approaches the predicted slope on the soil rating when using the basic management practices (1.04).

Figure 1 also shows that the predicted corn yields at all soil rating values along both the early-period and later-period regression lines fall between the respective expected yields obtained under basic management and high management practices. This result means that in both in the early and later periods of the dataset, the average farming practices, judged by yields, exceeded the basic management standard but fell short of the high management standard, although practices were closer to the high management standard in 1990–1994 than in 1980–1984. Furthermore, yields came closer to the high management standard (in either period) on farms with lower soil ratings than on farms with higher soil ratings. It can be shown that a similar pattern holds for soybeans and wheat; namely, between 1980 and 1994 the average production levels per acre lie between those predicted by basic and high management, but the rate of increase in output with the soil rating is at best only as high as that expected under basic management practices.

5. Estimating Rent Capture by Tenants

Having just established that the contractual terms for cropshare agreements are extremely uniform within Illinois's two broadly defined agricultural regions, now the goal is to demonstrate that this uniformity enables tenants to capture conformity rents. To this end I will show that those tenant farmers cultivating crops on higher quality soils earn more than their counterparts working on lower quality soils, and that this result appears robust to a number of controls and alternative explanations. The Illinois dataset permits a rigorous assessment of this issue because tenant *net* income is observed. This net income is calculated by taking the tenant's total gross earnings—consisting of the proceeds from the sale of his or her share of all crop outputs—and subtracting the tenant's expenditures on inputs such as seeds, fertilizer, equipment, and hired labor, and also subtracting any recorded side payments from the tenant to the landowner.

The key question to be answered is whether tenant income increases with soil quality, as the conformity hypothesis predicts. To test this theory, first tenant net income per acre is regressed against the soil rating and year dummies. The results are shown in Table 3 (Model 1). The estimated coefficient on the soil rating is 0.56 (with a standard error of 0.04), which means that tenant net income per acre increases by $0.56 for each one point increase in a farm's soil rating, or by $5.60 for a 10-point increase in the soil rating. Within the sample, median tenant net income per acre equals $36.78, and therefore an increase in net income per acre of $5.60 would represent a gain of better than 16 percent for the median tenant farmer. On 500 acres of cropland, the premium for a 10-point increase in soil quality amounts to $2,800 per year, a substantial sum.[7] Based on the standard error of the soil rating's estimated coefficient shown in Table 3 (Model 1), the 95 percent confidence interval for this 10-point quality premium runs from $2,400 to $3,200 on an annual basis.

As noted above, the average soil rating is higher on farms in the northern two-thirds of Illinois than in the southern third. The average soil rating may vary systematically across counties as well. If unobserved factors, such as nonfarm wages, also vary across locations and influence tenant net income, such factors might/may confound the estimates of the soil rating's effect on tenant net income. To control for these potential sources of bias, two additional models are estimated: first, a model that includes both a dummy variable indicating whether a farm is located in the South and an interaction term between this dummy variable and the soil rating (in addition to the variables in Model 1); and second a model that includes dummy variables for

[7]Within the sample, the median farm size is 517 acres, and the average farm size is 591 acres.

each county (in addition to the variables in Model 1).[8] The results of these respective models are shown in Table 3, Models 2 and 3.

In Model 2, the coefficient on the soil rating (0.57) does not differ significantly from the corresponding coefficient in Model 1, given the standard errors of the respective estimates. Similarly, the coefficient on the soil rating in Model 3 (0.64) does not differ significantly from the corresponding coefficient in Model 4 (0.55).[9] In Model 2, the interaction between the soil rating and the dummy for being located in the South is insignificant, which means that tenant net income increases with the soil rating at the same rate in the South as in the North. This result shows that the relationship between tenant net income and the farm's soil rating is highly robust to controls for unobserved heterogeneity across regions and counties within Illinois.

6. Earned Income versus Rent Capture

Of course, it is possible that the extra tenant income that accrues from farming on land with better soil quality represents compensation for inputs that the tenant provides rather than true rent capture. I offer three potential variants of this "earned income" hypothesis:

1. Owners of better land extract a greater quantity or higher quality of labor inputs from the tenant.

2. Tenants on better land provide extra amounts of nonlabor inputs, such as fertilizer and herbicides, and adopt practices, such as conserving topsoil, that enhance output in the short run and/or the long run.

3. Through rationing (assortative matching) better tenants secure contracts on farms with better land.

[8] A county is the smallest level of aggregation possible in the dataset. In Model 3 (as well as in Model 4), the estimation is conducted using the subset of counties with at least 80 individual observations in the dataset.

[9] Model 4 is equivalent to Model 1 except that it is conducted over the same sample as that used in Model 3. I estimate Model 4 to ensure that any differences between Model 3 and Model 1 are not driven by the difference between their respective samples.

While these separate variants of the earned income hypothesis rely on different mechanisms, the net effect is similar in each case: tenants enhance crop yields on higher quality soils over and above the additional output that results simply from the higher inherent productivity associated with these better soils. In other words, tenants on higher-quality land earn their higher income by providing the landlord with crop yields that are higher than normal.[10] The crucial point that I will argue here, however, is that the enhanced output must be very large at the margin for this earned income hypothesis to undermine the conformity hypothesis.

Consider a tenant who is working on farm A with a below-average soil rating of 75, and another tenant who is working on farm B with a soil rating of 85, just below the average rating of 85.5. Assume that both farms are in the North and, according to the dominant contractual norm in the North, both tenants are working under contracts which call for a 50-50 sharing of inputs and outputs between the landowner and the tenant. Assume also that both tenants are following the basic management practice recommendations, which means that the labor effort and other nonland inputs will be equal on a per-acre basis across the two farms. Then farm B will produce, on average, 10.4 more bushels of corn per acre than does farm A (see Table 2, column 1) due solely to farm B's higher soil rating. Under the terms of the share contract, the tenant on farm B receives half of this extra output (5.2 bushels per acre), and therefore receives more crop revenues per acre than the tenant on farm A, despite employing the same amount of inputs per acre (and therefore incurring the same costs). This extra net income represents a conformity rent arising from the fact that the share contracts adhere to the regional norm in the North and do not adjust for the differences in soil quality.

In order for the tenant on farm B to earn this conformity rent (and fully compensate the landowner for providing better soil), s/he would have to achieve double the marginal increase in yield that would occur holding the management practices constant across both farms because, under the contractual terms, the tenant takes half of any marginal increase. Therefore, unless the tenant on farm B is able to increase the marginal yields quite dramatically, s/he receives unearned conformity rent. In general, if the tenant's share is *s*, the marginal rate of increase in

[10]These include both immediate and long-run improvements in output. When analyzing the data the difference is immaterial because the data include a large number of farms and observations over many years, so both short-term and long-run improvements are accounted for.

yield must be at least *1/(1 - s)* times the rate of increase under fixed inputs if conformity rents are to be fully offset.

Table 2 and Figure 1 show, however, that the actual marginal rate of increase in crop yields (for Illinois farms operating under share contracts) is no greater than it would be under basic management practice. Based on Model 3 in Table 2, the actual marginal rate of increase for corn (on average between 1980 and 1994) is between 0.9 and 1.00 with a 95 percent confidence interval, whereas the benchmark rate under basic practice is 1.04. Furthermore, the actual rate of increase is much less than it would be under high management practice (1.40). Similar comparisons hold for soybeans and wheat. The analysis in the preceding paragraph indicates that, if tenants were fully earning the additional income enjoyed on higher quality soils, the observed rate of increase of the corn yield with the soil rating would have to be at least 2.0—that is, twice the expected rate of increase expected under basic management practice—and perhaps as high as 2.8, or twice the expected rate of increase under high management practices. Yet the data do not support such a conclusion. Rather, the data suggest that tenants farming on better soils may not be putting in *anything* extra, in which case they are capturing half (or more) of the incremental rent that should be going to landowners. This evidence undermines the assumption made by Allen and Lueck (2009) that competition for land and tenants results in perfect matching between tenant quality and land quality in equilibrium. However, without this assumption their model cannot explain why the terms of cropsharing contracts tend to cluster around simple fractional shares.

The above conclusions rely on the benchmark estimates for basic and high management practice made in the late 1970s, so one might worry that these benchmarks are out-of-date. This concern does not, however, render the argument invalid for the years between 1980 and 1984, the early part of the survey period. Furthermore, as shown in Figure 1, although actual management practice in the field, on average, has improved over time, the average yields have not strayed from the bounds established by the two benchmark levels. Because under controlled but more modern growing practices, the benchmark slopes would need to have changed a great deal to invalidate the above analysis, the likelihood is that some unearned rent is accruing to tenants on farms with more productive soils. The following sections in the paper investigate this possibility.

7. An Alternative Estimate of Rent Capture

Further evidence that tenants are capturing conformity rents is provided by a test that does not rely on the benchmark productivity estimates. In this alternative test I exploit the fact that, at any given point in time, different cropshare divisions can be found on farms that have the same soil rating but are located in different regions. To illustrate with a concrete example, suppose that in a given year the owner of farm A in the North gives the tenant half the gross crop output, whereas the owner of farm B in the South, with the same soil rating, awards the tenant two-thirds of the gross crop production. The tenant on farm B gets an additional 1/6 of each bushel harvested as compared to the tenant on farm A (subtracting 1/2 from 2/3). Since the soil rating remains fixed, tenant A in the North is earning some surplus land rent unless s/he can find a way to compensate the landowner with more or better inputs. Assuming that such a compensating increase in tenant inputs occurs, there should be a positive relationship between (corn) crop yield and the size of the tenant's share, holding constant the soil rating and the year (to control for changes in technology and other temporal fixed effects).

As Table 4 shows, however, there is no such compensating relationship. On the contrary, there is a statistically significant *negative* effect of the share on corn yields. In the hypothetical example above, the difference of 1/6 = 16.67 percent in the shares between farms A and B would result in roughly 2.4 *fewer* bushels of corn per acre being produced on farm B, all else being equal.[11] I conclude that the tenant on farm B is earning more, but is not compensating the landlord with correspondingly greater productivity.

How do tenants get away with capturing conformity rents while operating in a competitive market setting? One possibility is that reservation wages in the South are higher than in the North, so that labor in the South must be compensated with higher shares. But in fact, the case is just the opposite: average nonagricultural wages in the South are lower than in the North.[12] (This is hardly surprising since the North is more urbanized.) Therefore the higher tenant share in the South cannot be a form of compensation for higher wages, as it actually occurs *in spite of* lower wages prevailing in the South.

[11]To obtain this figure, the share difference of 16.67 percent, expressed as the fraction 0.1667, is multiplied by the coefficient on the output share in Table 4 (–14.17), and the result is –2.36.

[12]Illinois Department of Employment Security, Labor Economic Database. See www.ilworkinfo.com.

There is, however, another explanation. The customary tenant shares are higher in the South than in the North, and there is significant overlap in the range of soil ratings observed in the two regions. For example, many farms in both regions have soil index ratings in the range of 65 to 75, but operate under different output shares depending on the location. The farms in this range are at the lower end of the productivity spectrum in the North and in the middle to upper end of the spectrum in the South. What appears to be happening is that the customary share adapts to the *average* conditions present in a region, but is not very adaptable to *idiosyncratic differences* among farms within the same geographic region. The regional rigidity allows tenants in the South growing crops on better quality land to free ride on the higher customary share that prevails there without having to expend more labor (or nonlabor) inputs than do tenants on Northern farms with similar soil productivity.

8. The Risk Premium Hypothesis

The evidence adduced so far suggests that tenants operating under share contracts tend to earn higher incomes when working on higher quality soils, even though the marginal output does not increase enough to justify these higher payments. Might there be some hidden costs borne by the tenant (or a hidden benefit for the landowner) that offset this apparent rent capture? One possibility is that the higher payments are the equivalent of a risk premium. A farmer's annual income is extremely uncertain due to price and weather shocks. For example, the sample mean of tenant net income per acre on average-quality soils (θ = 85 or 86) is $39.44 per acre and the standard deviation is $36 per acre. (This apparent discrepancy arises because net farm income is potentially negative in any given year depending on random factors such as weather, pests, and commodity prices.) If the riskiness of returns (as measured by their variance) increases with the soil quality, and if tenants are risk averse, then a tenant's expected income would have to rise when working on better quality soil in order to compensate for the increased income risk.

It would be ideal to estimate the variance of income at the farm level and regress this quantity against the land's soil quality. Unfortunately the data do not permit this calculation because individual farm tracts are not followed for a sufficiently long period of time. Instead, I regress tenant net income against the soil rating and dummy variables for each county, compute the squared residuals, and then regress these against the soil rating.[13] This latter regression tests for whether there is a systematic positive relationship between the *variance* of a tenant's net income and the soil rating, controlling for *expected* tenant net income as a function of soil rating and county. The results of this latter regression indicate that no such systematic relationship exists: at 1.40, the estimated coefficient on the soil rating is indeed positive, but the standard error of 3.56 implies that the coefficient does not differ from zero in a statistically significant way. Based on this test, the data fail to support the hypothesis that conformity rents represent compensation for greater tenant income variability.

9. Turnover Costs

The final alternative to consider is that someone who owns higher-quality land benefits from paying a premium to the tenant because in doing so he ensures lower turnover costs. The payment serves as an incentive for the tenant to remain working the land for an extended period, and so the payment may be justified because the landlord saves money by not having to incur as frequently the costs of searching for a new tenant. In this scenario, the premium payment is not compensation for increased effort or skill on the part of the tenant, potential explanations that were ruled out in previous sections. This section examines whether the premium can be explained solely as an incentive to reduce tenant turnover and its associated search costs. The prediction is that the length of tenure increases with soil quality, and that it increases sufficiently rapidly to justify the higher income that tenants can expect to earn from growing crops on higher quality soils.

Unfortunately the Illinois data do not report the length of tenure on each farm operation governed by a cropshare contract, so this hypothesis cannot be tested directly. Nevertheless the data contain enough information to check the general plausibility of the hypothesis. An extensive survey conducted by the Illinois Cooperative Extension Service (1995) reports that for farms using share leases, the average length of tenure is 14 years. This tenure length can be expressed as a turnover rate of 1/14 or approximately 0.071, which represents the probability that the tenant

[13]This regression includes observations from all counties regardless of the number of observations per county. However, the regression results described in this paragraph are robust when restricted to observations from counties with at least 80 observations each.

quits in a given year.[14] Assume that the tenure hypothesis is correct, so that the annual turnover rate *τ(θ)* on soils of quality θ declines as θ increases. If the average tenure is 14 years, then there are quite a few farms (those with higher quality soils) on which the tenant is in place for at least 14 years. It seems safe to assume that this is the case on the farms with top-tier soil productivity ratings——those with θ between 90 and 100. It is reasonable to assume that maximum tenure length on a single farm is on the order of 40 years, which implies a minimum turnover rate of 0.025. Assume that this minimum rate is actually achieved on the soils of highest quality (θ = 100), and assume that the average turnover rate holds on farms with θ = 90. It follows that the differential turnover rate between farms with θ = 90 and those with θ = 100 equals 0.071 – 0.025 = 0.046, that is, 4.6 percent. This estimated difference is likely to be generous for two reasons: one, the actual turnover rate on farms with θ = 90 is likely to fall below the average turnover rate—on the assumption that turnover declines with soil quality—because a soil rating of 90 is above the average value (85.5); and two, the actual turnover rate on farms with θ = 100 might be greater than the minimum rate.

Assume that, in the event the tenant quits, it costs *S* dollars to find a new tenant in a reasonable amount of time. An upper bound for *S* can be estimated based on the argument that the premium paid for lowering the turnover rate will not exceed the resulting reduction in expected search costs. On a farm with a of soil rating of 100, the premium paid to the tenant compared to one working on a farm with a soil rating of 90 is approximately \$5.60α, where α denotes the acreage, and the expected savings in search costs on the higher-rated farm (for an estimated 4.6 percent reduction in the turnover rate) equals 0.046(*S*). For a risk-neutral landlord this implies that the total search cost, *S*, is not less than 5.6α/.046, which comes to 124α.[15] Evaluated at the median farm size of 517 acres observed in the dataset, the estimated minimum search cost amounts to \$64,108. Even for a farm half this size, the minimum search cost estimate is over \$32,000, which is still substantial.

Although there is no direct evidence regarding the actual magnitude of a landlord's potential search costs, these estimates nonetheless seem implausibly high when considered solely in

[14]To see this relationship, note that if the quit probability per year is 0.071, the cumulative quit probability over a period of 14 years equals (0.071)*14, which is approximately one. Therefore, on average a tenant will quit after 14 years on a particular farm.

[15]Given the nature of the estimate, the reduced turnover rate is probably considerably lower than 0.046 and hence the implied search cost likely is considerably higher.

relation to tenant net income. Considering farms with soil ratings of 100 (because the search costs were estimated based on the turnover benefits to owners of such farms), \$38.77 is the median tenant net income per acre, and therefore a median farm size will earn a total annual net income \$20,044, less than one-third the estimated minimum search cost for finding a new tenant.[16]

A second difficulty is that the relationship implies that search costs increase with farm size, when it is not obvious that this should be the case. One the one hand, it is generally easier to find tenants for larger tracts because, for example, it is more efficient to farm a single large, contiguous tract than it is to farm a set of smaller, separate tracts amounting to the same acreage. On the other hand, if monitoring costs are higher on a larger farm, owners of large parcels may be willing to pay higher search costs *ex ante* to find a trustworthy tenant in order to avoid monitoring costs *ex post*.[17] In the event that the search costs do increase with farm size, conformity rents are also expected to increase with farm size, since owners of larger farms should be willing to sacrifice more profit to avoid these higher search costs. To test this possibility, tenant net income per acre is regressed against farm size (in acres), controlling for the soil rating and year dummies. The estimated coefficient on farm size is effectively zero—the point estimate is 0.0001 and the standard error is 0.0014—which means that the premium paid to the tenant per acre (controlling for soil quality and year) does not depend on farm size. While the duration of tenure cannot be ruled out as a possible factor in determining tenant premiums, it is unlikely to be more than a minor factor in the calculation.

10. Summary and Conclusion

In Illinois agriculture, cropshare contracts are quite common; between 1980 and 1994, the period under study, these agreements constituted over half of all rental contracts for farmland. Furthermore, the nominal terms in Illinois cropshare contracts exhibit a high degree of rigidity within the state's two farming regions. In the North almost all share contracts specify that the landowner and tenant equally divide the crop yields. In the South the vast majority of cropshare

[16]A very similar income figure is obtained when looking directly at the distribution of annual total tenant net income (per farm rather than per acre) on farms with soil ratings of 100. This distribution has a median value of \$20,019.

[17]This is a farm-as-firm variant of the argument made by Barron, Black, and Loewenstein (1987) that larger firms will have higher employee monitoring costs and will therefore be willing to engage in more intensive and costly searching and screening of employees in order to minimize the need for monitoring.

contracts specify either a 3/5 or 2/3 split that favors the tenant. Thus there is strong prima facie evidence for the existence of regional norms, and these norms do not appear to adjust for idiosyncratic differences among farms within each region. This discrepancy leads to the hypothesis that, due to rigid contractual terms, tenants are able to extract some of the rent that would ordinarily accrue to the owners of more productive farmland.

This hypothesis was tested in several different ways. First it was shown that tenant income rises significantly as the soil quality increases, but that gross crop yields do not increase any more than would be expected under controlled levels of management inputs. This result suggests that when tenants receive their customary share, s, of output, they effectively capture about s of the marginal increase in output that would ordinarily be attributed to increases in soil quality. Further evidence of rent capture stems from the finding that, holding soil quality constant, tenants earning higher shares failed to produce above-average crop yields. The variation in customary share divisions is not explained by regional wage differentials, since the South, the region with the larger customary share division, actually has lower average wages compared to the North. Neither the risk-premium explanation nor the explanation relying on reduced turnover costs explains any substantial portion of the conformity rents that tenants earn under contracts that adhere to local norms.

Admittedly, the analysis does not eliminate every possible alternative explanation for the presence of these conformity rents that are captured by the tenant. For example, the tenants working on the better farms may confer other benefits to the landlords that almost no dataset will be able to capture—such as engaging in farming practices that maintain soil productivity in the long run, contributing to the maintenance of barns and silos, or simply offering a more pleasant business relationship. The analysis does show, however, that these benefits would have to be quite substantial if they are meant to offset the cost of the premium being paid to these tenants.

A more plausible explanation is that tenants are able to extract rents under share contracts because of the benefits that both the landowners and tenant farmers derive from conforming to regional custom. Deviating from the established norm is potentially costly for both parties, first because it may entail a protracted bargaining process, and second because a lack of adherence signals that the principal, the agent, or both parties may be unpredictable and difficult to work with. Although contractual conformity may cause factor returns to deviate from their competitive levels, the benefits of adhering to custom may outweigh the cost of such distortions.

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Table 1. Data Reported in the IFBFMA Management Analysis Program, 1980–1994

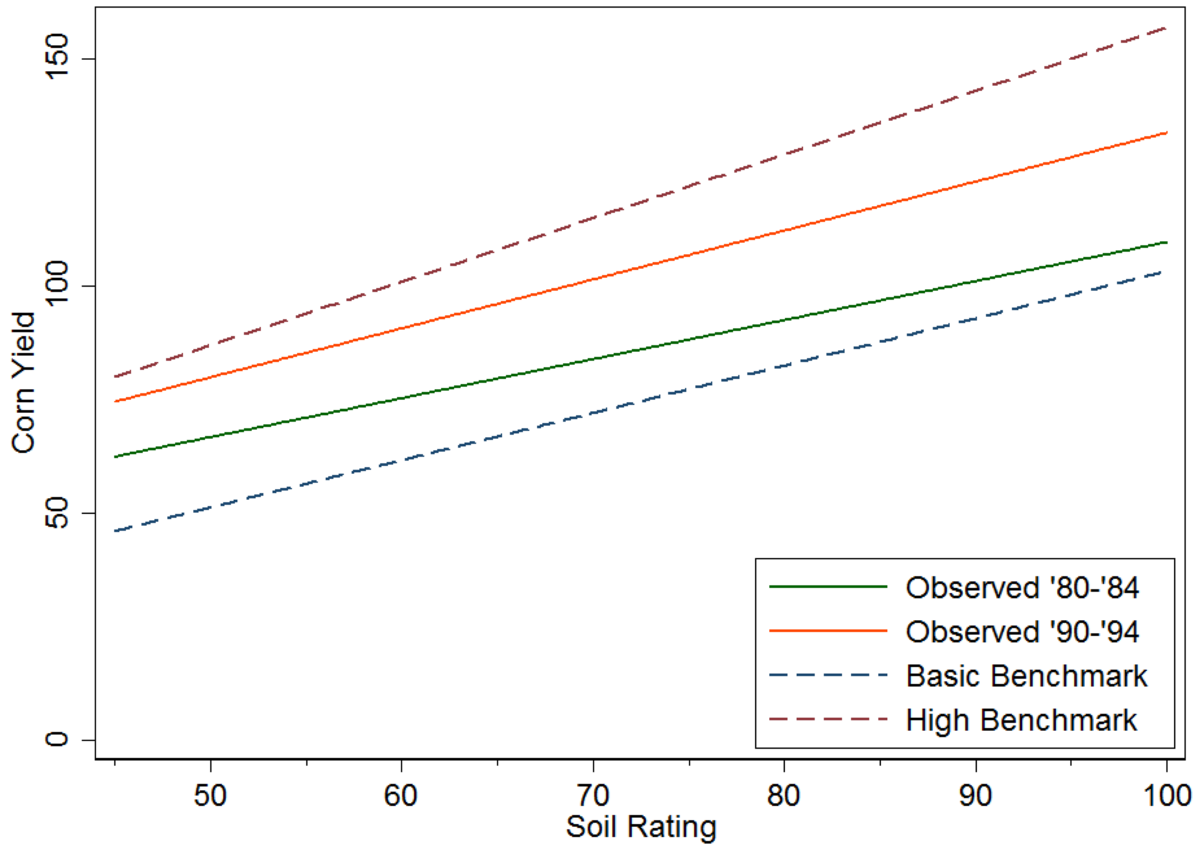
Soil Productivity Rating
County Location of Farm
Number of Acres under Lease
Year of Observation
Corn, Soybeans, and Wheat Yields per Acre
Total Gross Farm Income per Acre
Tenant Gross Farm Income per Acre
Total Net Farm Income per Acre
Tenant Net Farm Income per Acre
Total Cash Expenditure per Acre
Tenant Cash Expenditure per Acre
Total Depreciation and Capital Expenditure
Tenant Depreciation and Capital Expenditure

Table 2. Relationship of Annual Corn Yields (Bushels per Acre) to Soil Quality

Independent Variables	1. Basic Benchmark	2. High Benchmark	3. Observed Yields	4. Observed, with Year Trend
Constant	–0.86	16.82	16.15*** (2.95)	27.14*** (4.87)
Soil Rating	1.04	1.4	0.94*** (0.03)	0.79*** (0.06)
Soil Rating * Year				0.02*** (0.01)
Year Dummies			Yes	Yes
Sample Size			5,057	5,057
R-squared			0.5966	0.5972

Notes: The standard errors are in parentheses. The constant terms in columns 3 and 4 refer to 1980. The coefficient on the soil rating in the rightmost column refers to 1980; the coefficients for later years are obtained by multiplying the interaction term (0.02) by the number of years since 1980 and adding this amount to the soil rating coefficient for 1980 (0.79).

Figure 1. Corn Yields per Acre Under Different Management Practices as a Function of the Soil Productivity Rating



Notes: The line labelled "Observed '80-'84" represents the average regression line for the years 1980 through 1984, based on the regression results shown in Table 2, Column 3. (The y-intercept of the line represents the average of the y-intercepts for each of the years in the range and the slope of the line represents the average coefficient on the soil rating for the years in the range, as determined by the base coefficient on soil rating and the coefficient on the interaction term between the soil rating and year, where the year is expressed as the difference between the given year and 1980.) The line labelled "Observed '90-'94" represents the analogous average regression line for the years 1990 through 1994. The "Basic Benchmark" line refers to the relationship between the soil rating and corn yields predicted under basic management practices, and the "High Benchmark" line refers to the relationship between the soil rating and corn yields predicted under high management practices.

Table 3. Tenant Net Income per Acre in Relation to Soil Quality, Region, and County

Independent Variables	Model 1	Model 2	Model 3	Model 4
Constant	17.39*** (3.94)	15.87*** (4.91)	6.92 (7.02)	16.10*** (5.15)
Soil Rating	0.56*** (0.04)	0.57*** (0.05)	0.64*** (0.07)	0.55*** (0.06)
South		–7.85 (9.20)		
South * Soil Rating		0.15 (0.12)		
Year Dummies	Yes	Yes	Yes	Yes
County Dummies	No	No	Yes	No
Sample Size	5,057	5,057	3,942	3,942
R-squared	0.160	0.161	0.178	0.167

Notes: The standard errors are in parentheses. The dependent variable is tenant net income per acre, in 1982–1984 dollars. Model 1 and Model 2 employ the full sample of farms. Models 3 and 4 include only the 25 counties with at least 80 observations for each county. Model 3 includes the county dummies in the regressions and Model 4 does not. Model 5 is the same as Model 4 except for the addition of farm size as a possible explanatory variable (which turns out not to be significant). The constant terms refer to 1980.

Table 4. The Relationship of Corn Yields (bushels/acre) to Output Shares

Variable	Coefficient
Constant	25.06*** (3.52)
Output Share	–14.17*** (3.06)
Soil Rating	0.92*** (0.03)
Year Dummies	Yes
Sample Size	5,057
R-squared	0.598

Notes: Standard errors are in parentheses. The dependent variable is corn yield during a given annual growing season. The constant term refers to 1980.