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***RISK AND RISK MANAGEMENT IN  
ENGLISH AGRICULTURE, c.1750–1850***

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# **RISK AND RISK MANAGEMENT IN ENGLISH AGRICULTURE, c.1750–1850<sup>1</sup>**

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## **Abstract**

This article scrutinises the claim that the residual claimant in English agriculture was the fixed-rent tenant farmer rather than the landlord. Examination of methods of agricultural insurance and risk management indicates that the income risks of farming were sizeable, not straightforward to manage, and largely borne by the tenant. Thus the farmer's profit appears to have fluctuated by more over time and space than did the rent paid to the landlord. Attempts are made to assess changes over time in the nature and size of the production and price risks that farmers were exposed to.

## RISK AND RISK MANAGEMENT IN ENGLISH AGRICULTURE, C.1750–1850

In the late eighteenth and early nineteenth centuries, the greater part of agricultural land in England was owned by landowners who leased it out to tenant farmers for a fixed annual rent. Approximately 83 per cent of the income from British agriculture in 1808 came from tenants, and in the late 1880s the English and Welsh tenancy sector comprised about 82 per cent of the total number of farmers and 85 per cent of the overall cultivated acreage.<sup>2</sup> A widely recognised stylized fact is that, despite the far from trivial lingering on of the pre-existing tenurial system of copyhold and lifeleasehold, by the third or fourth quarter of the eighteenth century most tenanted English farmland was occupied under fixed-rent leases. As for sharecroppers, Adam Smith wrote: ‘They have been so long in disuse in England that at present I know no English name for them’.<sup>3</sup>

A farmer signing a fixed-rent lease contracted to bear the entire income risks of farming. The fixed-rent tenant agreed to pay a certain money rent to the landlord irrespective of the profitability of the harvest, ensuring that the landowner’s income, at least in contract, was insulated from the risks of an unprofitable year. England’s tenurial system, Offer has argued, therefore contradicted the traditional Ricardian conception of agricultural rent, where the landlord’s rent was supposed to form the fluctuating residual of agrarian income. English landowners were able to convert ‘rent from a residual surplus into a fixed overhead ... making the farmer absorb residual fluctuations’. He was also sceptical of claims that there was significant landlord/tenant sharing of risk outside the formal tenancy agreement by the landowner granting remissions of rent or allowing rent arrears in bad years.<sup>4</sup>

This article develops Offer’s analysis in two ways. First, it seeks to more precisely assess the nature and size of income risks in English agriculture during c.1750–1850, a period for which the data in his wide-ranging paper was limited. Second, it surveys in more detail some of the risk management and insurance strategies that were available to substantial fixed-rent tenant farmers. The discussion is of historical significance partly for the small contribution it makes to the history of the insurance industry, but chiefly because of what it implies about the

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<sup>2</sup> Mingay, ‘The farmer’, pp. 761–2; Turner et al., *Agricultural rent*, p. 68.

<sup>3</sup> Smith, *Wealth of nations*, p. 346. For a good sense of the slowly changing tenurial system, see Turner et al., *Agricultural rent*, pp. 24–32.

<sup>4</sup> Offer, ‘Farm tenure’, quote from pp. 8–9.

attitudes to risk of English landed society and the information it provides on the business of farming in England, a topic where the literature is ‘remarkably thin’.<sup>5</sup> What follows also has a minor bearing on the claims for the insurance provided by the open field system, either McCloskey’s well-known argument that scattering allowed farmers to achieve a diverse portfolio of land, or Bekar and Reed’s recent contention that scattering transformed land into a more liquid savings instrument. These models predict that one precondition for the enclosure of England’s open fields that occurred during the late eighteenth and early nineteenth centuries was that many farmers no longer required the insurance provided by scattering, either as risks fell or superior alternatives emerged. McCloskey has already supplied some important evidence on these points, but a closer inspection of risk and risk management by the occupiers of large enclosed farms provides a useful supplementary test.<sup>6</sup>

Section I of this paper reports quantitative evidence on the size of some specific farming risks during this period, and finds that their magnitude was far from insignificant and did not always fall over time. Section II examines the importance of commercial agricultural insurance, and sections III and IV survey some of the methods of informal insurance available (that is, risk-reducing arrangements not codified as formal contracts), with the former section focusing on farm diversification and the latter on landlord/tenant risk sharing. None of these methods, it is argued, reduced the risk faced by fixed-rent farmers to trivial proportions. Other forms of risk management – notably accessing the capital market, forward contracts, and part-time off-farm employment – are undoubtedly noteworthy but fall outside the limited scope of this article. Section V seeks to quantify the overall extent and allocation of risk by considering data on farmers’ profits, landlords’ rents, and farming failures, and as is concluded in section VI, provides some empirical support for the argument that farmers were the residual claimants.

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<sup>5</sup> Turner et al., *Farm production*, p. 29.

<sup>6</sup> Bekar and Reed, ‘Open fields’; McCloskey, ‘English open fields’, amongst a large and growing literature.

# I

The income risks that fixed-rent English tenant farmers contracted to bear were assuredly non-trivial. It is a commonplace that, even today, farming is one of the most precarious of industries on account of uncertainties over output and price. The quantity and quality of produce resulting from a given bundle of inputs is typically uncertain because of the impact of the largely exogenous and unpredictable variables of weather, pests, and disease. The effects of these factors are heightened by the long production lags inherent in farming, and indeed these lags also generate price uncertainty because farmers must make production decisions before they are aware of the market price. This price uncertainty is pertinent because the inelastic demand and supply curves known to be a feature of markets for agricultural commodities ensure that even moderate output or demand shocks can produce considerable fluctuations in price. These shocks may be idiosyncratic to an individual farm, or common across the regional or national farming population.<sup>7</sup>

To begin with the quantification of production risk, local and national data on the quantity and quality of crops, livestock, and livestock products in England during *c.* 1750–1850 show very substantial temporal and spatial variation. For instance, the carcass weight of 11 ewes from Stanton, Suffolk, sold in the early 1740s varied from 33–58 pounds.<sup>8</sup> Uncertainty affected farm inputs as well as outputs: the prices of inputs such as linseed cake, clover seeds, and nitrate of soda were often characterized by sharp annual fluctuations, and weather caused great variability in the cost of gathering in the harvest.<sup>9</sup> Unfortunately, the readily available output statistics provide an imperfect measure of production risk. Production variance is not only caused by factors that farmers were unable to influence but also by agriculturists' deliberate actions, for example the amount of fertilizer applied. Thus the output data incorporate endogenous variability as well as the exogenous variability that this paper attempts to measure.<sup>10</sup>

One way of overcoming this problem is to quantify the impact of some specific exogenous risks on farm output. Table 1 presents an attempt by one of the

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<sup>7</sup> Moschini and Hennessy, 'Uncertainty', pp. 89–91. Following this and other studies in the agricultural economics literature, what follows ignores Knight's distinction between risk and uncertainty.

<sup>8</sup> Turner et al., *Farm production*, p. 183. See also *ibid.*, chs. 4–6; Collins, 'Agricultural change', p. 89; John, 'Statistical appendix', sec. III.

<sup>9</sup> *Ibid.*, tab. I.16; Afton and Turner, 'Statistical base', tabs. 44.33–44.36; Jones, *Seasons and prices*, ch. 5.

<sup>10</sup> Allen and Lueck, *Nature of the farm*, pp. 100–2.

most careful of contemporary agricultural writers, Thomas Batchelor. It reports estimates of the expected average annual loss of farm output caused by certain risks on a hypothetical 150-acre farm in Bedfordshire. The figures in Table 1 are not especially large. The nine shilling expected loss from cow mortality, for example, represented less than four per cent of Batchelor's estimate of the total annual expense of keeping a middle-aged cow. Average losses, though, are not necessarily the best indicator of production risk: the extent of the downside is perhaps more fundamental. Here, Batchelor believed that 'blights, mildews, hailstorms, vermin, wet harvests, smut, &c' could 'sometimes' wipe out 'the extra gains of four or five years of prosperity', indicating that output risks actually were sizeable.<sup>11</sup> Other contemporaries agreed. For J. C. Loudon, a heavy rain-storm would 'almost ruin' a crop of barley at seeding time, even on the best-prepared land. One Suffolk farmer argued that frost destroyed a turnip crop once every 6–7 years, and Arthur Young reckoned that the failure of turnips and other fodder crops in 1784–5 reduced graziers' profits by 40 per cent in each year. Young further claimed that in the winter of 1798–9: 'Much more than a year's profit of the flocks is lost and where hay has been bought, the loss has upon the whole nearly equalled the value of the flock'.<sup>12</sup>

Econometric studies by Solomou and his collaborators suggest that weather shocks caused about half of the annual variation in an index of British arable and pasture output during 1867–1913. Tentative out-of-sample predictions suggest that the range of weather effects on farm produce in the eighteenth century was 'around +5 percent deviations from mean output', while over 1800–50 weather 'had a reduced range of effects' of  $\pm 2.5$  per cent of mean output.<sup>13</sup>

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<sup>11</sup> Batchelor, *General view, Bedford*, p. 147. The author is grateful to Robert Allen for directing him to Batchelor's discussion.

<sup>12</sup> Respectively, Turner et al., *Farm production*, pp. 152–3; Overton, 'Weather and agricultural change', p. 85; Jones, *Seasons and prices*, pp. 95–6, 102 (this book contains numerous other examples).

<sup>13</sup> Khatri et al., 'Weather and output', quotes from p. 97; Solomou and Wu, 'Weather effects'. Brunt's work, which focuses on wheat yields, produces qualitatively similar results. L. Brunt, 'Nature or nurture? Explaining English wheat yields in the agricultural revolution'; *idem*, 'Estimating English wheat production in the industrial revolution' (respectively, University of Oxford Discussion Papers in Economic and Social History, 19, 1997; 29, 1999).

Table 1. *Expected average annual loss of farm output from certain risks, Bedfordshire, c.1808*

<i>Item</i>	<i>Value</i>
<i>Arable</i>	
Losses from fires, floods, neighbours' cattle, bankruptcies (etc.)	6d per acre
Additional 'trouble and delay' gathering corn in 'ill weather'	6d per acre
<i>Livestock mortality</i>	
Cows	9s per head <sup>a</sup>
Pigs	2s per head <sup>b</sup>
Sheep	1s per head <sup>c</sup>

Notes: <sup>a</sup> including 4s cost of medicines.

<sup>b</sup> probable upper bound.

<sup>c</sup> after revenue from selling skin (etc.).

Source: Batchelor, *General view, Bedford*, pp. 92–3, 109, 112–13.

That the impact of weather on farm output appears to have been lower during the first half of the nineteenth century compared to the eighteenth was probably partly due to a reduction in the underlying exogenous weather risk – there is some evidence of a milder and less extreme climate during the second quarter of the nineteenth century – and partly due to farmers' improved ability to cope with the underlying weather risk using the methods mentioned in Section III.<sup>14</sup>

Disease was another exogenous risk that significantly impacted upon output. During the 1740s and 1750s, many English farmers were seriously affected by cattle plague (rinderpest). In subsequent years, however, rinderpest occurred only in minor localized outbreaks, and there were no major livestock epidemics until the appearance of foot and mouth disease in 1839.<sup>15</sup> In addition to the periodic chance of incurring heavy losses in an epidemic, farmers also faced the continual idiosyncratic risk of animal death in non-epidemic years. Batchelor's early nineteenth-century estimate of expected annual loss from cows dying from 'calving, and other causes', reported in Table 1, was derived from a belief that one in 56 cows would die during a normal year. This mortality rate (1.8 per cent)

<sup>14</sup> Holderness, 'Prices', pp. 98–9; McCloskey, 'New findings', p. 352.

<sup>15</sup> Brown and Beecham, 'Animal diseases'.

is within an estimated range of animal losses purely from disease in 1840 of 1.5–2.5 per cent. Conceivably, then, the underlying risk of livestock mortality did not change too dramatically over the nineteenth century until about mid-century when animals – and disease – were being increasingly imported from overseas. Pleuropneumonia was rife in the 1850s, and another major outbreak of rinderpest contributed to animal losses from disease rising to 5–11 per cent per annum during the 1860s.<sup>16</sup> Tan has recently highlighted a less vivid but still important component of output risk in livestock farming, namely the chances of non-conception in cattle. On average, perhaps one in three cows would fail to successfully calve in any given year, and more problematically for farmers, calving rates on a farm could vary a great deal over time.<sup>17</sup> Finally, historians have struggled to quantify the output losses caused by crop disease and pests, but the strong suspicion is that they were non-trivial.<sup>18</sup>

The farmer's income risk was caused by price risk as well as production risk. It appears easier to quantify price risk than output risk because some time series of prices are probably not as seriously contaminated by endogenous variability as series of output data. Particularly for the major grains, it is perhaps not indefensible to assume that English farmers faced exogenous prices. The consensus in the literature is that, even in the early eighteenth century, England largely constituted a national grain market, and was also somewhat well integrated into the emerging European grain market. Thus English grain producers can, as a simplifying first approximation, be characterized as price takers because they were trading in a wide market where individual farmer output would have trivial price effects (although this was unlikely to have been the case for other farm products such as hay). Grain price data, then, provide a good measure of the exogenous price risk in the arable sector, which would have been an aggregate rather than an idiosyncratic risk if producers faced a common market price. Overall the data indicate much instability caused by shocks arising from, amongst other things, weather, fungal diseases, and wars (which disrupted trading networks). Indeed, year-on-year price fluctuations were sometimes violent. Econometric examination of wheat prices by Persson and Scott et al. suggests that volatility was lower during most of the eighteenth century than in previous decades, partly on account of closer market integration through improved transportation (*ceteris pari-*

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<sup>16</sup> Walford, *Insurance cyclopaedia*, I, pp. 465–8; Afton and Turner, 'Statistical base', pp. 2106–7; Collins, 'Agricultural change', pp. 97–8.

<sup>17</sup> Tan, 'Enclosures'.

<sup>18</sup> Brassley, 'Weed and pest control'; Brown and Beecham, 'Crop pests'; Jones, 'Bird pests'; Mingay, 'Progress of agriculture', pp. 942–3; Turner et al., *Farm production*, pp. 93–5.

*bus* this would have lessened price volatility because of the decreased impact of local supply shocks on local prices in an widening market). While continued market integration in subsequent years would have acted to further reduce the price risk, the dominant influence of other factors produced very substantial fluctuations in wheat prices during the Napoleonic War period.<sup>19</sup> But although price variance was high so was the mean level of prices, ensuring that these years are generally regarded as being prosperous times for farmers. In the decades after Waterloo, English grain prices are commonly seen as being low on average, contributing to what seem to have been difficult times for at least some farmers in some regions.<sup>20</sup>

The above evidence, then, is very suggestive that farmers were exposed to substantial output and price risks. Yet it is conceivable that insurance and diversification could have reduced individually sizeable risks to minimal proportions, albeit at the cost of farmers paying insurance premiums or losing any gains arising from specialization.<sup>21</sup> The next three sections therefore consider the usefulness of these methods of risk management.

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<sup>19</sup> Chambers and Bailey, 'Wheat price fluctuations'; Granger and Elliott, 'Wheat prices'; McCloskey, 'English open fields', pp. 129, 137; Persson, *Grain markets*; Scott et al., 'Grain prices'.

<sup>20</sup> Turner et al., *Agricultural rent*, pp. 233–45.

<sup>21</sup> On the latter, see Jones, *Seasons and prices*, pp. 52, 82.

## II

English farmers working in the hundred years after 1750 had very little access to formal markets for insurance against farming risks. ‘What a precarious employment for a man to place his dependence on, is FARMING’, bemoaned William Marshall in 1790. ‘The merchant may guard against wind and weather ... while the farmer is left at the will of the elements, without any surety’.<sup>22</sup> What commercial insurance was available covered just a handful of specific risks affecting farm output. Pearson has recently investigated the reasons why many lines of insurance were not developed earlier in England. He argued that, in general, unhelpful government legislation, the difficulties of measuring underwriting risk, and possibly a conservative corporate culture in the leading insurance offices served to discourage the development of new insurance products for existing risks.<sup>23</sup>

Insurance against fire damage to farm buildings and stock (produce and implements) was available from London-based companies by the early eighteenth century, but reports written for the Sun Fire Office in the late 1720s suggest that the inhabitants of provincial areas were typically unfamiliar with the practice of insurance. Despite these early obstacles, the subsequent growth of the provincial agencies of London fire offices, together with the foundation of provincial companies, provided opportunities for the take-up of fire insurance in rural areas.<sup>24</sup> By the mid-nineteenth century, fire offices also seem to have been less unwilling to insure livestock against fire.<sup>25</sup> According to the leading contemporary authority on insurance, Cornelius Walford, insurance of buildings and contents were undertaken separately. Landlords appear to have been responsible for insuring the buildings used by their tenantry with the farmers covering their stock, although a few landowners also insured contents.<sup>26</sup> In the early nineteenth century, the premiums charged for the insurance of farming stock were thought to be low. During the second quarter of that century the risk of fire markedly increased due to the presence of ‘Lucifer’ matches, steam machinery, and arson by discontented agricultural labourers. Premiums rose in response, although the increases were at least partially offset by farm stock being exempted from the now oner-

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<sup>22</sup> Cited in Offer, ‘Farm tenure’, p. 5.

<sup>23</sup> Pearson, ‘Insurance industry’. See also *idem*, ‘Moral hazard’.

<sup>24</sup> Dickson, *Sun*, p. 69, and e.g. Pearson, ‘Taking risks’, pp. 43–4; Supple, *Royal Exchange Assurance*, pp. 98–9, 153–4.

<sup>25</sup> Guildhall Library (hereafter GL), MS 14,997/4, instructions to Royal Farmers agents, 1858, p. 12; Walford, *Insurance cyclopaedia*, III, p. 172; Pearson, ‘Insurance industry’, p. 240n.

<sup>26</sup> Walford, *Insurance cyclopaedia*, III, pp. 171–2; Stead, ‘Land tenure’, p. 16.

ous duty on fire insurance policies in 1833. In an attempt to minimize losses from incendiarism, some fire offices refused to insure many farmers in the worst affected areas. Insurers typically did not cover losses of corn or hay arising from spontaneous heating, but damage to adjoining property in consequence of such fires was made good.<sup>27</sup> The duration of many policies was of three or six months to cover seasonal variations in stocks held.<sup>28</sup>

Between 1716 and 1840, insurance of farm buildings and stock comprised a small and slightly increasing proportion of overall business undertaken by the Sun. In 1834, a total of £37.2m of farming stock in England and Wales was insured against fire; sixteen years later the amount had risen to £57.2m, an increase partly attributable to the duty exemption.<sup>29</sup> It is less clear what proportion of the potential available market these sums represented. Data on the business of the Sun and Royal Exchange Assurance during the last quarter of the eighteenth century reveals a mixed picture. In some primarily agricultural counties, especially in the south and southeast, many policies were taken out, but this was not the case in other such counties, including Cornwall, Cumberland, and Northumberland.<sup>30</sup> Archer, on the basis of newspaper evidence, argued that in the 1820s only a 'low' proportion of properties in East Anglia were insured against fire. Subsequent arson by labourers stirred tenant farmers in that region to attempt to take out insurance, and by the mid-1830s 'the majority' appear to have covered their stock. Archer's estimates are close to the national figure given by Phoenix Assurance in 1830: 'not more, certainly, than one half of the Farmers insure their Stock at all and of those that do, the Insurance is rarely in the proportion of more than one third the actual value'. While it is conceivable that the Phoenix's figures are biased downwards because they were given as part of a campaign to lower the duty on fire insurance, their closeness to Archer's estimates must make them more trustworthy than the anti-duty article published in the 1832 *Edinburgh Review*, which claimed that 'the insurance of farm-buildings and barnyards is comparatively rare'.<sup>31</sup>

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<sup>27</sup> Stephens, *Book of the farm*, II, p. 548; Walford, *Insurance cyclopaedia*, III, pp. 172–3; VI, p. 61. For fire insurance and rural arson, see GL, MS 14,997/4, p. 12; Archer, *By a flash*; Dickson, *Sun*, pp. 142–3; Supple, *Royal Exchange Assurance*, pp. 159–60; Trebilcock, *Phoenix Assurance*, pp. 148–50.

<sup>28</sup> Jenkins, 'Fire insurance', pp. 33–4.

<sup>29</sup> Sharman, *Fire duty*, p. 12; Walford, *Insurance cyclopaedia*, III, p. 176; Dickson, *Sun*, pp. 77, 140.

<sup>30</sup> Jenkins, *Fire insurance policies*, pp. 13–15.

<sup>31</sup> Quotes from, respectively, Archer, *By a flash*, p. 152; Trebilcock, *Phoenix Assurance*, pp. 155–6; Jenkins and Yoneyama, eds., *History of insurance*, I, p. 313.

Commercial fire insurance was available over a century before the establishment of companies offering accident insurance. The early history of this branch of the insurance business is less well documented than that of the others, but among the first firms were those offering insurance against damage to crops caused by hailstorms. Hailstones were far from being the most important exogenous production risk faced by farmers, but nonetheless a serious hailstorm could bruise and scar crops or sever their stems.<sup>32</sup> In line with Pearson's emphasis on the difficulties contemporaries faced in measuring underwriting risks, commercial insurers entered this new market with caution. The Farmers & General Fire & Life Insurance & Loan & Annuity Company, founded in 1840, was the first to offer hailstorm insurance. Its board of directors, after lengthy discussions in April and May 1840 (which included reading the prospectuses of French hailstorm insurers), proposed to provide policies for a trial period until Christmas 1843. 'There being no experience to guide them', the directors felt that claims should be met purely from hail premiums, not the general funds of the company, and would take no payment for managing this part of the firm's business. It appears, however, that the Farmers & General probably did not issue policies at this time, instead 'as a measure of precaution' promoting the Farmers & Gardeners Hailstorm Insurance Company, whose directors – some of whom were also directors of the Farmers & General – signed the first policies in May 1842.

An early board meeting of the Farmers & Gardeners resolved not to insure onion seed, 'the nature of the risk not having been sufficiently ascertained to enable the Directors to fix the Premium'. For those crops that were insurable, the premiums were initially set at two shillings per £100 of the produce's value. The first two rows of Table 2 report tentative estimates of the firm's business during 1842–3 (the loss ratio is the ratio of losses to premiums). An important cause of the massive losses stated for 1843 was a severe hailstorm on 9 August, probably the single most destructive British storm on record, and in October 1843 the company's shareholders were asked to provide additional capital to help meet claims. Three months later the directors of the Farmers & General decided to purchase the Farmers & Gardeners, apparently as 'it was not until last year that attention was sufficiently directed to the subject to induce persons to insure to

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<sup>32</sup> Walford, *Insurance cyclopaedia*, V, pp. 598–613; Jones, *Seasons and prices*, p. 38; Webb et al., 'Climatology of hailstorms'. The remainder of this paragraph and the next draw on GL, MS 14,988, Farmers & Gardeners directors' minute book, 1842–3 (one quote is from the entry for 30 Aug. 1842); MS 14,989/1, Royal Farmers board minute book, 1839–41, pp. 78–9, 83, 89, 91–3, 95 (a quote from p. 91); MS 14,991, Royal Farmers board reports, 1859–85, pp. 18–26 (two quotes from p. 25); Walford, *Insurance cyclopaedia*, V, pp. 587–8.

any extent, when it became manifest that a very extensive business could be done'. This must have been an effect of the great hailstorm of August 1843. The new firm, the Royal Farmers & General Insurance Company, implemented one of the last decisions of the Farmers & Gardeners board, which was to change the method of levying premiums to a rate per acre rather than as a percentage of crop value, partly because this would produce an increase in the premiums.

Table 2 also gives the hail branch performance figures of the Royal Farmers, together with those of the three other main insurers, from 1844 to 1860: their competitors were small-scale or short-lived. Premiums during these years were generally set at only a few pence per acre and over time tended to be cut; again, stamp duty appears to have been fairly onerous. The statistics in Table 2 must be treated cautiously, if only because they were often revised by the compliers and include coverage of market gardeners' glass panes, but the overall impression from them and contemporary comment is that the profitability of the leading firms was at least satisfactory. Indeed, the oldest fire insurance offices deemed a loss ratio of about 55 per cent to be an acceptable margin of profitability, and, for what the comparison is worth, almost all the loss ratios in Table 2 are well below that threshold. This business success may have been partly due to the alteration in the means of premium charging. There is also evidence in company reports of the early 1860s that these firms shared data on income and losses, and it is tempting to assert that the hail insurers engaged in some of the collusive practices that also characterized the fire insurance industry around the mid-nineteenth century. The premium income data reported in Table 2 indicates that hail business increased on trend over time, but as with fire insurance it is difficult to accurately estimate what proportion of the total market the figures represent. Some farmers were thought not to insure after a hail-free year, or would delay insuring if the season began well. By 1861, the principal insurers took on risks covering just two million acres of land, and in the 1870s it was estimated that only about eight per cent of English grain crops were insured against hailstorms. Even allowing for the fact that some parts of the country are

**Table 2. Hail branch performance of the leading English hailstorm insurance companies, 1842–60 (£)**

Year	<i>Royal Farmers (founded 1840)<sup>a</sup></i>			<i>General Hailstorm (1843)</i>	<i>County Hailstorm (1848)</i>			<i>Midland Counties (1851)</i>		
	Premiums	Losses	Loss ratio	Loss ratio	Premiums	Losses	Loss ratio	Premiums	Losses	Loss ratio
1842 <sup>b</sup>	934	108	12							
1843 <sup>b</sup>	236	5,522	2,340							
1844	2,132	397	19							
1845	3,812	966	25							
1846	4,018	2,210	55							
1847	7,504	82	1							
1848	2,532	593	23							
1849	4,016	324	8							
1850	3,731	954	26		2,860 <sup>c</sup>	1,006 <sup>c</sup>	35			
1851	4,611	788	17							
1852	6,073	4,647	77	37	3,738	997	27			
1853	5,936	700	12	29	3,684	2,483	67			
1854	6,808	778	11	21	4,928	726	15			
1855	6,237	927	15	21	4,675	349	7	415	81	20
1856	7,264	1,429	20	14	4,858	458	9	636	99	16
1857	7,030	1,776	25	21	4,829	627	13	945	185	20
1858	8,177	2,489	30	43	5,555	2,443	44	1,338	321	24
1859	8,374	8,520	102	71	6,317	1,523	24	1,545	1,675	108
1860	8,601	1,828	21	29	5,893	2,668	45	1,822	280	15

Notes: <sup>a</sup> founded as the Farmers & General.

<sup>b</sup> figures relate to the Farmers & Gardeners (founded 1842).

<sup>c</sup> standing grain only.

Sources: GL, MS 14,991, Royal Farmers board reports, 1859–1885, pp. 19, 31; Walford, *Insurance cyclopaedia*, V, p. 588.

more prone to severe hailstorms than others, coverage appears to have been low.<sup>33</sup>

As with hail insurance, commercial insurance against loss of livestock by accident or disease did not become available in England until the 1840s, when a handful of companies were founded, beginning with the Farmers & Graziers Mutual Cattle Assurance Association in 1844.<sup>34</sup> The premiums payable varied by the type and value of the animal covered. Those charged by the Agriculturist Cattle Insurance Company in 1851 ranged from 6d in the pound for insuring feeding cattle to 2s or more for a prize bull or ram. Landlords sometimes paid a proportion of the premiums for their tenants to help guarantee their rent. Perhaps not unexpectedly given the greater underlying risk, the early livestock insurance companies did not operate as successfully as their counterparts in hailstorm insurance. The loss ratios of the Norfolk Farmers Cattle Insurance Society in the three years after 1857, for example, were 69.25, 45, and 47 per cent. This company was the only one of the principal firms established in the 1840s to survive the outbreaks of pleuro-pneumonia and rinderpest that occurred over the next two decades, and some insurers failed leaving claims unpaid. The premiums charged seem to have been generally too low to allow for viable long-term insurance provision at a time when the risk of livestock mortality was increasing.<sup>35</sup>

Livestock insurance companies were preceded by, and co-existed with, cow clubs operating on a mutual basis at the local level. A villager joining the parish's club would pay an entrance fee and a regular subscription for each animal entered, with the members electing officials to manage the club's affairs. As with their close counterpart friendly societies, cow clubs had a social as well as an economic role, for their meetings were also held in inns and some arranged an annual dinner, but in regard to their chief function it is not clear that these institutions were particularly important in providing cattle insurance to tenant farmers. Firstly, there was not always a local club to join. Broad found a handful of examples of village insurance co-operatives formed during the mid-eighteenth-century outbreak of cattle plague, but according to Walford, cow clubs did not become 'innumerable' across the country until at least the close of the eighteenth

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<sup>33</sup> GL, MS 14,991, Royal Farmers board reports, pp. 1–34; Walford, *Insurance cyclopaedia*, II, p. 141; V, pp. 220, 586–97; Dinsdale, *Accident insurance*, pp. 228–30. For acceptable fire office loss ratios, see Pearson, 'Taking risks', p. 46.

<sup>34</sup> Ignoring the few short-lived speculative 'Little Goes' of the early eighteenth century which offered to insure horses.

<sup>35</sup> Walford, *Insurance cyclopaedia*, I, pp. 43–4, 466–73; II, p. 137; III, p. 171; V, p. 224; Dinsdale, *Accident insurance*, pp. 23–4, 235–8, 301–2, 319–20.

century. Indeed, the available information on their dates of foundation gives the impression that substantial growth in their numbers did not come until the second quarter of the nineteenth century. Secondly, the durability of cow clubs was suspect. The confined geographical spread of their risks – generally concentrated within a radius of (say) 3–4 miles – meant that they were extremely vulnerable to a succession of bad years or a local epidemic. If this occurred before the club had accumulated a sufficient reserve fund, then the payment of claims would be delayed and members asked to pay a heavy additional levy. In such cases many clubs broke down.<sup>36</sup>

Thirdly and most importantly, primary and secondary sources indicate that the members of cow clubs were overwhelmingly cottagers and agricultural labourers. A few clubs even explicitly restricted their membership to such groups, or prevented members from insuring more than two animals. Presumably one reason for this was to help limit losses in the event of a local epidemic, since the insured cattle would be isolated and not in herds where disease could easily spread. It is conceivable that some tenant farmers also joined, as is implied by the occasional name like the Farmers United Cow Club (Mawdesley, Lancashire), although Russell's research on nineteenth-century Lincolnshire cow clubs shows that in practice the vast majority of members only insured one animal. For instance, in 1852 the Alford Labourers' and Cottagers' Cow Club comprised of 107 members and 119 cows. Other evidence also suggests that it was unlikely that the majority of farmers had their livestock insured with a cow club or a commercial company. In Hardy's *Far from the madding crowd*, the character Gabriel Oak did not insure his sheep.<sup>37</sup> More concretely, when the 1865–6 cattle plague hit the Arley estate, Cheshire, it was said that 'there is no one insured on our side of the parish'. An earlier proposal for a cow club had failed because not all the villagers would join, 'so we trusted to Providence'. There is also evidence that demand for commercial livestock insurance declined after the cessation of that outbreak as 'those formerly insured became apathetic'.<sup>38</sup>

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<sup>36</sup> This paragraph and part of the next are based on PRO, FS/15/254, 258, 1330, 1332, 1590, 1693, 1763, 1895, files of cow clubs registered under a Friendly Societies Act, various years; *Articles of a cow club, established ... 1805 ... in Brighouse* (Halifax, 1816); *Articles of a new established cow club ... in Norton* (Doncaster, 1822); Stephens, *Book of the farm*, II, pp. 549–50; Walford, *Insurance cyclopaedia*, I, p. 469; Broad, 'Cattle plague', p. 113; Dinsdale, *Accident insurance*, pp. 24–5; Matthews, 'Cattle plague', p. 113; Russell, *Cottagers & cows*; Wilson, 'Co-operative insurance of live-stock'.

<sup>37</sup> Hardy, *Madding crowd*, p. 44.

<sup>38</sup> Quotes respectively from Matthews, 'Cattle plague', p. 113; Walford, *Insurance cyclopaedia*, II, p. 137. See also *ibid.*, I, p. 473.

Commercial insurance markets against other risks faced by farmers were not merely thin but probably entirely missing. No English companies appear to have provided frost or flood insurance, and there does not seem to have been any notable multi-peril insurance of yields or revenue.<sup>39</sup> Thus, apart from the limited assistance provided by fire offices and conceivably local cow clubs, formal insurance markets do not appear to have helped farmers combat risk until at least well into the nineteenth century. One point worth briefly highlighting from the forgoing discussion, though, is that farmers' take-up of those lines of commercial insurance that did become available was apparently fairly low. There are a number of potential explanations for this seemingly low demand. Dinsdale has noted that some consumers were reluctant to buy insurance due to superstition, religious objections, or a failure to appreciate the benefits of protection. Other factors to add to his list include the high cost of insurance, especially where the duty on policies was higher than the premiums (as was often the case for hailstorm insurance and pre-1833 fire insurance); the possible application of the average clause (which essentially forced farmers to fully insure even if expected losses were only a fraction of full value, for example because scattered hay stacks and barns meant that a fire was unlikely to spread); and the lack of confidence in the durability of newly-founded insurance companies, which would not have been unjustified given the fairly high failure rates of early livestock insurers. It may also have been that, considering all the risks that they were exposed to, tenant farmers did not feel it worthwhile to insure against only a few of them, or alternatively that they had reasonable access to less formal methods of insurance.<sup>40</sup> The next two sections consider this latter possibility.

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<sup>39</sup> Ibid., IV, pp. 186-7; V, pp. 155-6; Mayet, *Agricultural insurance*, pp. xv, 9-10, 53; McCloskey, 'English open fields', pp. 162-3.

<sup>40</sup> Dinsdale, *Accident insurance*, p. 16, together with the above references and Clark, *Betting on lives*.

### III

Many of the production decisions made by farmers were chosen in an attempt to lower the probability of a loss occurring, or to reduce the size of a loss once one had occurred. These methods of managing risk must have been far more popular than the taking out of policies with commercial insurers, but the albeit meagre evidence available suggests that their effectiveness should probably not be exaggerated.

Successful minimization of the impact of pests and disease on output posed obvious difficulties in the pre-chemical age where scientific knowledge of crop and animal diseases was still in its infancy. Mid-nineteenth-century veterinary science, for instance, still relied on theories that disease was carried by atmospheric conditions. Farmers therefore remained largely dependent on traditional methods such as mole-traps, scarecrows, wooden clappers, dusting crops with soot, steeping seeds, applying ointments and dips to livestock, and treating sick animals with herbal remedies, opium pills, bleeding, and even charms and spells. Many of these measures were not completely ineffective, and generations of learning by doing must have improved their efficacy. By the mid-nineteenth-century, scientific knowledge too had advanced. A number of insect pests and crop fungal diseases were identified and described, animal medicines (albeit somewhat dubious) had been developed, and a few inventors had tried to produce helpful mechanical devices, including automatic guns that discharged blanks at regular intervals to scare birds and game. The growth of the agricultural press and societies must have helped disseminate this increasing body of knowledge. Nonetheless, science and technology did not provide greatly effective assistance to farmers until the twentieth century.<sup>41</sup>

The classic study by Jones reveals a similar situation for agriculturists' attempts to combat weather: again nowhere near straightforward, but with a number of successful risk-reducing innovations being developed. One well-known important example was improved drainage, but many others could be cited. For instance, since turnips were vulnerable to rot in frosts and thaws, from the 1790s the swede (and later the mangel-wurzel) was introduced as a hardier fodder crop. Jones also pointed to the gradual shift of cereal growing out of the wet, heavy soils of the clay vales and onto the sandlands and free-draining uplands as another factor that muted the weather's effects over time. The improved ability of

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<sup>41</sup> Brassley, 'Animal health'; Brown and Beecham, 'Animal diseases'; Perren, 'Veterinary products'; Turner et al., *Farm production*, pp. 96–7, 106–7; and the studies cited in n. 18 above.

farmers to deal with weather risk is confirmed by the econometric work of Solomou and his collaborators mentioned in section I.<sup>42</sup>

Risk management also influenced what farmers chose to produce. Almost all agriculturists avoided having a large stake in especially precarious products such as hops, teazles, and pork.<sup>43</sup> More fundamentally, diversification of farm output provided a potentially potent means of self-insurance against price and production risks. Arable farmers diversified by growing a range of different crops and crop varieties, but this strategy would not have been wholly effective. The prices of the arable farmer's main cash crops – wheat, barley, and oats – were strongly positively correlated, indicating that arable diversification would have done little to reduce price risk.<sup>44</sup> In terms of production risk, despite these three grains being sown at different times, and requiring differing weather for optimal growth, their harvest outcomes also appear to have been positively correlated. Pair-wise correlations between some limited data on wheat, barley, and oats yields, both over time and in a cross-section, produce six correlation coefficients of 0.68–0.84, all of which were statistically significant at the one per cent level. Overton's calculations indicated that average annual temperature had an almost identical impact on wheat and barley yields in East Anglia during 1660–1739; this was also the case for wet summers. Only mild winters had a statistically significant differential effect on wheat and barley yields. In short, this imperfect quantitative evidence suggests that diversification into multiple arable crops would have reduced income risk, but far from eliminated it.<sup>45</sup>

Mixed farming, of course, provided a more promising means of self-insurance, and it is very tempting to speculate that this celebrated feature of English agriculture was partly a function of attempts to diversify by tenant farmers exposed to non-trivial risk. But the success of even this strategy is questionable, if only because the arable and livestock sectors were not completely unconnected. For example, a hard winter and dry spring and summer could adversely affect grain and fodder crops and thus raise the cost of animal feed. In turn, the

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<sup>42</sup> Jones, *Seasons and prices*, esp. chs. 9–10.

<sup>43</sup> *Ibid.*, pp. 63, 74–7; *Penny Magazine*, supplement on British agriculture, Sep. 1840, pp. 382–3; Holderness, 'Prices', p. 112.

<sup>44</sup> Scott et al., 'Grain prices', pp. 6–7; Wilkes, 'Farming', p. 97.

<sup>45</sup> Overton, 'Weather and agricultural change', tab. 2; pair-wise Pearson correlations calculated on average yields from 1,581 tithe districts reporting data on all three crops from *The 1836 national tithe files database on CD ROM* (Marlborough, 1995); Spearman's rank correlations calculated on mean wheat, barley, and oats yields by decade from 1720s–1870s (16 observations) from Turner et al., *Farm production*, tabs. 4.4, 5.1–5.2. Compare the remarks in *ibid.*, p. 160; Holderness, 'Prices', pp. 97–8.

availability of feed would affect the number and fecundity of animals surviving, and amongst other things, thereby increase the cost of fertilizer for the farm's arable operations.<sup>46</sup> The effectiveness of mixed farming in reducing risk can be assessed more rigorously in terms of price risk, and the 'high' positive correlations between meat and cereals prices during 1813–50 found by Wilkes – from 0.64 (barley and beef) to 0.75 (wheat and beef) – imply that mixed farming only made a relatively small contribution to lowering price risk.<sup>47</sup> However, this conclusion can only be tentative because, as discussed in section I, while grain prices can probably be regarded as exogenous the prices of other farm products cannot, and hence measure endogenous as well as exogenous variability.

Another means of diversifying output, highlighted by Thirsk, was through engaging in alternative agriculture, that is activities such as dairying, horticulture, poultry keeping, and the growing of industrial crops. Where these lines of business were undertaken, the farmer's wife would have played an important role in the managing of risk since she was traditionally closely identified with the farm's poultry and dairy operations, either doing the work herself or supervising the labour of others. The prevalence of alternative agriculture during 1750–1850 should not be exaggerated, though, because Thirsk argued that this was a period in which there was a widespread movement away from alternatives on account of the general profitability of mainstream cereals and meat production. *Ceteris paribus*, this trend towards less output diversification implies farmers felt that the general size of the income risk they were exposed to was lower than in the pre-1750 period.<sup>48</sup>

An imperfect assessment of the magnitude of the overall price risk faced by a mixed farmer over 1700–1850 is possible using Clark's national agricultural price index, which was constructed using the weighted average prices of 22 different farm commodities, including some alternative products (the important caveat over the endogeneity of non-grain prices should once again be noted). Despite representing the high watermark of output diversification, his index still shows substantial year-on-year price volatility. As a pilot test of establishing the nature of changes over time in the size of the mixed farmer's overall price risk, following Persson's procedure the standard deviation of the error term in a random walk model of the logarithm of annual prices was calculated for four sub-periods between 1700 and 1850. The random walk model states that expected price next

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<sup>46</sup> Bowden, 'Prices', pp. 111–16; Holderness, 'Prices', pp. 113, 119.

<sup>47</sup> Wilkes, 'Farming', p. 100.

<sup>48</sup> Thirsk, *Alternative agriculture*. See also Collins, 'Agricultural change', pp. 190–2; Jones, 'Agriculture', p. 74; and for the (arguably changing) role of farmers' wives, Verdon, 'Farmers' wives'.

year is equal to price this year, as in the basic cobweb model (or hog cycle) of agricultural markets, and as a simple model of price formation it may not be a completely inappropriate description of the views contemporaries had about price behaviour. It therefore provides a useful means of teasing out the magnitude of unexpected changes in prices (captured by the model's residuals). Nevertheless, much caution is required in interpreting the results because of potential imperfections with the regression model and the data. The regressions revealed identical price 'surprise' during 1700–50 and 1750–90 (in both sub-periods a standard deviation of the residual of 0.029 per cent), with this almost doubling over 1790–1815 (standard deviation of 0.053 per cent), and then falling substantially during 1815–50, though interestingly to a level higher than before 1790 (0.037 per cent). This limited exercise, then, suggests that price risk was not obviously declining on trend over time.<sup>49</sup>

Farmers could also self-insure by storing output, allowing the sale of stocks in hard times. The extent of grain storage remains a controversial issue. Lacking conclusive direct evidence, scholars have tried to infer the extent of carry-over from examination of price data, and do not always find the features that would be expected if storage was substantial. Indeed, Persson has argued that one commonly employed econometric test (namely determining the existence of autocorrelation of prices) actually cannot distinguish stored from non-stored goods.<sup>50</sup> It appears that the cost of any carry-over would have been far from trivial because it was still quite expensive to rent storage space and incur losses from rotting, smutting, pests, and theft, together with forgone investment opportunities: the total annual storage cost of wheat during the nineteenth century has been estimated at 14 per cent of its harvest price.<sup>51</sup> Even if farmers did carry-over considerable amounts of grain from year to year, it is not clear that this was easily achievable for many other types of farm output. Adam Smith knew that 'It is difficult to preserve potatoes through the year, and impossible to store them like corn, for two or three years together'. Even if milk was made into salt butter, it could only be stored for a year. Only cheese could be kept for 'several

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<sup>49</sup> Persson, *Grain markets*, pp. 106–22. The model estimated was  $y_t = by_{t-1} + e_t$ , where  $y_t = \log(P_t) - \log(P_{t-1})$ ,  $P_t$  is price at time  $t$  and  $e_t$  an error term. Data from G. Clark, 'The price history of English agriculture, 1500–1914' (May 2002), available at <http://www.econ.ucdavis.edu/faculty/gclark/>, accessed July 2003.

<sup>50</sup> Compare Persson, *Grain markets*, pp. 55–62, 67–71, with the studies cited in n. 19 above and Fenoaltea, 'Medieval agriculture', pp. 134–41; McCloskey and Nash, 'Corn at interest'.

<sup>51</sup> N. Poynder, 'Grain storage in theory and history' (paper presented to the conference of the European Historical Economics Society, Lisbon, 1999).

years'.<sup>52</sup> Another possibility is that farmers postponed livestock sales in the anticipation of a future improvement in prices. Yet direct evidence from 167 livestock transactions during 1741–1846, due to the paucity of data coming almost entirely from a farm at Saltmarshe in the East Riding of Yorkshire, shows that the mean time between the purchase of an animal and its subsequent resale was just 36.9 weeks (median 33.1), with 78 per cent of resales occurring within 49 weeks of purchase. Only 4 per cent of observations were in excess of 65 weeks and none was above 87 weeks.<sup>53</sup> This limited evidence suggests that farmers were generally reluctant to delay reselling for more than a few months, presumably partly because of the risk of the fattened animal falling sick in the meantime. In short, the costs and difficulties inherent in carrying over a diversified buffer stock must have meant that farmers were at least fairly reliant on the revenue from a given year's output.

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<sup>52</sup> Smith, *Wealth of nations*, pp. 147, 208.

<sup>53</sup> Data from East Riding of Yorkshire Archives, DDSA 1203/1–6, farm accounts, 1801–46 (153 observations); Bowden, 'Prices', tab. 13.22 (11 observations); Turner et al., *Farm production*, p. 57 (3 observations).

## IV

Fixed-rent landlords could still have shared risks with their tenantry by giving remissions of rent, allowing rent arrears, or increasing their share of expenditure on farm repairs. Some historians have argued that these arrangements were a significant source of insurance for farmers, but Offer's scepticism over the validity of these claims is only strengthened by a consideration of the relevant economic theory and the data that has become available since the publication of his paper. Although undoubtedly vital in individual cases, the importance of landlord/tenant risk sharing in general probably should not be overemphasized.<sup>54</sup>

As the landlord was under no contractual obligation to provide assistance to tenants experiencing difficulties, farmers would have needed to make a persuasive case to obtain aid (assuming the landowner was not financially constrained). Yet farmers' reputation as perennial grumblers worked against them in some instances, even when their complaints were justified.<sup>55</sup> Rent arrears and remissions were also subject to the unwelcome side effects characteristic of insurance schemes. A landowner known to be generous would attract an adverse selection of disproportionately inexpert applicants for his vacant farms. More importantly, lessees had an incentive to take excessive risks if they believed that there was a high probability of generous support from their landlord if it turned out that they were unlucky. These factors must have checked landlords' willingness to share risks. Lord Fitzwilliam certainly recognised the moral hazard problem: 'to much forbearance makes many of them [tenants] careless and begets their ruine'.<sup>56</sup> The economics of insurance therefore suggests that a prudent landowner would not grant remissions or arrears automatically or generally, but only in individual cases of clear need. Thus the duke of Bedford did not give general abatements, instead assessing each plea on its own merits.<sup>57</sup> Tellingly, even long-standing tenants possessing a good reputation and substantial capital were not necessarily guaranteed favourable treatment. Earl Cardigan's estate steward threatened to sue each of the 36 tenants behind with their rent, irrespective of their previous record: 'a great many of them are people which we have always look'd upon to be our best chaps', he thundered, 'but ... I will not favour one of them'.<sup>58</sup>

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<sup>54</sup> Offer, 'Farm tenure', p. 6, in contrast to e.g. Chambers and Mingay, *Agricultural revolution*, p. 21; Jones, 'Agriculture', p. 75.

<sup>55</sup> E.g. Wordie, 'Rent movements', p. 209.

<sup>56</sup> Hainsworth and Walker, eds., *Fitzwilliam correspondence*, pp. 248–9.

<sup>57</sup> Caird, *English agriculture*, p. 436.

<sup>58</sup> Wake and Webster, eds., *Eaton letters*, p. 94.

Figure 1, reproducing recent research by Turner, Beckett, and Afton, reports average annual net new rent arrears on a sample of estates across England during 1750–1850 as a percentage of the total rent due in that year. The graph shows that net newly granted arrears (positive values) and net repayments of old arrears (negative values) represented a relatively small proportion of the overall rent roll: the 95 per cent confidence interval for mean annual arrears was just 2.4–3.3 per cent of the rent due, and the series exceeded plus 10 per cent on only one occasion. The sample of rentals used by Turner et al. is probably biased towards landowners who kept good records and who therefore might have been more commercially minded than the norm, and hence more careful about allowing arrears. Nonetheless, the mean of their series is not drastically below that suggested by the slender amount of previous evidence.<sup>59</sup>

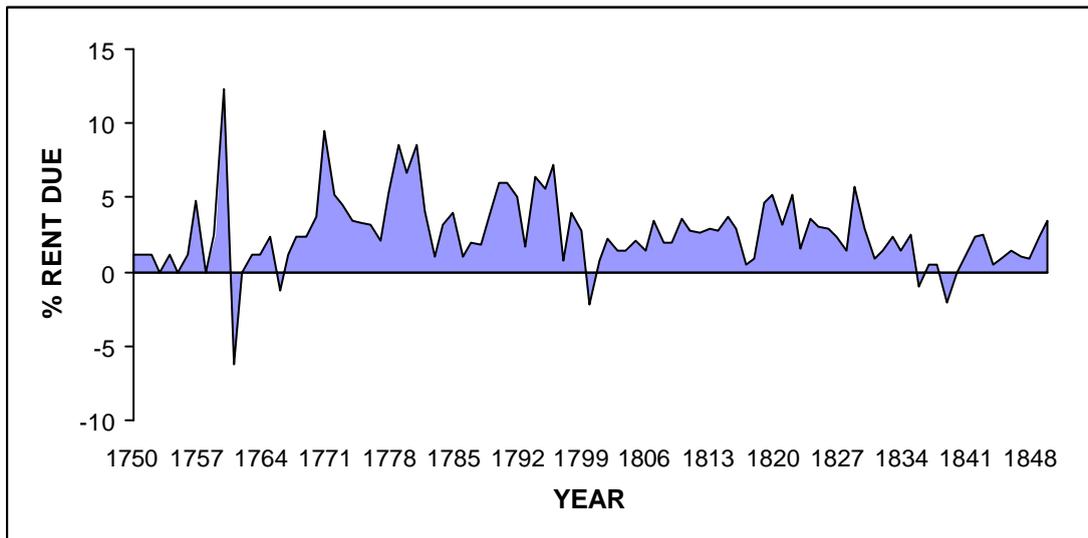


Figure 1. *Average annual net new rent arrears in England, 1750–1850*

*Source:* Turner et al., *Agricultural rent*, tab. A2.3.

<sup>59</sup> Compare the examples in Offer, 'Farm tenure', p. 6; Turner et al., *Agricultural rent*, p. 184.

Interestingly, the mean and variance of the arrears graphed in Figure 1 fell over time, with (as a crude test) the differences between 1750–99 and 1800–50 being statistically significant.<sup>60</sup> Turner et al. ascribed the reduction in new arrears to more business-like attitudes from landowners and to the movement towards shorter leases, which would have allowed the headline rent to be more frequently adjusted.<sup>61</sup> Another interpretation, which is consistent with some of the evidence reported earlier and particularly suggestive given the fall in the second moment of the arrears series as well as the first, is that tenants' need for arrears declined over time as methods of risk management improved. A further notable feature of Figure 1 is that there were almost no negative values, indicating that arrears were very rarely repaid. Indeed, landlords periodically wrote off sizeable sums they had given up hope of retrieving.<sup>62</sup> Of course, an inability to reclaim old arrears would have been unimportant if the rent was initially set high enough to incorporate an expected element of default.<sup>63</sup> But if the social norm was that repayment was hardly ever expected, then why did landowners sometimes exercise their legal power to distrain tenants' assets to discharge their debt, or not write off arrears sooner? Especially suggestive are examples of farmers in arrears avoiding meetings with their landlord. When many of the more than 30 tenants leasing property from Thomas Newton were in arrears, just two attended his rent day dinner.<sup>64</sup>

More importantly, Figure 1 can be used to derive a rough impression of the degree of risk sharing provided by rent arrears. To achieve this, the arrears series needs to be compared with the best currently available (although flawed) summary measure of the farmer's overall exposure to income risk, namely the variability of annual net farm profits (which measure the returns to the three types of inputs provided by farmers, namely capital, manual labour, and their managerial/entrepreneurial role). If arrears were an important means of landlord/tenant risk sharing then they should loom large relative to the worst-case scenario for farmers' profits, suggesting that landowners and tenants were both bearing sizeable risks. To undertake this comparison, the data in Figure 1 must be mapped onto the fragmentary information on net farm profits, which is summarized in Section V below. This is possible by invoking contemporary views that, as a rule

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<sup>60</sup> P-values=0.004 and 0.00 for t- and F-tests respectively. All statistics calculated using absolute values.

<sup>61</sup> Turner et al., *Agricultural rent*, p. 183.

<sup>62</sup> Ibid.

<sup>63</sup> Jones, 'Agriculture', p. 75.

<sup>64</sup> Christ Church Archives, Oxford, MS Estates 60, fo. 250, Newton to S. Smith, 6 Dec. 1823.

of thumb, the farmer's average net annual profit could be expressed as some proportion of the landlord's gross annual rent. The most common perceptions were that, on average, net profit was equal to the rent, which is one interpretation of the traditional notion that a farm should produce three rents ('one for the landlord, one for the expenses of cultivation, and another for the farmer'), or alternatively that average net profit equalled half the rent, as was assumed by the Inland Revenue when income tax was reintroduced in 1842. The following analysis uses both possibilities.<sup>65</sup>

According to Figure 1, on average farmers received maximum rent arrears of 12 per cent of the rent due. This is the relevant figure for comparison if net profit on average equalled rent; if net profit instead averaged about half the rent, then this upper bound figure needs to be doubled to 24 per cent.<sup>66</sup> To anticipate the results tentatively indicated in section V, the downside of average annual net profit (expressed as the approximate percentage fall from the mean to make the numbers comparable with the arrears figures) appears to have been well in excess of 12–24 per cent. Thus, on average, even the most generous amount of rent arrears does not seem to have been particularly large compared to the downside in net farming profits. It would, therefore, have taken substantial additional insurance from rent abatements or spending on repairs for English landowners to have shared risks with their tenantry to an especially substantial extent. Section V examines some of the data on these other forms of risk sharing, and suggests that it was unlikely that they necessarily added very much to rent arrears.

Before proceeding to that discussion, it is useful to briefly consider the additional evidence provided by a case study of landlords' reactions to their tenants' troubles caused by cattle plague in the 1740s and 1750s. Farmers were not completely dependent on their landlord for aid: government compensation for slaughtering infected animals was available, which in practice came to perhaps 14–38 per cent of the animal's market value, and as already mentioned, some villages

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<sup>65</sup> Quote (from William Marshall) cited in Turner et al., *Agricultural rent*, p. 19. Compare Collins, 'Agricultural change', p. 117; Holderness, 'Prices', pp. 179–80; *idem*, 'Investment', pp. 912–13; Mingay, 'Agricultural taxation', p. 931.

<sup>66</sup> If average net profit equalled half the rent, then the simplest way to map the arrears series in fig. 1 onto net profits is to halve the annual figures for rent due from which Fig. 1 is calculated. This doubles the percentage importance of arrears (£1 of arrears is worth less when rent/profit is £100 compared to when the latter is halved to £50). For simplicity, and in the absence of overwhelming evidence to the contrary, it was assumed that the rent:profit ratio was constant over 1750–1850: if this was not the case, then a given amount of arrears would have been more sizeable in relation to profits at some times than others.

had established cow clubs. The money from these sources alone, though, probably would not have been sufficient for afflicted farmers to undertake substantial restocking, and there was no marked rise in cattle prices to help such farmers offset part of their losses. Landowners would be expected to have been at about their most generous in providing financial assistance since mid-eighteenth-century cattle plague was a serious and largely exogenous setback arising well before commercial insurance against livestock mortality became available. Yet the handful of detailed statements that survive indicate that this likely upper bound of landlord aid was not especially munificent. At Thorney, Cambridgeshire, the duke of Bedford gave £546, which equalled only 19 per cent of the total lost sales value of the animals. With government compensation, this aid would have taken the tenants' compensation to 57 per cent of value, but tellingly Bedford's estate steward warned that this was insufficient to avoid 'fatal consequences'. The Norfolk tenants of Sir Leeke Okeover also suffered heavy losses but were allowed little leeway from their landlord, who had his own financial problems.<sup>67</sup> Of the 18 farmers on the Robinson estate at Clifton, North Riding, who lost at least one animal, just six received any aid, with the full sum comprising only 13.5 per cent of the tenantry's total losses of £215 10s.<sup>68</sup> Finally, Tyrwhitt-Drake allowed most of his Cheshire tenants about a third of their net losses, roughly twice the amount of government compensation received, but like many other landowners he set this allowance against rent arrears rather than giving cash, again to the complaints of his steward.<sup>69</sup>

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<sup>67</sup> Clay, 'Estate management', pp. 231, 245.

<sup>68</sup> York City Archives, M31/449, account of cattle lost, c. 1752.

<sup>69</sup> Broad, 'Cattle plague', pp. 113–14.

## V

It is essential to attempt to assess the overall impact of all the specific risks and risk management strategies surveyed in the previous sections. This is desirable partly because it has often not been possible to convincingly ascertain their individual importance, but more fundamentally because the various factors considered could have offset one another.<sup>70</sup> Data on farm profits is the obvious summary indicator of the combined impact of risks and insurance strategies. If the overall income risk was substantial and farmers not landlords were the residual claimants, then farming profits should have been high on average and very variable, in particular fluctuating to a greater extent than the rent paid to the landowner (since rent paid captures rent arrears and abatements). Unfortunately there are a number of problems with undertaking these tests. First, only very limited profit data are available because few farmers kept careful accounts. Second, profits can be measured in a variety of ways. The most popular modern measures are net profit (gross farm revenue less operating expenses but excluding the cost of implicit payments to the farmer's capital and labour) and economic profit (net profit less imputed payments). In what follows net profit is preferred where available, if only because it was the easiest comparator when ascertaining the importance of the rent arrears graphed in Figure 1, but it is not always possible to be sure what measure the numbers derived by contemporaries and historians represent. Finally, whatever measure is deployed, profit is a flawed indicator of the income risk experienced by farmers since its components – output, prices, and costs – contain endogenous variability as well as the exogenous variability that is the target measure. Yet even though the profit data are unsatisfactory, they do provide the best available quantitative evidence.

Statements of the average size of the farmer's profit were made by the county reporters of the Board of Agriculture around the turn of the nineteenth century. On the basis of over a dozen testimonies, many of which complained that generalization was difficult because profits varied so substantially, the farmer's net profit appears to have averaged at 10–15 per cent of capital employed.<sup>71</sup> Despite the unsophisticated standards of contemporary accounting, historians' estimates are not entirely dissimilar. Holderness thought the dairy farmer's 'total return on capital' in 1800 to be 'perhaps 15 per cent'. Hueckel has corrected the accounts of eight farms for some, though not all, contemporary errors, and his calculations of 'property income' – revenue net of expenses including the implicit cost

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<sup>70</sup> As emphasized by Jones, *Seasons and prices*.

<sup>71</sup> Hueckel, 'Farming profits', pp. 334–5; Stead, 'Land tenure', pp. 54–5.

of the farmer's labour (manual and managerial) – indicate a mean return during 1790–1818 of 11 per cent of capital employed (median 9.5 per cent; 46 observations).<sup>72</sup> Since this period was an agrarian boom, these returns are not representative of less prosperous years. Evidence given to the 1830s parliamentary inquiries on the state of agriculture gives some suggestion of lower profits, with one witness from Norwich saying that farming profits had fallen by 6–10 per cent.<sup>73</sup> For the 1840s and 1850s, an average return to farmers' capital of 8–10 per cent is repeatedly cited in the literature, probably referring more often than not to net profit.<sup>74</sup>

Taking Hueckel's figure of 11 per cent as an approximation of the average return to the farmer's capital (after charging implicit labour costs) around 1800, a sense of the size of this profit can be obtained by rough-and-ready comparisons with a selection of alternative average returns on capital obtained at about the same time. Farming profitability appears to have been comparable to that in the risky industries of coal mining, ironworking, and brewing (5–14 per cent), and about twice that available from the low risk investments of mortgages, consols, and land (3.5–5 per cent).<sup>75</sup> Although it is tempting to ascribe the farmer's apparently high average return to purely being a risk premium, this is not possible because it is conceivable that it could include an element of monopoly profit if farmers possessed some degree of market power.

The empirical evidence also shows that farm profits varied considerably over time and space suggesting that, in spite of all the risk management strategies available to them, tenant farmers were still exposed to considerable income volatility. Hueckel's estimates indicate substantial variations in property income on the same holding over time. During 1803–4 to 1814–15, for example, the occupier of a grazing farm, probably in Wiltshire, experienced annual returns on capital ranging from 7–26 per cent around a mean of 16 per cent. Scattered qualitative and quantitative evidence elsewhere is also indicative of a substantial range in farm profits, including the making of losses.<sup>76</sup> Some of this profit volatility was a

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<sup>72</sup> Holderness, 'Prices', p. 183; unweighted mean calculated from Hueckel, 'Farming profits', tab. 1, assuming a capital/output ratio of 1.55 by linear interpolation between the printed figures.

<sup>73</sup> Wade Martins, *A great estate at work*, p. 14. Compare Turner et al., *Agricultural rent*, p. 20.

<sup>74</sup> Collins, 'Agricultural change', p. 119; Thompson, *Landed society*, pp. 244–5; Turner et al., *Farm production*, p. 37.

<sup>75</sup> Clark, 'Land hunger', tabs. 3–4; Hueckel, 'Farming profits', pp. 342–3; Thompson, *Landed society*, pp. 251–2; Wordie, *Estate management*, pp. 124, 147.

<sup>76</sup> Hueckel, 'Farming profits', tab. 1 (on a capital/output ratio of 1.3); also Caird, *English agriculture*, pp. 155–6; Collins, 'Agricultural change', pp. 117–20; Holderness, 'Prices', pp. 179–84; Turner et al., *Farm production*, pp. 59–60.

function of the treatment of one-off large capital expenditures, which tended to be included in a single year's operating costs. Thus in 1853–4 the Lincolnshire farmer William Scorer recorded a loss of £68, but was careful to note that this was due to spending £250 altering a farmhouse.<sup>77</sup> Nonetheless, it is difficult to believe that all the profit variability can be put down to this factor.

Some very limited data allows a comparison of the variation of farm profits with that of rent received by the landlord. The albeit imperfect evidence indicates that, despite the theoretical possibility that landowners extensively shared risks with their tenants through rent remittances or arrears, in practice farmers rather than landlords were exposed to the bulk of the income risk. Table 3 reports estimates of net profit (in pounds and as a percentage of capital invested) together with the rent paid on four farms in two time periods, which vary from farm to farm. The data was taken from contemporary farm accounts which are sufficiently detailed to be sure that the profit volatility was not driven by substantial capital expenditures. Table 3 shows that, as expected, on each farm the time-series variation in profits was greater than that of rent received. The ledger of the Osborne family – yeoman farmers of Derbyshire who let some of their property – for 1697–1745 also provides some indication that rental income was typically more stable than farm profits.<sup>78</sup> It might be objected that, considering the dubious accounting practices of contemporaries, these unadjusted accounts could give a misleading impression. Further supportive evidence, though, comes from Allen's carefully constructed accounts of 100-acres of farmland in four old and recently enclosed villages in the pasture district of the south midlands for *c.*1806. This cross-sectional sample is very small but does control for farm size, enclosed status, and to some extent environmental conditions. Allen's calculations show sizeable variation in costs and revenues even on these relatively homogeneous farms, and that rent varied by less than the farmer's economic profit, which in three of the four cases was negative.<sup>79</sup> Finally, as mentioned above Hueckel's reconstructed accounts show substantial time-

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<sup>77</sup> Mingay, 'The farmer', p. 789.

<sup>78</sup> Lee and Osborne, 'Account book', tab. 1.

<sup>79</sup> Allen, *Enclosure and the yeoman*, tab. 9.4.

**Table 3. Net farm profit and rent paid in two time periods, 1824–69**

Farm	Period I			Period II		
	Profit (£)	Profit (%)	Rent (£)	Profit (£)	Profit (%)	Rent (£)
c. 600 acres in Norfolk <sup>a</sup>	919	27	522	- 146	- 4	540
590 acres mixed-soil in east Suffolk <sup>b</sup>	763	13	652	750	11	651
230 acres heavy arable land, west Suffolk <sup>c</sup>	33	2	221	210	9	200
836 acres in south Wiltshire <sup>d</sup>	124	2	1,035	639	11	1,042

- Notes:*
- <sup>a</sup> for this farm, period I was 1824 and period II was 1826.
  - <sup>b</sup> period I was the average of profit and rent over 1839–43 and period II was the average profit and rent during 1863–7.
  - <sup>c</sup> period I was the average over 1840–4 and II was the average during 1863–7.
  - <sup>d</sup> period I was 1868 and II was 1869. Profit is measured as net profit in pounds and as a percentage of the occupier's capital.

*Sources:* *Royal Commission on Agriculture* (P.P. 1896, XVI), tabs. LXXXI–LXXXII, XCV; Holderness, 'Prices', tab. 2.11. The post-1870 data from the former source was ignored on the grounds that it was even more outside the time period covered by this article than some of the data used.

series variation in property income on a grazing farm, but the landlords' rent was a constant £255.

An important caveat to the foregoing discussion is that the frequency of farming failures appears to have been lower than the level that might be expected from the above evidence on the size and allocation of income risk. Local and national statistics on eighteenth- and nineteenth-century insolvent debtors and bankruptcies suggest very low failure rates, although the coverage problems of these sources are particularly acute in the case of agriculturists, if only because farmers' creditors seem to have been especially likely to employ non-official – and thus unrecorded – methods of debt recovery, or even write off the money owed

(since the only assets most tenants in trouble possessed were growing crops, livestock, and implements, this often gave creditors little to make it worthwhile undertaking what could be costly and protracted formal proceedings).<sup>80</sup> More reliable data is provided by Holderness's study of estate rentals in Lincolnshire, Norfolk, and Suffolk, which indicated that between 1760 and 1830 'fewer than five per cent of all tenants apparently failed, quit owing large arrears, or were evicted for non-payment of rent'. The wider based evidence of fairly lengthy durations of occupancy of rack rent farmers on the same holding is also indicative of low failure rates.<sup>81</sup> Further research is required to reconcile the apparent inconsistency between the sizeable income risks borne by farmers and their infrequent failures. One speculative explanation is that landowners tried to concentrate their relatively limited risk sharing on those lessees about to go under. This would have saved them the costs of quickly finding a replacement tenant, and if landlords were able to commit to only providing insurance as a last resort, this might have overcome much of the perverse incentives arising from rent arrears and remissions. Another possibility is that farmers were usually able to successfully manage the underlying income risk by utilizing some of the strategies not covered by this paper, such as borrowing or liquidizing assets in bad years.

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<sup>80</sup> PRO, CHES/10/1, list of discharged debtors from Chester Castle gaol, 1737–8, 1804; PCOM/2/396, Shrewsbury gaol debtors' register, 1855–61; Haagen, 'Debt law'; Hoppit, *Risk and failure*; Lester, *Victorian insolvency*.

<sup>81</sup> Holderness, 'Prices', p. 187; Stead, 'Mobility of tenant farmers'.

## VI

Farming is a hazardous business. The traditional Ricardian view is that landlords were the residual claimants of agrarian income, but this article has provided evidence from the period 1750–1850 that supports Offer's argument that actually landowners passed most of the income risk onto their tenant farmers. It was not straightforward for English farmers to manage the sizeable risk that they contracted to bear when they signed fixed-rent contracts. Risk management and diversification on the farm certainly helped reduce exposure to income shocks, but it is unlikely that these methods provided anything like complete protection. Moreover, the scope for insuring against agricultural risks was very limited before well into the nineteenth century. It is difficult to confidently assess changes in the size of the overall risk over the eighteenth and early nineteenth centuries. Some risks, such as the impact of weather on output, seem to have declined, while others – notably price risk and the chances of livestock dying from disease – probably did not. Yet the overall impression (suggested by the statistics on rent arrears and the move away from alternative agriculture) is that, by the nineteenth century, farmers were operating in a generally less risky environment than before, partly due to improved methods of risk management. Thus, although not all the possibilities have been examined, and it is difficult to determine the precise timing of the apparent reduction in overall risk, this evidence provides some support for claims that a precondition of the enclosure occurring during the late eighteenth and early nineteenth centuries was that many farmers no longer needed the insurance provided by scattering.

Tenants were not entirely left to manage risk on their own: landowners did share risks through rent arrears and abatements. The limited available quantitative evidence, however, suggests that the extent of this assistance should not be exaggerated. Despite all the methods of risk sharing and self-insurance available, the farmer's profit varied substantially across time and space, and to a greater extent than the rent received by the landlord. Offer's claims over the allocation of risk in the English land tenure system, then, withstand closer scrutiny.

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