

Contract Choice and Legal Change in Medieval England*

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Abstract

This paper proposes a solution to a longstanding puzzle of medieval economic history. Throughout Europe over the course of the Middle Ages, tenant farming became more common relative to direct management, while in England around the thirteenth century, this trend briefly reversed. Also, sharecropping was common on the Continent and between peasants in England, but rare in England between tenants and lords.

This paper models the lord-peasant relationship as a one-period game where contract form is chosen as the result of a tradeoff between incentives for high effort and excessive risk-bearing. Sharecropping is ruled out between English tenants and lords because of pleading requirements for the writ of debt in central royal courts. The model explains increased leasing as the result of improved outside options for peasants, and also explains why small landowners are more likely to manage their land directly and why large landowners are more likely to lease their small estates than their large ones.

When freehold and leasehold property rights are insecure, improved freehold protection tends to increase direct management and improved leasehold protection tends to increase leasing. The stylized facts about medieval agriculture match the timing of changes in English property law.

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1 Introduction

1.1 The puzzle

In this paper, I propose a solution to a longstanding puzzle of medieval economic history. Throughout Europe over the course of the Middle Ages¹ on feudal lords' agricultural estates (or "demesnes"), tenant farming became more common relative to direct management, while in England around the thirteenth century, this trend briefly reversed.

¹For the sake of convenience, I use the terms "Middle Ages" and "medieval" in this paper to refer to the period 1100–1500, though the term can also be used to refer to the period 500–1500.

I explain the baseline move toward tenant farming as the result of increasing wages and living standards. In England as on the Continent, lords moved toward greater leasing as peasants became better off and therefore less risk averse and more willing to take on tenancy contracts, which carry greater risk but also greater incentives for productive effort. For the specifically English evolution, I propose a contract-theoretic explanation based on legal change. I explain the move toward direct management as a result of the increased protection of freehold property rights in the early Middle Ages, and the move back toward leasing as a result of the increased protection of leasehold property rights in the late Middle Ages. This explanation is more plausible than most of the existing theories of contract choice in medieval agriculture, and matches the English trends with English legal history.

The rest of this section gives an overview of medieval agriculture and the feudal system, and provides a rough chronology of trends.

Part 2 surveys the economic and legal history literature on the topic, and critiques some of the existing explanations of the trends in contract choice.

Part 3 models contract choice a one-period game between a lord and peasant, where the choice between direct management and leasing trades off risk sharing and incentives to exert high effort. I show in this section (1) why there was so little sharecropping in England between tenants and lords, (2) why we should expect increases in peasants' wages to increase leasing, provided the disutility of effort is not too high, (3) why we should expect small landowners to do more direct management, and (4) why we should expect that large landowners with many demesnes of differing sizes will be more likely to lease their small demesnes than their large ones.

Part 4 introduces insecure freehold property rights and shows that direct management will increase as the security of freehold property rights increases, provided the disutility of effort is not too high.

Part 5 introduces insecure leasehold property rights. I show in this section that leasing will increase as the security of leasehold property rights increases, provided peasants are risk-averse enough.

Part 6 concludes.

1.2 A whirlwind tour through the agricultural sector

The basic unit of agricultural organization in the Middle Ages was the manor, which we may define as “an agricultural estate, great or small, over which lordship was exercised” (Bolton (1980, p. 17)). In the typical manor (see Shepherd (1911, p. 104)), some of the land (“glebe”) would be held by the church, while the rest would be divided into the “demesne”² — the land over

²The word “demesne” may be pronounced to sound like “demean,” or alternatively to rhyme with “remain.” We may use the term “seigniorial sector” to represent demesnes that were directly managed by their lords. The seigniorial sector was always less important than the non-seigniorial sector (which includes both customary land and leased demesnes) (see Campbell (2000), p. 3). Some historians adopt a different convention and use “demesne” to refer only to the seigniorial sector. For instance, Bolton (1980, p. 17) refers to “the demesne

which the lord of the manor retained direct control — and customary (that is, unfree) tenures, in a ratio of roughly one to two. Both the demesne and customary tenures would typically be scattered throughout the fields, instead of being a single block (see Bolton (1980, p. 17), Campbell (2000, p. 365 & n. 117)).³ See Appendix 1 for a stylized representation of a generic medieval manor.

There were many sorts of men in the Middle Ages, both free and unfree. By the time the legal treatise *Bracton* was written in the 1240s or 1250s, the most extreme forms of personal servitude had disappeared in England. Unfree men or “villeins” had three main disabilities at common law: the lord could seize a villein’s property (though barring this, villeins could hold and transfer property); the lord could exercise some amount of corporal discipline over a villein without being liable to an action of trespass; and the lord could prevent the villeins’ escape from his tenement by force (see Baker (1990, pp. 532–534)).

There were also many sorts of land tenures, both free and unfree — depending on what sort of work was required of the tenant — and according to *Bracton*, free and unfree tenures did not necessarily correspond to free and unfree men: either a villein or a free man could hold a free tenure from one lord and an unfree tenure from another. If the lord could demand any kind of work of the tenant, the tenure was “unfree” and was called “villeinage”; if the labor services were fixed (say, helping the lord with sowing or reaping at certain times), the tenure was called “socage.” These labor services were often commuted for cash payments. The freehold tenant owed few labor services to his lord (harvest work sometimes on the lord’s land, and the obligation to attend the lord’s court), could buy or sell land more or less freely, and was allowed to sue in the royal courts (to the extent these were available).⁴

There were many sorts of landlords besides demesne lords, but the activities of demesne lords are the best documented. Demesne lords could be either lay or ecclesiastical (for instance, bishoprics or monastic houses) (see Harvey (1988, pp. 78–85, 97–121), Campbell (2000, p. 1)). This paper will concentrate on how demesne lords managed their demesne.

Finally, there were three main ways a lord could manage his demesne:

- If he managed his demesne directly, he would appoint various officers — bailiffs and reeves — to run the estate and possibly sell its produce. These officers would hire paid estate laborers (*famuli*), skilled hired labor (such as ploughmen), and customary tenants.⁵
- Or he could lease portions of the demesne out to freehold tenants (Bolton

and the tenants’ or the customary land,” lumping all tenants together with customary land, but this inappropriately mixes customary land with portions of demesne leased out to free tenants.

³On the practice of scattering, see McCloskey (1989), who argues that it was a form of hedging against risk.

⁴See Baker (1990, pp. 259–262), Bolton (1980, pp. 18–21), and Postan (1978, p. 524).

⁵Stacey (1986, pp. 191 n. 1, 920 n. 4) refers to the directly managed part of the demesne as the “manorial inland” or “direct[ly] manage[d] manorial inland.”

(1980, p. 40).⁶

- One sometimes sees sharecropping or “champart,” an intermediate form of land management in which the rent is equal to a specified portion of the agricultural produce, say a third or a half. Champart rent is rather rare in England, though one does see it often in secondary leases (i.e., from one peasant to another) of customary tenancies.⁷

1.3 A rough chronology of direct management and leasing

On the Continent (that is, in modern-day France and Germany), the contract mix shifted regularly toward leasing throughout the Middle Ages (Poynder (2003, ch. 1), Duby (1962, vol. 2, bk. 3, ch. 4)).

In England, the contract-mix trend reversed itself twice over the course of the Middle Ages.

One would like rigorous land tenure records in convenient, time-series form from Anglo-Saxon to Tudor times, but we will have to instead content ourselves with snippets of evidence at irregular intervals, produced by historians who have undertaken intensive studies of particular estates where land tenure records were preserved. Naturally, there was some regional variation in the timing of these changes, but the broad outlines seem consistent across regions (see Du Boulay (1965, p. 444)). The following chronology is useful not for the precise timing of changes on particular estates, but for the stylized facts it generates — the broad movements in the amount of land being directly managed as opposed to leased.

Leasing was common both before and after the Conquest, particularly on ecclesiastical estates, and the twelfth century inherited and extended this system of leasing.⁸ While Postan interpreted the twelfth-century leasing of demesnes and commutation of labor services as a sign of economic stagnation and depletion of manorial assets, other economic historians, such as Bridbury (1978, pp. 513–514) and Faith (1994, p. 657), have described leasing as potentially good for the manorial economy.

The trend toward leasing reversed itself either early or late in the thirteenth century, depending where one looks.⁹ But this period of direct management

⁶There were different kinds of leasing — a piece of land could be “assized,” that is, made into a permanent tenancy, or it could be held *de dominio*, that is, let on short-term lease, in which case it continued to be considered part of the demesne. See Faith (1994, p. 671).

⁷See Hilton (1990, pp. 512–515; 1987), North and Thomas (1971), Reed and Anderson (1973, p. 136 n. 6), and Stacey (1986, p. 924).

⁸See Postan (1953, pp. 359–362; 1956, pp. 112–118), Bridbury (1978, pp. 505–509, 516), Miller (1971, pp. 7–8; 1973, p. 139), Bolton (1980, p. 40), and Faith (1994, p. 671). But see Bridbury (1978, pp. 503–504) and Lennard (1956, pp. 359, 363), questioning this evolution.

Demesnes and free peasants may have accounted for about 58% of the rural component of national income in 1086; excluding consumption by free peasants reduces this to 45%, and excluding their traded surplus reduces it still further. (So perhaps 20% of land was held by free peasants at the time of Domesday.) A third of plough-teams seems to have been held in demesne in 1086. (See Campbell (2000, pp. 56–58).)

⁹For the “early” story, see Biddick (1990, pp. 11–13), Bridbury (1978, p. 518), Harvey

— which did not occur on the Continent (see Biddick (1990, p. 11)) — was no more than “a substantial interlude in the age-long system of leasehold farming” (see Miller (1971, p. 14)). The shift back toward leasing may have begun in many places in the early fourteenth century — the process was well under way before the Black Death (1348), and may even have been retarded rather than sped up by the Death in some places — though some date the shift to the second half of the century.¹⁰

In any case, whether the seignorial share of agricultural production at the beginning of the fourteenth century was closer to a third or a fifth, the share declined by perhaps half over the course of the century (see Campbell (2000, p. 60)). Overall, leasing of entire demesnes for a period of years, instead of annual piecemeal leases, seems to have become more common.¹¹ From the 1370s on, leasing was more common than direct management, and demesnes that remained in hand “were mostly restricted to the home farms of monastic and noble households.”¹² By the mid-fifteenth century, direct management had been all but abandoned (Campbell (2000, pp. 3, 59–60, 235 tbl. 5.03)).

The table in Appendix 2, from Poynder (2003), summarizes changes in methods of demesne management on 42 estates.

The direct management/leasing choice also presented itself in other agricultural contexts; for instance, water-mills and windmills could also either be attached to the demesne or rented out (see Langdon (1991, p. 429)). The chronology of direct management and leasing of mills roughly tracks the chronology for land — leasing during the twelfth century, moving toward demesne status from the end of the twelfth century through the thirteenth century, and moving back toward leasing around the mid-fourteenth century (Langdon (1991, p. 437)).

There is some evidence that minor landlords were more likely to manage their lands directly, and that large landowners with many demesnes of differing sizes were more likely to lease their small than their large demesnes (Poynder

(1975, pp. 345, 353), Mate (1983, p. 331), and Miller (1971, pp. 2–4, 10).

For the “late” story, see Campbell (2000, pp. 57–59) who, following Kosminsky (1956), notes that the Hundred Rolls of 1279 record that 32% of land was “in demesne” and “leasing was of limited importance” at the time (in Campbell’s terminology, “in demesne” means “held by the lord,” though not necessarily directly managed), so the share of arable in the direct control of landlords was perhaps between 25% and 30% (40% was in the hands of villein tenants and 28% was in the hands of freehold tenants). Campbell estimates that by 1300, the national share of land held “in demesne” was perhaps closer to 20–25%, and “the share of arable in the direct control of landlords” was closer to 20%. This is consistent with an estimate that puts the 1300 demesne share of rural national income at 20% (pp. 56–58).

¹⁰On the shift back toward leasing in the early fourteenth century, see Campbell (2000, p. 59), Dyer (1989, p. 37), and Harvey (1969, p. 19); in particular, see Bolton (1980, pp. 181, 206), Campbell (2000, p. 59), Harvey (1969, p. 17), and Lomas (1978, p. 345 tbl. 2), on the timing relative to the Black Death. For the view that the shift occurred after the Black Death, see Bolton (1980, pp. 58–59, 188), Britnell (1991, p. 614), Du Boulay (1965, pp. 445–446), Halcrow (1955, p. 350), Hare (1981, pp. 1–2), Harvey (1969, p. 19), and Mate (1983, p. 337). Lomas (1978, p. 339) suggests that the shift to leasing began before the Black Death but that the shift to *long* leases happened after the Black Death.

¹¹See DuBoulay (1965, pp. 445–446), Halcrow (1955, pp. 355–356), and Harvey (1969, p. 19).

¹²Bolton (1980, p. 220); see also Campbell (2000, p. 59).

(2003, ch. 1)).

2 Literature review

On agricultural contract choice generally, see the excellent survey articles by Binswanger, Deininger, and Feder (1995) and Otsuka, Chuma, and Hayami (1992). See Glaeser and Shleifer (2002) for an economic analysis of medieval law on England and on the Continent. A seminal theoretical article on optimal contracts in the presence of moral hazard is Grossman and Hart (1983).

The most popular explanation among economic historians for the change in contract mix in medieval England has been movements in prices and wages:

- Rising wages made direct management, with its demand for hired labor, more expensive relative to farms worked by family labor, and therefore decreased the amount of land under direct management.¹³
- Falling grain prices made production for the market less profitable, and therefore increased lords' willingness to rent their lands for cash.¹⁴
- Rising land values, due to the pressure of population on land, made lords more willing to rent.¹⁵
- Ups and downs in leasing are also attributed to the price and wage stories together, more generally to ups and downs in economic conditions (with hard times associated with leasing), or simply to cash flow problems on the part of the lord.¹⁶

Many of the price-based explanations implicitly assume that lords, as direct managers, produced primarily for the market while peasants, as lessees, produced primarily for personal consumption;¹⁷ but in fact, both lords and peasants had access to, and participated in, the market, and also produced for home consumption.¹⁸ Also, these explanations generally do not explicitly include both risk aversion and moral hazard, without which price movements may not affect contract choice¹⁹ and, more importantly, implicitly do not take

¹³Bolton (1980, pp. 208, 220), Campbell (2000, pp. 10, 59), Postan (1978, p. 522), Stacey (1986, p. 925). But see Du Boulay (1965, p. 450), disputing this explanation in Canterbury.

¹⁴Campbell (2000, p. 59), Langdon (1991, p. 437) (for the case of mills), Mate (1983, p. 331), Postan (1978, p. 522).

¹⁵Campbell (2000, p. 232), Halcrow (1955, p. 355).

¹⁶Bolton (1980, pp. 45, 100, 188–189, 218–219), Campbell (2000, pp. 233–236, 431), Halcrow (1955, p. 348), Lomas (1978, p. 339), Langdon (1991, p. 437), Miller (1971, pp. 11–14), Du Boulay (1965, p. 444).

¹⁷Bolton (1980, pp. 45, 62), Campbell (2000, p. 203).

¹⁸Campbell (2000, pp. 56, 194 tbl. 5.01, 196 tbl. 5.02, 200–203), Dyer (1989a, pp. 71–85; 1989b, pp. 305–06, 310), Epstein (1994, p. 474). See Jones (1993) for evidence of the spread of market institutions in England even before the Norman Conquest (1066).

¹⁹In the model presented later in this paper, if there is only one effort level, say $e = 0$, then direct management is always optimal because there is no need to motivate high effort levels: $\Delta \equiv q(0) - v^{-1}(\bar{u}) - r$, subject to $Ev(q(0)\theta - r) = \bar{u}$, is always positive, because $v(q(0) - r) >$

into account that wages, agricultural prices, and rents are related variables that are determined simultaneously. Finally, the relevant price movements are not restricted to England (see Poynder (2003, ch. 2)).

Palmer (1985) offers a monetary explanation and argues that twelfth-century inflation encouraged direct management (see Appendix 3 for a chart of the price of a representative bundle).²⁰ The inflation explanation implicitly assumes that indexation is impossible. But we do have examples of rental contracts where rents increased according to a predetermined schedule,²¹ and substantial evidence of rent payments in kind, which are a form of automatic indexation.²² Moreover, the inflation was not restricted to England (see Poynder (2003, ch. 2)).

Miller (1975, pp. 15–16) offers an institutional explanation and argues that fourteenth-century tax policy encouraged leasing. Others, notably Postan, have suggested that political turmoil may encourage leasing, though the chronologies of political turmoil and leasing do not line up neatly, either in England or on the Continent.²³ Duby (1962) suggested that direct management was a response to the English crown’s appropriation of seignorial revenues. Fenoaltea (1975b) presents a contract-theoretic explanation of the changes in contract mix based on two-sided moral hazard and the need to provide landlords with incentives to introduce agricultural innovations in the thirteenth century; but the same innovations were available and were in fact in greater use in western Europe during the thirteenth century, and moreover, it is uncertain whether the thirteenth century was really more innovative than other centuries (see Poynder (2003, ch. 2)). Britnell (1993) gives a legal explanation of direct management, arguing that changes in property law made leases dangerous to landlords by threatening to convert them into inheritable tenancies, though his hypothesis only concerns life tenancies (not tenancies for terms of years). Poynder (2003), relying on the informal property rights model in Barzel (1997), has suggested a legal explanation of contract choice based on contract-theoretic considerations (among other factors) and consistent with the model I present here.²⁴

Among non-rational-choice explanations, some historians have suggested

$\bar{u} \implies r < q(0) - v^{-1}(\bar{u})$. With different effort levels but without risk aversion, say if $v(x) = x$, then leasing is always optimal because there is no need to dilute peasant incentives by reducing risk: $\Delta \equiv q(0) - v^{-1}(\bar{u}) - r = q(0) - \bar{u} - r$ subject to $Ev(q(e_H)\theta - r) - g(e_H) = q(e_H) - r - g(e_H) = \bar{u}$, is always negative because $r = q(e_H) - g(e_H) - \bar{u} > q(0) - v^{-1}(\bar{u})$. So without both risk aversion and the need to motivate high effort, changes in agricultural prices (which can be modeled here as increases in $q(e_H)$, since price is normalized to 1) do not affect the contractual mix, and neither do changes in wages or rents (which are really derived variables, but which could be understood as changes in \bar{u}). But see Allen and Lueck (1995, 1999), who dispute that risk aversion really is a driving factor in agricultural contract choice.

²⁰See also Dyer (1989a, p. 35), Bridbury (1978, p. 519), and Reed and Anderson (1973, p. 136). But see Bolton (1980, p. 188), arguing that direct management is more beneficial during deflation because it avoids the problem of defaulting tenants.

²¹See Bridbury (1978, p. 517), Miller (1971, pp. 4–5), Halcrow (1955, pp. 348–349).

²²See the footnote in the section on sharecropping.

²³Postan (1956, p. 118; 1978, p. 522), Miller (1971, pp. 4–5), Bridbury (1978, pp. 504–505), Mate (1983, p. 334), Lomas (1978, p. 343).

²⁴See also the interesting debate between North and Thomas (1971) and Fenoaltea (1975a) for institutional explanations of this phenomenon.

that landowners who were busy acquiring new land did not care so much about maximizing their return from their existing land (perhaps a behavioral story),²⁵ that large estates were too large to allow for landowners to keep track of profit on individual demesnes,²⁶ or that feudal and ecclesiastical landowners had a noneconomic mentality.²⁷ Others focus on the larger political model and suggest that leasing could have been a means of patronage.²⁸

3 The baseline model with secure property rights

3.1 Setup

I model the direct management-leasing choice as a one-period game with two players, a lord and a peasant. The model in this section, which sets up the baseline trend that occurred over the Middle Ages in Western Europe generally, is a standard principal-agent model with risk aversion and moral hazard (see Grossman and Hart (1983)).

Agricultural production is a random variable equal to $q(e)\theta$, where $e \in \{0, e_H\}$ is productive effort ($q(0) < q(e_H)$), and $\theta \geq 0$ is a random variable with mean 1 and distribution function $F(\theta)$.²⁹ The harvest $q(e)\theta$ is sold on the market at a price normalized to 1, so the expected revenue from the sale of agricultural produce is equal to $q(e)$.

The lord is risk-neutral and has a utility function Π that only depends on his profit x ; thus, $\Pi(x) = x$.

The peasant is risk-averse and has a utility function u that depends positively on his net revenue y and negatively on his effort e . I assume, for simplicity, that u is additively separable in y and e , so $u(y, e) = Ev(y) - g(e)$, where $v(y) = y^\rho$ ($\rho \in (0, 1)$) is a von Neumann-Morgenstern utility function with constant relative risk aversion (and hence declining absolute risk aversion), and where $g(e)$ satisfies $g(0) = 0 < g(e_H)$. (If $g(e_H)$ is too high, then it is never optimal to expend high effort, and then leasing will have no incentive effects. To motivate the model, where contract choice is a tradeoff between risk sharing and incentives, we will often assume later in the paper that $g(e_H)$ is not too high.) Thus, we have $v'(y) > 0$, $v''(y) < 0$, and $-\frac{yv''(y)}{v'(y)} = 1 - \rho$ for some constant $\rho \in (0, 1)$.³⁰ The peasant will accept any offer the lord makes as long

²⁵Miller (1971, pp. 7–8).

²⁶Lomas (1978, pp. 342, 352–353).

²⁷Miller (1971, pp. 7–8, 13), Lomas (1978, p. 353).

²⁸Du Boulay (1965, p. 451), Harvey (1969, p. 24), Miller (1971, p. 5), Faith (1994, p. 659), Hare (1981, p. 1), Stacey (1986, p. 933).

²⁹See, e.g., Binswanger, Deininger, and Feder (1995, p. 2712), Otsuka, Chuma, and Hayami (1992, p. 1979), and Eswaran and Kotwal (1985, p. 355), for this setup. The random element θ is not only necessary for talking about risk aversion but also prevents a trivial end-run around the unobservability of effort: if agricultural production were deterministic, effort levels could be deduced from output levels. Here, it will be mathematically convenient for θ to not only be positive but also bounded above 0, so that $q(e)\theta - r$ will be positive for all observations of θ .

³⁰The only other von Neumann-Morgenstern utility functions with constant relative risk

as it gives him utility greater than his reservation utility level \bar{u} (his “outside option”).³¹

The timing of the game is as follows:

- $t = 0$: The lord (who, it seems reasonable to assume in the medieval context, has the bargaining power) decides the contract type. I restrict attention to two types of contracts: direct management or leasing. Direct management is a contract that offers a wage w in exchange for the peasant’s effort e and under which the lord keeps the output $q(e)\theta$. I assume, following the substantial literature on the principal-agent problem (see Grossman and Hart (1983)) and consistent with the medieval evidence, that the peasant’s effort cannot be monitored. More realistically, we should interpret effort level 0 as the maximum effort level enforceable by conventional monitoring technology (that is, by medieval overseers and estate managers, bailiffs, stewards, and reeves), which is lower than the optimal effort level.³² Leasing is a contract under which the peasant keeps the output $q(e)\theta$ in exchange for a payment of r .
- $t = 1$: The peasant, whether a wage worker or a tenant farmer, chooses what effort level e to expend and expends it.
- $t = 2$: Uncertainty θ is resolved, and $q(e)\theta$ is grown and sold by its owner: by the lord in the case of direct management and by the peasant in the case of leasing.
- $t = 3$: The lord pays his worker w or the tenant pays his lord r .

3.2 A note on labor services

Feudal lords did not only rely on wage labor; they could also demand compulsory (“customary”) labor services from their unfree tenants. But we do not expect the availability of unfree labor to change the relative profitability of direct management and leasing.³³ In the first place, lords could and often did commute labor services due to the land, and by not commuting labor services, the lord was foregoing the potential commutation fee. Commutation was especially advantageous because compulsory labor is at least as hard to motivate as

aversion are affine transformations of $v(x) = \ln x$, which have a coefficient of relative risk aversion $c_R = -1$. Allen and Lueck (1995, 1999) point out that many empirical papers have failed to find empirical support of risk sharing as an important determination of contract choice; but risk sharing is certain a factor and is sufficient to make the points in this paper.

³¹The reservation utility level \bar{u} is a “black box” that takes into account any alternative use of the peasant’s time, which may be tending a customary holding, going to another lord, moving to a town, and so on.

³²The important role played by bailiffs and reeves, and the proliferation of medieval English accounting treatises aimed at these estate managers, attest to the difficulty in properly motivating hired workers and preventing them from cheating. See Plucknett (1954), Oschinsky (1947, 1956), Mate (1983, p. 336), Postan (1978, p. 521), Stacey (1986, pp. 921–923).

³³Labor services were usually responsive for a small proportion of seignorial production (Campbell (2000, p. 3)).

free wage labor, and generally less productive — for instance, an unfree tenant who owed the lord plowing services could choose to send his not-very-productive son to do the plowing. Thus, one would expect that commutation would be widespread and that labor services would be used only in circumstances where labor was in especially short supply and where monitoring was not a serious problem (for instance, in highly time-sensitive, easy-to-monitor tasks like harvesting). In the second place, labor services did not disappear if the land was leased; lessees could acquire the same rights over peasantry that the lord had (Bolton (1980, p. 40)); or the lord could keep the labor services and apply them to other land that he still managed directly (Bridbury (1978, p. 510), Faith (1994, p. 665)). Rights over land and rights over labor were separable, with limits imposed only by the ingenuity of the contracting parties.³⁴ Thus, the availability of labor services may affect direct management and leasing equally.

3.3 Why not sharecropping?

This model only allows for two contractual choices: a pure wage contract or a pure rental contract. In reality, the peasant’s compensation can be made contingent on observations of $q(e)\theta$. The relation of optimal compensation to output does not need to take any particular form (see Grossman and Hart (1983), showing that optimal compensation depends on likelihood ratios), but it is common to restrict the set of optimal contracts to linear compensation schemes, where the peasant’s compensation is $y = \alpha q(e)\theta + \beta$, possibly because such contracts are simple.³⁵ Wage contracts are an extreme case where $\alpha = 0$ and $\beta > 0$, rental contracts are another extreme case where $\alpha = 1$ and $\beta < 0$, and sharecropping is the intermediate case where $\alpha \in (0, 1)$ and β could be either positive or negative.³⁶

Some commentators have tried to explain why there was so little sharecropping (champtant) in England. Reed and Anderson (1973, p. 136 n. 6) and North and Thomas (1971) merely say that sharecropping had no precedent in the customs of the manor and would have been costly to introduce, though

³⁴See also Bolton (1980, pp. 13–14), Faith (1994, p. 671), Hilton (1990), Miller (1971, p. 2), North and Thomas (1971), Reed and Anderson (1973, p. 137). Conversely, if a villein leased his own land, his subtenant now owed labor services to the lord; on one of the bishop of Winchester’s manors, one finds a tenant presenting himself at the harvest boon works with 25 of his own subtenants (Postan (1960, p. xl)).

³⁵See Diamond (1998), who argues that optimal compensation is “nearly linear” under certain conditions.

³⁶Laffont and Matoussi (1995, p. 383) write that α is often $\frac{1}{2}$ and β is usually 0. But see Otsuka, Chuma, and Hayami (1992, pp. 1995–2002), interpreting β as the implicit transfer involved in interlinked credit and cost-sharing contracts. Many agricultural contracts also involve input sharing. See, e.g., Langdon (1991, pp. 438–39) (mill costs were normally borne by the lessee, with the common exception that the lord would supply timber for repairs) and Mate (1983, p. 340) (as wool and stock prices fell in the late 1380s, the contracts that had prevailed in the late 1370s, under which the farmer was responsible for maintaining the stock of sheep at his own risk, gave way to arrangements under which farmers could deduct the expenses of maintaining the stock from the farm). See also Luporini and Parigi (1996, p. 446) (under sharecropping contracts in late nineteenth-century central Italy, livestock and seeds were supplied in part by the tenant and in part by the landlord).

sharecropping was widespread on the Continent, for instance in especially in western and southern France and in Burgundy (Ganshof and Verhulst (1971, pp. 324–325)). Ganshof and Verhulst suggest that “[i]n most of these districts it seems to have been an adaptation of local custom,” but if so, it was a widespread local custom, and one would like an explanation of why it did not spread to England.³⁷

Hilton (1990, pp. 512–515) suggests that lords did not choose sharecropping contracts because they preferred rents in cash to rents in kind. But this confuses the nature of the rent (fixed or proportional, which have different incentive effects) with the currency in which the rent is denominated (coins or grain). One can have sharecropping contracts payable in cash, or rental contracts payable in kind. In fact, both wage and rental payments in kind were common,³⁸ and there is no reason why tenant farmers could not have paid a share of the value of their harvest according to prevailing prices.

Hilton also suggests that “the collection from peasants of a proportion of the crop was by no means easy” and that “the direct producers could by one means or another cheat the landlord of his proper share of the product”:

[Even monastic landowners who collected parish tithes (a form of sharecropping where $\alpha = 0.1$)] leased them out for fixed rents to local merchants who took the responsibility for their collection. It was the social distance between the lord or his agents and the peasant family producers which made cheating easy. That distance did not exist between the peasant lessor and his sub-tenant and this may be one explanation for the fact that insofar as champart rent existed on any scale in medieval England, it was that paid by peasant to peasant (p. 517).

³⁷For other sources that indicate just how widespread sharecropping was on the Continent early on and throughout the Middle Ages, see Stouff (Provence from the ninth to the fifteenth centuries), Martínez Sopena (1987) (northern Spain from the tenth to the fourteenth centuries), Sivéry (1987) (northern France from the tenth to the sixteenth centuries), Le Mené (1987) (western France from the eleventh to the fifteenth centuries), Spiess (western Germany from the eleventh century to the modern period), Lohrmann (1987) (Vermandois in northern France in the twelfth century), Sicard (1987) (southwestern France from the twelfth to the fourteenth centuries), Rios Rodríguez (1987) (Galicia in the thirteenth and fourteenth centuries), Piccinni (1987) (central and northern Italy from the thirteenth to the fifteenth centuries), Loubergé (1987) (Jurançon in southern France in the fifteenth and sixteenth centuries), and Féral (1987) (Gascony from the sixteenth to the eighteenth centuries).

³⁸For examples of rental payments in kind in every century from the twelfth to the sixteenth, see Bolton (1980, p. 40), Bridbury (1978, pp. 511, 517), Du Boulay (1965, pp. 448–49), Dyer (1989b, p. 312), Faith (1994, pp. 658–659), Halcrow (1955, pp. 351, 356), Hare (1981, p. 1), Harvey (1974, pp. 349–351), Harvey (1969, pp. 20–23), Hilton (1990), Lennard (1975, p. 521), Lomas (1978, pp. 343–344), Mate (1983, pp. 332, 340–41), and Miller (1971, pp. 2, 8). In a more recent context, see Galassi and Cohen (1994, p. 588) and Luporini and Parigi (1996, p. 445).

For examples of wage payments in kind, see Campbell (2000, pp. 199, 202), Dyer (1989b, p. 380), Langdon (1991, p. 438), and Stacey (1986, p. 932). Payments in kind (food, clothes, hay, use of the lord’s plough or pasture) were often used after the Black Death to evade maximum-wage laws such as the Ordinance of Labourers of 1349, the Statute of Labourers of 1351, and the Statute of Cambridge of 1388 (Penn and Dyer (1990, pp. 357, 366, 371)).

But it is not clear how easy it is to falsify the amount of output, since major crops were harvested in common, and moreover, this story does not explain the difference between England and the Continent that promoted large-scale sharecropping in the latter and not in the former.

A more likely explanation relates to the legal actions used to enforce payment of rent in the English royal courts — the writs of “debt” and “covenant,” both of which date from the twelfth century. The action of debt could only be brought for an amount fixed at the time the contract was made: thus, debt could not be brought “on a sale of goods which had no existence at the time of the sale; for instance, the sale of a crop not yet grown, or of all the butter to be produced in a year from a herd of cows.” The action of covenant did not have these limitations, but it usually required a written instrument (Baker (1990, pp. 360–373)). Issues relating to free tenures were litigated in royal courts, while manorial courts were primarily for the litigation of customary (villein) tenure (see Beckerman (1992), Poos and Bonfield (1998)), so the common law’s displacement of manorial law may have made sharecropping arrangements, as a practical matter, unenforceable between free tenants and lords (though still enforceable between peasants, who still used manorial courts). By contrast, in France, these actions were tried either in feudal courts or by royal judges whose job was to enforce local custom (Ourliac (1961, vol. 2, pp. 148–185)).

Consequently, I assume here that sharecropping was an infeasible solution in England between lords and peasants and limit myself to considering wage and rental contracts.

3.4 Solution with secure property rights

We solve the problem by backward induction.

At $t = 1$, the peasant chooses his effort level.

- If the contract type is direct management, the peasant is a wage worker who receives w . By assumption, monitoring is only effective at enforcing effort levels above 0, so the peasant’s wage w cannot depend on any effort choice in $\{0, e_H\}$. The peasant chooses e in $\{0, e_H\}$ to maximize $u(w, e) \equiv v(w) - g(e)$, which is equivalent to choosing e to minimize $g(e)$, the disutility of effort. Because g is increasing with effort, the peasant chooses the lowest possible value of e , that is, 0.
- If the contract type is leasing, the peasant is a tenant farmer who pays a rental rate r (chosen, as will be explained later, by the lord so as to keep the peasant’s utility no higher than his reservation utility). His net revenue is $q(e)\theta - r$, so he chooses $e^*(r) \in \{0, e_H\}$ to maximize his expected utility $Eu(q(e)\theta - r, e) \equiv Ev(q(e)\theta - r) - g(e)$.

Moving backwards, at $t = 0$, the lord is faced with two possible contracts.

- If the lord chooses direct management, his revenue is $q(0) - w$. He must offer a wage w that satisfies $u(w, 0) \equiv v(w) \geq \bar{u} \Rightarrow w \geq v^{-1}(\bar{u})$. The

wage that maximizes profit for the lord is of course the lowest w in this range, that is, $w = v^{-1}(\bar{u})$, so the lord's utility under direct management is $\Pi = q(0) - v^{-1}(\bar{u})$.

- If the lord chooses leasing, his revenue is $\Pi = r$. The lord, taking the tenant's response to the rental rate as given, must offer a rental rate r that satisfies $u(q(e^*(r))\theta - r, e^*(r)) \equiv Ev(q(e^*(r))\theta - r) - g(e^*(r)) \geq \bar{u}$. Since higher r increases the lord's revenue from leasing and decreases the tenant's utility, and moreover, tends to increase the tenant's effort level,³⁹ the lord will choose a rental rate r that satisfies $Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$, and I assume that $g(e_H)$ is not too high, so this rent implements e_H (otherwise, leasing has no incentive effects).

Thus, the lord chooses which contract to adopt by comparing $q(0) - v^{-1}(\bar{u})$ with r . The contract choice depends on the sign of $\Delta \equiv q(0) - v^{-1}(\bar{u}) - r$ (the relative advantage of choosing direct management), subject to $Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$.

3.5 Explaining the diversity of the contract mix

This is a one-field model with a single binary choice: either the field is directly managed or it is leased. And yet, both direct management and leasing existed, in some mix, in Europe during the entire Middle Ages. With heterogeneous fields, we can easily accommodate this diversity. Fields are not only differently productive but also differently responsive to effort. On some fields, we may have $q(0)$ near $q(e_H)$; that is, the field is so barren that even high effort levels don't accomplish much, or it is so naturally productive that even low effort levels are sufficient to exploit it productively. In the extreme case of $q(0) = q(e_H)$, we have $\bar{u} + g(e_H) = Ev(q(e_H)\theta - r) = Ev(q(0)\theta - r) < v(q(0) - r)$. Since v is increasing, we have $q(0) - r > v^{-1}(\bar{u} + g(e_H)) \implies r < q(0) - v^{-1}(\bar{u} + g(e_H)) \implies \Delta \equiv q(0) - v^{-1}(\bar{u}) - r > 0$, so direct management is strictly preferred. (This makes sense, since incentives for effort are unimportant here, and optimal insurance dictates that the risk-averse party's compensation should be constant.) There is therefore a range of values of $q(0)$ below $q(e_H)$ such that direct management is optimal, and for $q(0)$ low enough, leasing may be optimal.

Indeed, it is immediately evident why minor landlords are more likely to directly manage their demesnes. Smaller estates face lower total monitoring costs, so the effort floor, which I normalized to 0, is higher for minor landlords, so

³⁹There is a cutoff \bar{g} such that the tenant chooses $e = e_H$ for $g(e_H) \leq \bar{g}$ and chooses $e = 0$ for $g(e_H) > \bar{g}$. Thus, $Ev(q(e_H)\theta - r) - \bar{g} = Ev(q(0)\theta - r)$. As r rises, this threshold \bar{g} also rises: $\frac{\partial \bar{g}}{\partial r} = Ev'(q(0)\theta - r) - Ev'(q(e_H)\theta - r) > 0$, since $\theta > 0$ and thus $q(e_H)\theta$ first-order stochastically dominates $q(0)\theta$. Thus, if the landlord seeks to increase his profits by increasing r , he does not need to worry that higher r might reduce the tenant's effort: if it has any effect, depending on $g(e_H)$, higher r will make the tenant work more. The intuition is that, at lower utility levels, peasants are more risk-averse, so low effort couple with a bad harvest (low θ) could be disastrous.

$q(0)$ is higher.⁴⁰ Also, it is evident why, holding the total size of the landlord's holdings constant, a lord is more likely to lease the smaller component demesnes of his estate: it is administratively inconvenient to set up a separate monitoring system for small demesnes, so monitoring costs for small enough demesnes may be too high to make monitoring worthwhile. Thus, $q(0)$ is lower for such small component demesnes.

Thus, assume that fields differ only in their level of $q(0)$, which is equal to $\bar{q} + \epsilon$, where ϵ is a random variable distributed over the interval $[-\bar{q}, q(e_H) - \bar{q}]$ with absolutely continuous distribution function Φ .⁴¹ The realization of ϵ is known to both lords and peasants at $t = 0$, so lords choose contract type optimally given ϵ . Then $\Psi \equiv \Pr(\Delta > 0) = \Pr(q(0) = \bar{q} + \epsilon > v^{-1}(\bar{u}) + r) = \Pr(\epsilon > v^{-1}(\bar{u}) + r - \bar{q}) = 1 - \Phi(v^{-1}(\bar{u}) + r - \bar{q})$ is the proportion of fields under direct management at any time, and we can examine how Ψ varies with changes in the parameters of the model.

3.6 How contract choice changes with changing living standards

Broadly speaking, over the course of the Middle Ages, wages were flat or increasing for the relatively wealthy peasants who had the opportunity to choose between wage and rental contracts. Over a short window in the late thirteenth century, real agricultural wages seem to have dropped somewhat, but they were stagnant in the early thirteenth century and rising steadily through the end of the fourteenth century (see the graph of the twenty-year moving average of agricultural wages in Appendix 4). Other sources characterize wage movements as a “decline or stagnation” in the period 1200–1320 and a rise from 1320 through the end of the fourteenth century (Dyer (1989a, p. 218)). Similarly, building workers' real wages, on average, increased from 1264 to the late fourteenth century (Dyer (1989a, p. 217 fig. 8)), and building wages were in some measure available to agricultural workers. While the evidence is far from conclusive and some of it is contradictory, the view that the prospects of the peasants described in this model improved over this period is defensible.

The simplest and most natural way to represent increasing wages in this model is to make reservation utility \bar{u} increase.⁴² The following proposition

⁴⁰I have assumed that lords are risk-neutral, and the smaller the landlord, the more likely it is that this assumption is false. But this assumption still seems reasonable, since in any event, we still expect that peasants are more risk-averse than even small lords — so any risk sharing would probably favor the peasant than the lord.

⁴¹In reality, many factors vary, including unobservable characteristics of peasants, harvest variability, and so on, which can lead to difficulties in testing theories of contract choice empirically. See Akerberg and Botticini (2002) (who model endogenous matching of peasants with contract form), Allen and Lueck (1995, 1999) (who discuss how factors like harvest variability can lead to sharecropping even without risk aversion). The model in this paper abstracts away from all these considerations for the sake of simplicity.

⁴²Increasing wages, agricultural or otherwise, definitely increase \bar{u} , since in this partial-equilibrium model, the lord does not determine prevailing wages on other estates or in other professions open to agricultural workers.

Some material evidence of peasant living standards also suggests that peasants were becom-

shows that if $g(e_H)$ is not too large, that is, if the high effort level is not too onerous, then rising living standards make rental contracts more attractive.

Proposition 1 *If the disutility of effort is not too high, rental contracts become more common as living standards increase. That is, for any \bar{u} , there exists a maximum disutility of effort $\bar{g}(\bar{u})$ such that $\frac{\partial \Psi}{\partial \bar{u}} < 0$ for all $g(e_H) \in (0, \bar{g}(\bar{u}))$.*

Proof. See Appendix 5. ■

The intuition of the preceding is clear. As peasants' reservation utility increases, holding all else (in particular, agricultural productivity) constant, the lord is constrained to offer the peasants contracts that leave them better off, whether he offers them wage contracts or rental contracts. Because peasants are assumed to have constant relative risk aversion and therefore declining absolute risk aversion, they are less risk-averse at higher utility levels, so the insurance function of wage contracts becomes less important and the incentive function of rental contracts becomes more important. This intuition breaks down for high enough disutility of effort, when it is just no longer worthwhile to try to provide incentives for high effort.

Note that $\frac{\partial \Psi}{\partial q(e_H)} = -\Phi'(v^{-1}(\bar{u}) + r - \bar{q}) \frac{\partial r}{\partial q(e_H)}$, and $\frac{\partial r}{\partial q(e_H)} = \frac{Ev'[(q(e_H)\theta - r)\theta]}{Ev'(q(e_H)\theta - r)} > 0$, so $\frac{\partial \Psi}{\partial q(e_H)} < 0$. That is, as $q(e_H)$ increases, leasing increases. So improvements in agricultural productivity that increase the return to high effort relative to low effort can also explain the general increase in leasing. This makes sense because increases in $q(e_H)$ make incentives for high effort important. But one needs to distinguish innovations that increase $q(e_H)$ relative to $q(0)$ from innovations that simply make land more productive uniformly even with low effort, which may require a detailed innovation-by-innovation approach.

Thus, one can explain the general trend toward a greater proportion of rental contracts over the course of the Middle Ages by the general increase in peasants' reservation utility — modest before 1300 and greater after 1300. The remaining questions are how to explain the dip toward more wage contracts in England and the subsequent return to the trend toward more rental contracts.

4 Insecure freehold property rights

4.1 The evolution of freehold property rights

In the Middle Ages, the concept of “property rights” in the modern, absolute sense did not exist. Everyone with land, except the king, was someone's tenant and “held” land of their lord (Baker (1990, pp. 255–256)):

ing better off in the thirteenth century: house quality was improving (Dyer (1989a, p. 166) and peasant diets were improving at least from 1250 on in England and throughout western Europe (Dyer (1989a, pp. 158–159)). Increasing general living standards, such as longer life spans or better diets, are not necessarily appropriately modeled as increasing \bar{u} . For instance, if they increase utility in the same way regardless of what the peasant does, then the effect of improved living standards may wash out in the contract choice model.

[In the 1170s, after the Norman Conquest,] the tenancies in chief — those held directly of the Crown — were concentrated in the hands of a few Norman families. In return for their holdings the tenants in chief owed the king loyalty and military service. These chief lords parcelled out their dominions in like manner, keeping some for themselves and distributing the rest in return for the loyalty and service of their own tenants. . . .

The relationship between Norman lord and tenant may be seen as contractual: and the contract was more like that for a tenured appointment than a sale of property. . . . The tenant bound himself to perform what had been settled as the consideration for his holding, and he forfeited his interest if he committed a fundamental breach of his contract by failing in the service, by committing an unpardonable crime, or by being unfaithful. The lord in return protected the tenant as his man, guaranteed his security of tenure, and held court for him and for all his other tenants. But tenure was much more than a commercial bargain. It was a life-long bond, comparable in some respects with marriage, which also began by contract. . . .

Feudal tenure was the antithesis of ownership as we know it. Before the advent of the common law, the tenant enjoyed few of the privileges which we now attribute to an owner. He could not do what he liked with the land. He could not sell it without the lord's consent. He could not pass it on to others by will, and there was no legally enforceable right of succession in his family after his death. His only protection against dispossession by the lord was the lord's moral or social obligation to protect his own men. The tenant's interest therefore stopped short at possession [or "seisin"],⁴³ which is a fact and not a legal right. (pp. 257–258, 262)

This sort of lifelong status, when enjoyed by a free man, was called "freehold" (p. 296). (Freehold is thus distinct from tenure for a period of years, which is a leasehold.) Moreover, tenants' interests were protected, first, by the lord's court's application of manorial custom and, second, by royal common law. Henry II's promise to restore the inheritances of those displaced in the civil war of Stephen's reign (1135–1154) took the form of various "writs" ordering lords to accept (or "seise") aggrieved tenants.

- The "writ of right" forced the lord, after an inquiry into history, to put a tenant with hereditary right in seisin. The writ of right "was designed to settle the ultimate right for all eternity, through the solemnities of judicial combat" (Baker (1990, p. 266)).
- "The 'petty assizes' of Henry II were intended to produce a speedy enquiry by neighbours into more readily ascertainable questions of fact. The

⁴³ "Seisin" is pronounced to rhyme with "season," and the verb "seise," meaning "to put in possession" in the context of land tenures, rhymes with "seize."

assizes did not go into the right, but protected the status quo against wrong” (p. 266). These included the assize of “novel disseisin” (established around the 1160s), which reinstated plaintiffs who had been recently disseised “unjustly and without judgment” and the assize of “mort d’ancestor” (established around the 1170s), which put plaintiffs in seisin if they were the heir of someone who had been in seisin when he died.

- “Writs of entry” were invented in the very late twelfth to early thirteenth century as a way for lords to litigate about the rights of their tenants in royal courts. Under novel disseisin, defendant lords could not present an argument that the plaintiff had been lawfully disseised; but writs of entry allowed them to explain why the plaintiff’s claimed right was invalid. For instance, lords could use the writ of entry called *ad terminum qui preteriiit* (“for the term that ran out”) to argue that the plaintiff had been a tenant for a term of years whose term had run out.

Through the thirteenth and fourteenth centuries, the assize of novel disseisin expanded continuously, and after 1400, other personal actions, such as trespass, were also used. But the main writs had been created by the thirteenth century. These writs, combined with the falling price of litigating freehold property rights, are generally considered to have gradually made freehold tenure more secure.

In contrast, the Continent did not develop a centralized body of substantive law that displaced feudal law. To the extent that royal judges became involved, say in French law, they were enforcing local customs and not imposing a new body of property law. As a result, property rights became secure much more slowly than in England.

The next sections explain why, other things remaining equal, we can expect this to lead to more direct management.

4.2 Setup

The basic parameters of the model are the same as before. The game is expanded, with the following timing:

- $t = 0$: The lord, as before, decides the contract type, and offers a wage w if the contract type is direct management or a rental rate r if the contract type is leasing.
- $t = 1$: The peasant, as before, chooses and expends an unobservable effort level e .
- $t = 2$: A third party tries to expropriate the lord. This third party may either be a stranger or the lord’s own lord. (This attempt need not be malicious: the lord’s lord or third party may sincerely believe that he has a right to evict the lord.) This attempt fails (that is, the lord’s freehold property rights are secure) with probability p_F (F stands for “freehold”). With probability $1 - p_F$, the lord leaves the game with utility 0, and the

new lord evicts the tenant or fires the worker, who also leaves the game with utility 0.⁴⁴

- $t = 3$: Uncertainty θ is resolved, and $q(e)\theta$ is grown and sold by its owner. Under direct management, it is sold by the original lord with probability p_F . Under leasing, it is sold by the peasant if his lord is not expropriated, also with probability p_F .
- $t = 4$: If the original lord is still in place, he pays his worker w , or the tenant pays the lord r .

4.3 Solution with insecure freehold property rights

We solve the problem by backward induction.

At $t = 1$, the peasant chooses his effort level.

- Under direct management, he again chooses $e = 0$.
- Under leasing, he chooses $e^*(p_F, r) \in \{0, e_H\}$ to maximize his expected utility $p_F Ev(q(e)\theta - r) - g(e)$.

At $t = 0$, the lord chooses the contract type.

- If he chooses direct management, his expected revenue is $p_F[q(0) - w]$. He sets a wage w to satisfy $p_F v(w) = \bar{u}$, so $w = v^{-1}(\frac{\bar{u}}{p_F})$ and his utility under direct management is $\Pi = p_F[q(0) - v^{-1}(\frac{\bar{u}}{p_F})]$.
- If he chooses leasing, his expected revenue is $\Pi = p_F r$, where r satisfies $p_F Ev(q(e^*(p_F, r))\theta - r) - g(e^*(p_F, r)) \geq \bar{u}$. As before (this is easy to check), higher r increases the lord's revenue from leasing, tends to increase the tenant's effort level, and decreases the tenant's utility, so the lord chooses a rental rate r that satisfies $p_F Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$, and I again assume that $g(e_H)$ is not too high, so this rate implements e_H over the relevant range of p_F .

Thus, the lord chooses which contract to adopt by comparing $p_F[q(0) - v^{-1}(\frac{\bar{u}}{p_F})]$ with $p_F r$. Dropping out the p_F , the lord's contract choice at $t = 0$ depends on the sign of $\Delta_1 \equiv q(0) - v^{-1}(\frac{\bar{u}}{p_F}) - r$ (the relative advantage of choosing direct management), subject to $p_F Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$. The proportion of direct management is $\Psi_1 \equiv \Pr(\Delta > 0) = \Pr(\epsilon > v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q}) = 1 - \Phi(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})$.

It is easy to check in this expanded model that the inclusion of p_F does not change the the baseline result of the previous section: if $g(e_H)$ is not too

⁴⁴The tenant may not have been totally insecure. A tenant at will, for instance, could be evicted at any time, but he retained the right to "emblemments," that is, to collect the crop he had planted. Whether the tenant for a term of years, who knew when his term was up, had the right to emblemments was doubtful as late as the early fourteenth century (see Holdsworth (1942 [1977], vol. 3, p. 125 & n.3).

high, increasing \bar{u} increases leasing.⁴⁵ But, as the next subsection shows, the inclusion of p_F allows us to examine the effect of property rights protections on the relative attractiveness of direct management over leasing.

4.4 The effect of increased freehold protection

The next proposition shows that as freehold property rights become more secure, we should expect to see more direct management.

Proposition 2 *If the disutility of effort is not too high, direct management becomes more common as p_F increases. That is, for any p_F , there is a maximum disutility of effort $\bar{g}(p_F)$ such that $\frac{\partial \Psi}{\partial p_F} > 0$ for $g(e_H) \in (0, \bar{g}(p_F))$.*

Proof. See Appendix 6. ■

This result may seem surprising, since increasing p_F improves the lord's ability to profit from his land in any way he chooses. He is more likely to keep his profits from both direct management or to collect his rents from leasing. But changes in p_F , through the workers' and tenants' participation constraints, affect the wage and the rental rate. As freehold property rights become secure, the lord can extract more rent from the tenant or pay a lower wage to the worker; but because the tenant is risk-averse and exposed to risk while the worker is fully insured, the rent increase is greater than the wage decrease.

Is this result robust? The assumption that the interloping lord would evict the tenant and fire the worker is admittedly extreme. Tenants did suffer from their lord's insecure property rights, since their own leasehold was only a personal contract with the lord, and we know that collusive arrangements between lords and "interlopers" aiming to evict a tenant were a problem.⁴⁶ But surely an interloping lord did not always evict the original lord's tenants and fire his workers. He may not always have had his own people to establish instead, and he may have preferred to leave the original workers and tenants in place to induce them to work for him or rent from him later on.

But the result is robust. If we assume that interloping lords, instead of evicting tenants or firing workers with certainty, only do so with probability γ ,

⁴⁵Simply substituting appropriately in the proof of Proposition 1, we obtain: $\frac{\partial \Psi}{\partial \bar{u}} = \frac{\Phi'(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})}{p_F} \cdot \frac{v'(v^{-1}(\frac{\bar{u}}{p_F})) - Ev'(q(e_H)\theta - r)}{v'(v^{-1}(\frac{\bar{u}}{p_F}))Ev'(q(e_H)\theta - r)}$, which depends on the sign of $v'(v^{-1}(\frac{\bar{u}}{p_F})) - Ev'(q(e_H)\theta - r)$, which we know is negative over some range of $g(e_H)$ by examining the rent-determination constraint when $g(e_H) = 0$.

⁴⁶Hudson (1994) argues that a lord's forfeiture was hazardous for his sub-tenants especially between the late eleventh and late twelfth centuries. Poynder (2003, ch. 4) gives the example of two sisters who brought an action of mort d'ancestor against their uncle Ranulf in 1236, claiming their father Thomas was seized of the land in question when he died and that they were their father's next heirs. When they recovered the land, they evicted Hunfrid, Thomas's tenant for a term of years. Such actions of recovery may have been collusive, that is, designed to evict tenants, especially before the common law provided specific sanctions against collusive recoveries.

then the result goes through for any $\gamma > 0$.⁴⁷ (If $\gamma = 0$, changes in freehold protection do not change rents and wages, so profits from direct management and from leasing change equally and $\frac{\partial \Psi}{\partial p_F} = 0$.) Note also that even if a lord decided to keep the previous lord's tenant in place, he could still renegotiate the rent on unfavorable terms to the tenant, who had now expended effort and would be unwilling to walk away from his leasehold.

The model is also robust to having different probabilities of firing workers (say γ_w) and evicting tenants (say γ_r), as long as the difference between the two probabilities is not too great. We can also allow for interlopers' never breaching wage contracts ($\gamma_w = 0$ — this is equivalent to assuming that wages are paid contemporaneously with effort at $t = 1$), as long as γ_r is close enough to 0.

5 Insecure leasehold property rights

5.1 The evolution of leasehold property rights

Before 1290, a common way of renting out one's land was called the "fee farm" or *firma*. A lord would subinfeudate a portion of his property — that is, he would become his tenant's lord — in exchange for money. The statute *Quia emptores* in 1290 ended subinfeudation. From then on, one could still proceed through "substitution" — that is, the tenant would take one's place as one's lord's vassal with respect to the land in question. Substitution is roughly similar to a land sale — it requires one to part with one's land permanently, and this might be undesirable to many lords, since land was a popular store of value as well as a source of political power. Thus, the husbandry lease grew in popularity (Baker (1990, pp. 337–339)).

The protection of leaseholds in the English common law lagged far behind the protection of freeholds. Leaseholds were considered personal property, not real property, because the remedy for infringement was money damages, not restitution of the leasehold; and consequently, leaseholds lay outside the reach of the real actions described in the previous section. The following legal changes relative to leaseholds were developed over the course of the Middle Ages (see generally Poynder (2003, ch. 4)).

- In the late twelfth century and afterwards, the newly developed freehold actions also protected lords against encroaching lessees. The writ of debt could be used to recover rental arrears, the writ of waste (developed in the mid- to late thirteenth century) protected the lord against lessees who had run down the demesne, and the writ of *ad terminum qui preterit* ("for the term that ran out") was developed as an alternative to novel disseisin to

⁴⁷In the worker's and tenant's participation constraints, p_F , the probability that the peasant stays in the game, becomes $p'_F = p_F + (1 - p_F)(1 - \gamma) = 1 - \gamma + p_F\gamma$. The lord still faces a probability p_F of keeping his land, but this p_F , as above, drops out, and all remaining occurrences of p_F become p'_F . Thus, $\frac{\partial \Psi}{\partial p'_F} = \frac{\partial \Psi}{\partial p_F} \frac{\partial p_F}{\partial p'_F} = \frac{1}{\gamma} \frac{\partial \Psi}{\partial p_F}$, which has the same sign as $\frac{\partial \Psi}{\partial p_F}$ as long as $\gamma > 0$.

evict lessees who had overstayed their term. Lessees themselves, however, had no access to these freehold actions.

- From the late twelfth century on, lessees could protect themselves against the depredations of their lords through various writs of their own. The writ of covenant, which was invented in the twelfth century and became common in royal courts around 1220–1230, allowed lessees to enforce agreements, such as their lease. But the writ of covenant may only have been effective against the lord personally (and possibly not against the lord’s heir or an interloping lord); eventually, enforcement of agreements through the writ of covenant required written evidence of the agreement; and specific performance (i.e., forcing the landlord to admit the tenant back to his leasehold instead of merely requiring payment of money damages) was not always available (see Biancalana (2002)).
- In the 1230s, lessees were given the writ *quare ejecit infra terminum* (“because he ejected within the term”), which protected them against early eviction by the landlord’s successor and may have protected them against eviction by the landlord himself or by strangers (see Holdsworth (1942 [1977], vol. 3, pp. 213–217), *Bracton* (1997, f. 220, vol. 3, p. 161)).⁴⁸ But the writ only protected them against early eviction, not against lesser breaches of the agreement (for which lessees still had to rely on the imperfect writ of covenant).
- Lessees gained little additional protection between the mid-thirteenth and mid-fourteenth centuries, while freehold tenure gained additional protection. Lords gained some additional protection against lessees through statutes such as the Statute of Marlborough (1267), the Statute of Westminster II (1285), and the Statute of Wales (1284) (which strengthened landlords’ ability to terminate leases for non-payment of rent). Lessees gained somewhat by the Statute of Gloucester (1278), which limited grounds for collusive recoveries. The only meaningful improvement in lessees’ prospects came with the introduction of the writ of trespass against evicting lords.
- Leasehold protection accelerated rapidly starting in the fourteenth century. The ejectment action (*de ejectione firmæ*), a species of the writ of trespass, emerged during the reign of Edward II or Edward III (Holdsworth (1942 [1977], vol. 3, p. 214), Donahue (1996, p. 175)). The availability of this action increased lessees’ protection, though we are still unsure exactly who it was available against and what the precise remedy was.⁴⁹

⁴⁸Even in the late fourteenth century (see Donahue (1996, pp. 175–176)), it is thought that *quare ejecit* was only available against the lessor’s alienee, not against any stranger.

⁴⁹In the case of *Brancaster v. Master of Royston* (1383), Chief Justice Belknap claimed that only damages were available, though recovery of the term was allowed seven years later, so “Belknap’s remarks may represent a quirky view.” See Donahue (1996, p. 175), who also discusses the relationship between *quare ejecit* and the ejectment action in the early days of the ejectment action.

The ejectment action eventually came to eclipse the *quare ejecit* action, probably because it was available against more people — by 1500, it was definitely available against all strangers to the lease (the writ of covenant was used against lessors themselves). By 1600, protections for the freeholder and for the leasehold had converged, and in fact, even freeholders were using fictitious ejectment actions to litigate their rights to property because the freehold actions were so inconvenient to use.

On the Continent, as discussed above, there was no system of central royal courts enforcing substantive law that displaced the feudal law applied in individual feudal courts. Thus, the development of the sort described in England, with both freehold and leasehold become substantially more secure, but with leasehold lagging a few centuries behind freehold, did not occur in, say, France.

5.2 Setup

The game is similar to the game with insecure freehold property rights:

- $t = 0$: The lord decides the contract type, and offers a wage w if the contract type is direct management or a rental rate r if the contract type is leasing.
- $t = 1$: The peasant chooses and expends an unobservable effort level e .
- $t = 2$: If the contract type is leasing, the lord tries to expropriate the tenant. (Again, this attempt need not be malicious.) This attempt fails (that is, the tenant’s leasehold property rights are secure) with probability p_L (L stands for “leasehold”). With probability $1 - p_L$, the tenant leaves the game with utility 0, and the lord takes the tenant’s harvest.⁵⁰
- $t = 3$: Uncertainty θ is resolved, and $q(e)\theta$ is grown and sold by its owner. In the case of direct management, it is sold by the lord. In the case of leasing, it is sold by the peasant with probability p_L and by the lord with probability $1 - p_L$.
- $t = 4$: The lord pays his worker w , or the surviving tenant pays the lord r .

5.3 Solution with insecure leasehold property rights

We solve the problem by backward induction.

At $t = 1$, the peasant chooses his effort level.

- Under direct management, he again chooses $e = 0$.

⁵⁰Is p_L known to all parties? This paper assumes that the state of the law, which implies p_L , is uniform throughout England and known to the parties. See Beckerman (1995, pp. 11, 13), who explains that by the thirteenth century, there had emerged a “professional corps of estate administrators and lawyers schooled at Westminster and familiar with the procedures and doctrines of the royal courts.”

- Under leasing, he chooses $e^*(p_L, r) \in \{0, e_H\}$ to maximize his expected utility $p_L Ev(q(e)\theta - r) - g(e)$.

At $t = 0$, the lord chooses the contract type.

- If he chooses direct management, his expected revenue is $q(0) - w$. He sets a wage w to satisfy $v(w) = \bar{u}$, so $w = v^{-1}(\bar{u})$ and his utility under direct management is $\Pi = q(0) - v^{-1}(\bar{u})$.
- If he chooses leasing, his expected revenue is $\Pi = p_L r + (1 - p_L)q(e_H)$, where r satisfies $p_L Ev(q(e^*(p_L, r))\theta - r) - g(e^*(p_L, r)) \geq \bar{u}$. As before (this is easy to check), higher r increases the lord's revenue from leasing, tends to increase the tenant's effort level, and decreases the tenant's utility, so the lord chooses a rental rate r that satisfies $p_L Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$, and I again assume that $g(e_H)$ is not too high, so this rate implements e_H over the relevant range of p_L .

Thus, the lord chooses which contract to adopt by comparing $q(0) - v^{-1}(\bar{u})$ with $p_L r + (1 - p_L)q(e_H)$. In other words, the lord's contract choice at $t = 0$ depends on the sign of $\Delta_2 \equiv q(0) - v^{-1}(\bar{u}) - p_L r - (1 - p_L)q(e_H)$ (the relative advantage of choosing direct management), subject to $p_L Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$. The proportion of direct management is $\Psi_2 \equiv \Pr(\Delta_2 > 0) = \Pr(\epsilon > v^{-1}(\bar{u}) + p_L r + (1 - p_L)q(e_H) - \bar{q}) = 1 - \Phi(v^{-1}(\bar{u}) + p_L r + (1 - p_L)q(e_H) - \bar{q})$.

It is easy to check in this expanded model that the inclusion of p_L does not change the result of the baseline model that, over some range of $g(e_H)$, increasing \bar{u} makes rental contracts more advantageous for the lord.

5.4 The effect of increased leasehold protection

The next proposition shows that as leasehold property rights become more secure, we should expect to see more leasing.

Proposition 3 *If peasants' relative risk aversion is high enough, rental contracts become more common as p_L increases (assuming that $q(e_H)\theta - r$ is lognormal). That is, for any p_L , there is a threshold coefficient of relative risk aversion $\bar{c}_R(v, p_L)$ such that for all coefficients of relative risk aversion $c_R(v) > \bar{c}_R(v, p_L)$, $\frac{\partial \Psi_2}{\partial p_L} < 0$.*

Proof. See Appendix 7. ■

This game assumes that $p_F = 1$, that is, that freehold property rights protection is absolute, but is easy to check that the result is robust to assuming any $p_F > 0$ and (in the notation of the freehold section) any $\gamma > 0$.

This result — that, under certain conditions, including sufficient risk neutrality (a reasonable assumption), increased security of leasehold tenure increases leasing — is not surprising, but it turns out to be not obvious. The advantages for the lord of higher p_L is that the tenant's rent increases, as does the probability that the lord will receive this rent. Unfortunately for the lord, higher p_L also

decreases the lord's probability of gaining by expropriating the tenant. If the peasant is very risk-averse, then expropriation is disastrous for the tenant, and the tenant needs to be compensated with much lower rents. When p_L increases, the lord can raise the tenant's rent substantially because of the decrease in expropriation risk. As the tenant becomes more risk-neutral, the expropriation benefit for the lord may dominate. In real life, even then, the value of expropriation is probably lower (because of reputation effects) than it appears here, though such dynamic effects are not modeled here in this one-period model.

6 Conclusion

In short, the hypothesis that legal change brought about changes in contract structure is plausible. The baseline movement in Europe over the Middle Ages — a movement toward more leasing — can be explained by increasing living standards (and possibly by agricultural improvements that increased the return to high effort levels). In England, the movement toward more direct management can be explained by developments in property law that increased the security of freehold property rights while not giving much protection to leaseholds; and the movement back toward leasing can be explained by leasehold protections' catching up to freehold protection in the later Middle Ages.

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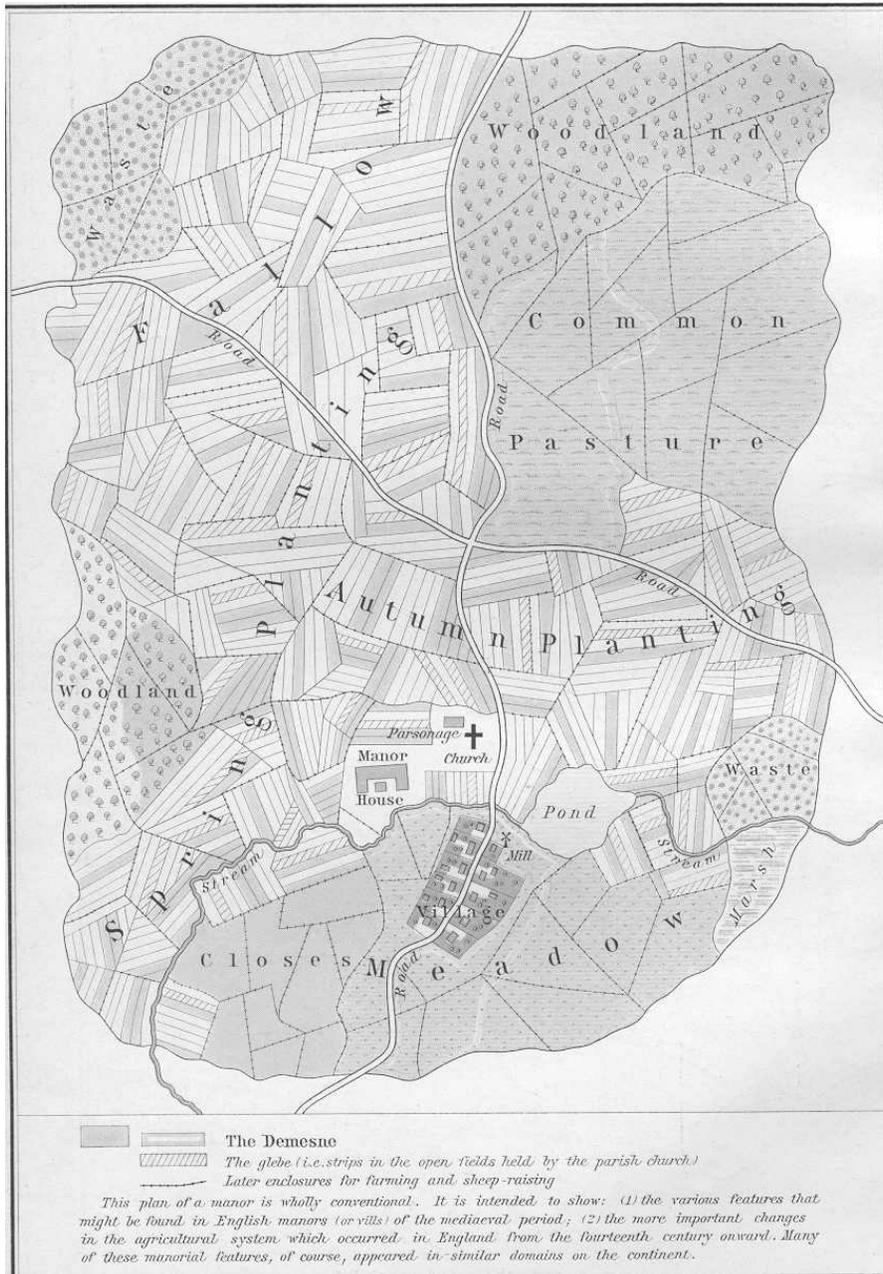
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8 Appendices

8.1 Plan of a generic medieval manor



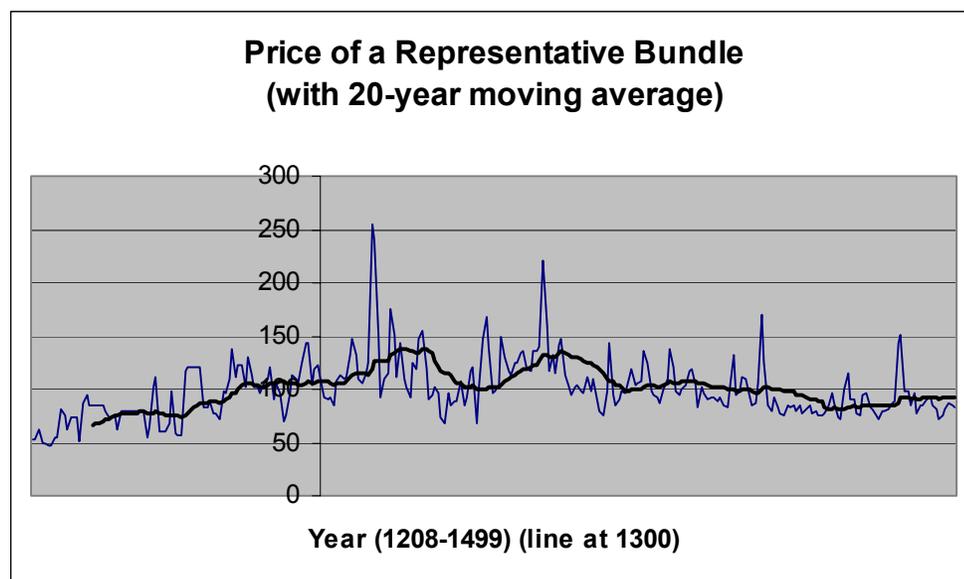
Source: Shepherd (1911, p. 104).

8.2 Chronology of the growth and decline of direct demesne management

Estate type	Estate	1060 -1119	1120 -1179	1180 -1239	1240 -1299	1300 -1359	1360 -1419	1420 -1479	1480 -1539	
Lay	The crown	F	F	F/S	F/S	F	F	F	F	
	Berkeley						M/F			
	Cornwall				S	M/S				
	De Clare			S/M		M/S	M/F			
	De Curci		F	S						
	Gaunt						M/F			
	Haughley			F/M						
	Percy					S	S/F			
	Bishopric	Canterbury	F		F/M	M	M	M/F		
		Durham	F					F		
Ely		F	F		M					
Lincoln			F	S						
Winchester			F	M	M	M	M/S	S/F		
Worcester		F			M		S/F	F		
Abbey	Battle			F	M	M	S/M	S/F		
	Beaulieu				M				F	
	Bec				M	M/S	S/F			
	Bury	F		F/M	M	M	M/S	S	F	
	Crowland				M	M/S		S/F		
	Fountains				M	S			S	
	Glastonbury	F	F/S		M	M	S	S	S/F	
	Haughmond					M		S/F		
	Hyde		F	S						
	Leicester			S	M	M		F		
	Malmesbury		F	S						
	Meaux				M		S			
	Peterborough	F	F	S	M	M	M	F	F	
	Ramsey	F	F	S	M	M	M/F	F	F	
	St. Benet of Holme	F			M					
	Selby						S/F	F		
Priory	Sherbourne			S/M						
	Tavistock								S/F	
	Westminster			F	M	M	S	F	F	
	Bolton				M	M		F		
	Canterbury	F	F	M	M	M	M/F	F	F	
	Durham				S	S	S/F	F		
	Ely	F	F		M	M	M	S	F	
	Norwich				M	M	M/F	F	F	
	Winchester					M	S	F		
	Worcester	F				M	M	S	F	
College	Merton College					S	F			
	New College						S/F			

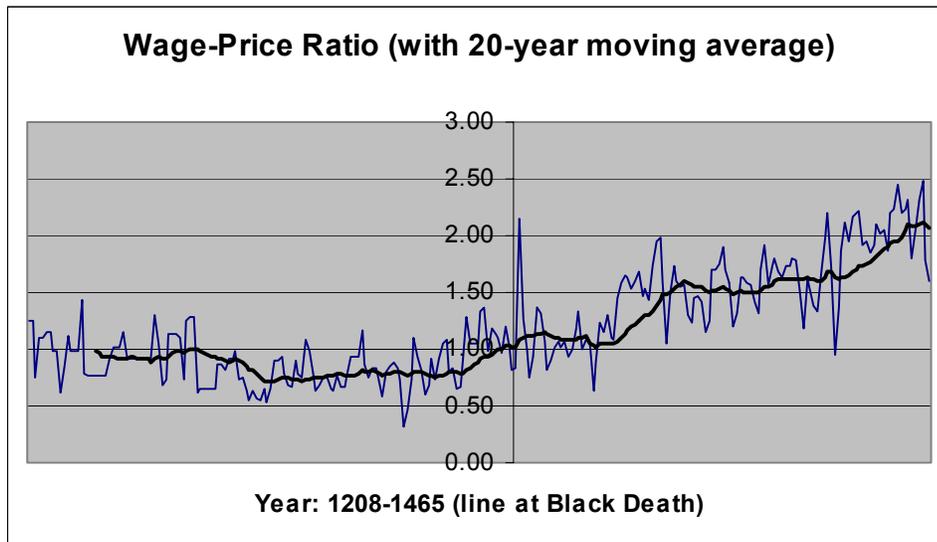
Source: Poynder (2003, ch. 1, tbl. 1.1). This is a qualitative assessment of demesne management on 42 estates (an estate contains several demesnes). The extent of direct demesne management in any period is placed in three classes: “none of few” substantial demesnes managed directly (F), “a substantial proportion” so managed (S), and “mostly or all” so managed (M). If within a single period the extent of direct management is recognized to have changed, two classes are separated by a slash. Only estates with two or more assessments of class have been included.

8.3 The price of a representative bundle, 1208–1465



Prices from 1208–1209 to 1355–1356 were taken from Farmer (1988, p. 776 tbl. 7.10). “The price index . . . assumes the consumption by a family of four quarters of barley (for bread and malt) and two quarters of peas, the tenth part of an ox, half a sheep, half a pig, a quarter of a wey of cheese, a tenth of a quarter of salt, and a stone of wool, a very modest annual allowance for a family of four or five” (p. 775). Prices from 1350–1351 to 1465–1466 were taken from Farmer (1991, p. 520 apx. I). The bundle used in this later series is the same as the bundle used in the earlier series (p. 492 n. 115). For the overlap period, 1350–1351 to 1355–1356, the later series was rescaled so the means from the overlap period matched the means from the overlap period in the earlier series (since the series are indexed by different base periods); then, the values in both series were averaged for the overlap period.

8.4 Real wages, 1208–1465



Prices (used as a deflator) were taken from Farmer (1988, 1991), as explained in the previous appendix. Wages from 1208–09 to 1355–56 were calculated by averaging the agricultural wages (threshing & winnowing, reaping & binding) from Farmer (1988, p. 811 tbl. F). Wages from 1350–51 to 1465–66 were taken from the agricultural wages column (mean of threshing & winnowing, reaping & binding, and mowing & spreading) from Farmer (1991, p. 520 apx. I). For the overlap period, 1350–51 to 1355–56, the later wage series was rescaled so the means from the overlap period matched the means from the overlap period in the first series (since the series are indexed by different base periods); then, the values in both series were averaged for the overlap period.

8.5 Proof of Proposition 1

Proposition 4 *If the disutility of effort is not too high, rental contracts become more common as living standards increase. That is, for any \bar{u} , there exists a maximum disutility of effort $\bar{g}(\bar{u})$ such that $\frac{\partial \Psi}{\partial \bar{u}} < 0$ for all $g(e_H) \in (0, \bar{g}(\bar{u}))$.*

Proof. Consider the proportion of direct management: $\Psi = 1 - \Phi(v^{-1}(\bar{u}) + r - \bar{q})$, where r is determined by $Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$.

(1) We differentiate Ψ with respect to \bar{u} , and obtain: $\frac{\partial \Psi}{\partial \bar{u}} = -\Phi'(v^{-1}(\bar{u}) + r - \bar{q})[(v^{-1})'(\bar{u}) + \frac{\partial r}{\partial \bar{u}}]$.

(2) Recall that $v(v^{-1}(x)) = x$, and therefore (by differentiating) that $v'(v^{-1}(x))(v^{-1})'(x) = 1 \implies (v^{-1})'(x) = \frac{1}{v'(v^{-1}(x))}$. (Since $v'(x)$ is a decreasing function and $v^{-1}(x)$ is an increasing function, $(v^{-1})'(x)$ is an increasing function, so $(v^{-1})''(x) > 0$; thus, $-v^{-1}(x)$ is concave.)

(3) We obtain $\frac{\partial r}{\partial \bar{u}}$ by implicitly differentiating the rent-determination constraint: $-\frac{\partial r}{\partial \bar{u}}Ev'(q(e_H)\theta - r) = 1 \implies \frac{\partial r}{\partial \bar{u}} = \frac{-1}{Ev'(q(e_H)\theta - r)}$. (Note, for future reference, that $\frac{\partial r}{\partial g(e_H)} = \frac{\partial r}{\partial \bar{u}}$.)

(4) Substituting back into the original expression: $\frac{\partial \Psi}{\partial \bar{u}} = -\Phi'(v^{-1}(\bar{u}) + r - \bar{q})[\frac{1}{v'(v^{-1}(\bar{u}))} - \frac{1}{Ev'(q(e_H)\theta - r)}] = \Phi'(v^{-1}(\bar{u}) + r - \bar{q})\frac{v'(v^{-1}(\bar{u})) - Ev'(q(e_H)\theta - r)}{v'(v^{-1}(\bar{u}))Ev'(q(e_H)\theta - r)}$. The sign of $\frac{\partial \Delta}{\partial \bar{u}}$ is the same as the sign of $\Gamma \equiv v'(v^{-1}(\bar{u})) - Ev'(q(e_H)\theta - r)$, subject to $Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$.

(5) Now we establish that $-v'(x)$ is concave. Since v has constant relative risk aversion, $\frac{xv''(x)}{v'(x)} = C$ for all x . Differentiating, we obtain: $\frac{(xv'''(x) + v''(x))v'(x) - x(v''(x))^2}{(v'(x))^2} = 0 \implies (xv'''(x) + v''(x))v'(x) = x(v''(x))^2 \implies v'''(x) = \frac{1}{x}[\frac{xv''(x)^2}{v'(x)} - v''(x)] > 0$, since $v'(x) > 0$ and $v''(x) < 0$. Thus, $-v'''(x) < 0$ for all x , so $-v'(x)$ is an increasing and concave function.

(6) Now suppose that $g(e_H) = 0$. We have $Ev(q(e_H)\theta - r) = \bar{u} \implies v'(v^{-1}(Ev(q(e_H)\theta - r))) = v'(v^{-1}(\bar{u})) \implies Ev'(q(e_H)\theta - r) > v'(v^{-1}(\bar{u}))$. Thus, $\Gamma \equiv v'(v^{-1}(\bar{u})) - Ev'(q(e_H)\theta - r) < 0 \implies \frac{\partial \Psi}{\partial \bar{u}} < 0$, so $\frac{\partial \Psi}{\partial \bar{u}}$ is still negative for some $g(e_H) > 0$. For large enough $g(e_H)$, as we know, direct management is advantageous because high effort is no longer worthwhile.

(7) Thus, for any \bar{u} , there exists $\bar{g}(\bar{u})$ such that $\frac{\partial \Psi}{\partial \bar{u}} < 0$ for all $g(e_H) \in (0, \bar{g}(\bar{u}))$. So if the disutility of effort is not too high, increasing living standards make leasing more common. ■

8.6 Proof of Proposition 2

Proposition 5 *If the disutility of effort is not too high, direct management becomes more common as p_F increases. That is, for any p_F , there is a maximum disutility of effort $\bar{g}(p_F)$ such that $\frac{\partial \Psi}{\partial p_F} > 0$ for $g(e_H) \in (0, \bar{g}(p_F))$.*

Proof. Consider the proportion of direct management: $\Psi_1 \equiv 1 - \Phi(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})$, where r is determined by $p_F Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$.

(1) We differentiate Ψ_1 with respect to p_F , and obtain: $\frac{\partial \Psi_1}{\partial p_F} = \Phi'(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})[\frac{\bar{u}}{p_F^2}(v^{-1})'(\frac{\bar{u}}{p_F}) - \frac{\partial r}{\partial p_F}]$.

(2) We obtain $\frac{\partial r}{\partial p_F}$ by implicitly differentiating the rent-determination constraint: $Ev(q(e_H)\theta - r) - p_F Ev'(q(e_H)\theta - r) \frac{\partial r}{\partial p_F} = 0 \implies \frac{\partial r}{\partial p_F} = \frac{Ev(q(e_H)\theta - r)}{p_F Ev'(q(e_H)\theta - r)} = \frac{\bar{u} + g(e_H)}{p_F^2 Ev'(q(e_H)\theta - r)}$.

(3) Thus $\frac{\partial \Psi_1}{\partial p_F} = \frac{\Phi'(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})}{p_F^2} [\frac{\bar{u}}{v'(v^{-1}(\frac{\bar{u}}{p_F}))} - \frac{\bar{u} + g(e_H)}{Ev'(q(e_H)\theta - r)}] = \frac{\Phi'(v^{-1}(\frac{\bar{u}}{p_F}) + r - \bar{q})}{p_F^2} \frac{\bar{u} Ev'(q(e_H)\theta - r) - (\bar{u} + g(e_H))v'(v^{-1}(\frac{\bar{u}}{p_F}))}{v'(v^{-1}(\frac{\bar{u}}{p_F}))Ev'(q(e_H)\theta - r)}$, so $\frac{\partial \Psi_1}{\partial p_F}$ has the same sign as $\Gamma_1 = \bar{u} Ev'(q(e_H)\theta - r) - (\bar{u} + g(e_H))v'(v^{-1}(\frac{\bar{u}}{p_F}))$.

(4) Suppose $g(e_H) = 0$. Then $\Gamma_1 = \bar{u}[Ev'(q(e_H)\theta - r) - v'(v^{-1}(\frac{\bar{u}}{p_F}))]$. Moreover, $Ev(q(e_H)\theta - r) = \frac{\bar{u}}{p_F} \implies v'(v^{-1}(Ev(q(e_H)\theta - r))) = v'(v^{-1}(\frac{\bar{u}}{p_F})) \implies Ev'(q(e_H)\theta - r) > v'(v^{-1}(\frac{\bar{u}}{p_F})) \implies \Gamma_1 > 0 \implies \frac{\partial \Psi_1}{\partial p_F} > 0$. So for some

$g(e_H) > 0$, $\frac{\partial \Psi}{\partial p_F} > 0$, that is, the proportion of direct management increases as p_F increases.

(5) Thus, for any p_F , there is a maximum disutility of effort $\bar{g}(p_F)$ such that $\frac{\partial \Psi}{\partial p_F} > 0$ for all $g(e_H) \in (0, \bar{g}(p_F))$. So if the disutility of effort is not too high, increasing security of freehold tenure increases direct management. ■

8.7 Proof of Proposition 3

Proposition 6 *If peasants' relative risk aversion is high enough, rental contracts become more common as p_L increases (assuming that $q(e_H)\theta - r$ is lognormal). That is, for any p_L , there is a threshold coefficient of relative risk aversion $\bar{c}_R(v, p_L)$ such that for all coefficients of relative risk aversion $c_R(v) > \bar{c}_R(v, p_L)$, $\frac{\partial \Psi_2}{\partial p_L} < 0$.*

Proof. Consider the proportion of direct management: $\Psi_2 \equiv 1 - \Phi(v^{-1}(\bar{u}) + p_L r + (1 - p_L)q(e_H) - \bar{q})$, where r is determined by $p_L Ev(q(e_H)\theta - r) - g(e_H) = \bar{u}$.

(1) We differentiate Ψ_2 with respect to p_L , and obtain: $\frac{\partial \Psi_2}{\partial p_L} = \Phi'(v^{-1}(\bar{u}) + p_L r + (1 - p_L)q(e_H) - \bar{q})[q(e_H) - r - p_L \frac{\partial r}{\partial p_L}]$.

(2) We obtain $\frac{\partial r}{\partial p_L}$ by implicitly differentiating the rent-determination constraint: $Ev(q(e_H)\theta - r) - p_L Ev'(q(e_H)\theta - r) \frac{\partial r}{\partial p_L} = 0 \implies \frac{\partial r}{\partial p_L} = \frac{Ev(q(e_H)\theta - r)}{p_L Ev'(q(e_H)\theta - r)}$.

(3) Thus $\frac{\partial \Psi_2}{\partial p_L} = \Phi'(v^{-1}(\bar{u}) + p_L r + (1 - p_L)q(e_H) - \bar{q})[q(e_H) - r - \frac{Ev(q(e_H)\theta - r)}{Ev'(q(e_H)\theta - r)}]$, so $\frac{\partial \Psi_2}{\partial p_L}$ has the same sign as $\Gamma_2 = q(e_H) - r - \frac{Ev(q(e_H)\theta - r)}{Ev'(q(e_H)\theta - r)}$.

(4) Suppose $X = q(e_H)\theta - r$ is lognormal, that is, $\ln X$ is distributed normally with mean μ and variance σ^2 . Then it is a known result that $\ln EX^\rho = \rho E \ln X + \frac{\rho^2}{2} \text{var} \ln X = \rho \mu + \frac{\rho^2}{2} \sigma^2$. So $\Gamma_2 < 0 \implies q(e_H) - r < \frac{Ev(q(e_H)\theta - r)}{Ev'(q(e_H)\theta - r)} \implies EX < \frac{EX^\rho}{\rho EX^{\rho-1}} \implies \ln EX < \ln \frac{EX^\rho}{\rho EX^{\rho-1}} = \ln EX^\rho - \ln \rho EX^{\rho-1} \implies \mu + \frac{1}{2} \sigma^2 < \rho \mu + \frac{\rho^2}{2} \sigma^2 - \ln \rho - (\rho - 1) \mu - \frac{(\rho - 1)^2}{2} \sigma^2 = \mu + (\rho - \frac{1}{2}) \sigma^2 - \ln \rho \implies \sigma^2 < \rho \sigma^2 - \ln \rho$. Define $r(\rho) = \rho \sigma^2 - \ln \rho$. Since $\lim_{\rho \rightarrow 0} r(\rho) = \infty$, the inequality holds as $\rho \rightarrow 0$; that is, if peasants are risk-averse enough, $\Gamma_2 < 0 \implies \frac{\partial \Psi_2}{\partial p_L} < 0$. Note that $r(1) = \sigma^2$ and hence $\Gamma_2 = 0$, that is, changes in p_L do not affect leasing if the tenant is risk neutral. Moreover, $\frac{\partial r}{\partial \rho} = \sigma^2 - \frac{1}{\rho}$, so for $r(\rho)$ is decreasing over the range $(0, \frac{1}{\sigma^2})$. If $\sigma^2 < 1$, $r(\rho)$ is decreasing over its whole domain, so increased leasehold security increases leasing for all degrees of relative risk aversion.⁵¹

(5) Thus, as long as lognormality is a reasonable assumption for the distribution of X , for any p_L , there is a threshold degree of risk-aversion $\bar{c}_R(p_L)$ (possible equal to 1) such that $\frac{\partial \Psi_2}{\partial p_L} < 0$ for all $c_R \in (\bar{c}_R(p_L), 1)$. ■

⁵¹ Also, as harvests become less variable, that is, as $\text{var}(\theta) \rightarrow 0$, we have $\sigma^2 \rightarrow 0$, and the inequality also holds (since $\rho < 1$).