

Manorial estates as business firms: the relevance of economic rent in determining crop choices in London's hinterland, c.1300^{*}

by Harry Kitsikopoulos

Abstract

This paper addresses the claim made by some scholars that production decisions on the part of manorial estates in the London region c.1300 conformed to the logic of a model advanced by the German agricultural economist Johann von Thunen. The claim is tested by calculating the economic rent of four major grains and the results are contrasted with actual cropping patterns, revealing certain discrepancies. In the end, an alternative interpretation is offered questioning the relevance of von Thunen's model.

Manorial accounts, comprising the richest source of information on English medieval agricultural history, have been used to establish with astounding clarity the production profiles of feudal estates, especially for the decades before the Black Death. This impressive documentation, however, has not been matched by progress in the realm of interpretation, particularly when it comes to understanding the rationale and motives driving production decisions. The role of markets in this regard is especially ambiguous. There is no doubt that manorial estates used markets as means of generating monetary wealth. Did they use them, however, only occasionally and after 'satisficing strategies' had been pursued to extravagant limits? If so, this would indicate that market activities played a useful but marginal role.¹ Or did markets function

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¹ The emphasis on 'satisficing strategies' has been advanced by Kathleen Biddick in *The other economy: pastoral husbandry on a medieval estate* (1989), and in her paper (with Catrien Bijleveld), 'Agrarian productivity on the estates of the bishopric of Winchester in the early thirteenth century: a managerial perspective', in B. M. S. Campbell and Mark Overton (eds.), *Land, labour and livestock: historical studies in European agricultural productivity* (1991).

as loci where a notion of profit, at least rudimentary, found its expression feeding backwards and determining production decisions?

Writing in the second quarter of the nineteenth century, the German agricultural economist Johann von Thunen professed to have uncovered the principle that determines a broad range of decisions on the part of agrarian producers, from the choice of field systems and crops to the degree of commercial orientation and productive intensity.² This principle, he argued, was the level of economic rent whose size depended, *ceteris paribus*, on the distance of a farm from an urban centre and the transportation cost involved in carrying commodities to this market. Economic rent was defined as the difference between the price of a product and the total amount of payments made to the various factors of production.

Von Thunen's model provided the inspiration and theoretical framework for a large number of case studies, principally among economic geographers. One of the most recent studies to utilize this model, the 'Feeding the City' project (henceforth the FTC study), directed by Campbell and Keene and published in 1993, undertook the enormous task of uncovering the patterns of production and distribution within London's hinterland around the turn of the fourteenth century. Reviewing and assessing the multifaceted aspects of this work goes far beyond the scope of this paper. Nevertheless, there is one claim made by the authors that is particularly troublesome, namely that the configuration of economic rent played a significant role in determining crop choices on the part of manorial estates within London's provisioning zone.³ According to this argument, crops that were unable to sustain a high transportation cost (e.g., oats) were grown predominantly very near London, followed by intermediate crops (such as barley and rye), which prevailed at some distance from the metropolis; wheat, commanding the highest price among grains and thus able to sustain a high transportation cost, was the speciality of demesnes lying at the periphery of London's provisioning zone.

The present paper argues that the applicability of von Thunen's model for the issue at hand is uncertain; specifically, while it is a useful tool in defining the outer limits of this provisioning zone given different modes of transportation, it lacks predictive power when it comes to explaining the spatial configuration of crop choices, assuming we treat the London region as a single, unified market. To support the argument that economic rent was the principal determinant of the spatial distribution of crops, it is imperative to draw the marginal rent lines for each crop in order to calculate the distances at which economic rent is exhausted for each one of them, as well as the rings that define the areas where one crop's economic rent supersedes the rent of another. This theoretical exercise presupposes, as shown in the next section, the utilization of data regarding yields, market prices, production costs, and transportation rates for each crop prevailing at that time within the London region. Once the exercise is completed, the results can be contrasted with the actual distribution of crops to verify the presence or absence of identical patterns or, in the case of deviations, the magnitude of them. The authors of the FTC study cite all the data necessary, with the exception of production costs, for this theoretical

² J. H. von Thunen, *The isolated state*, ed. P. Hall (1966).

³ B. M. S. Campbell, James Galloway, Derek Keene, and Margaret Murphy, *A medieval capital and its grain*

supply: agrarian production and distribution in the London region, c.1300 (1993); the discussion on crop choices is on pp. 111–25.

exercise to be undertaken. Despite the fact that rough but reasonable estimates of the latter can be provided, they failed to calculate them, instead assuming that production costs were 'roughly constant' for each crop;⁴ as will be shown later, this claim is a fatal flaw in their argument. They then conclude that the actual crop distribution patterns conform to von Thunen's model without having drawn the marginal rent lines of each crop, as the model dictates. Hence, the primary objective of this paper is a methodological one: to describe the theoretical exercise that ought to have been undertaken by the authors of the FTC study before any claims to von Thunen's authority were made.

The resolution of this issue has far broader implications. There is a lively and ongoing debate regarding the determinants of medieval economic growth and the role played by markets in this context. There is an optimistic interpretation, whose origins can be traced back to Boserup's work, arguing that population growth induced the expansion of markets, drew a positive response from producers (the evidence is drawn mainly from manorial estates) and led to an increase of total output, a mechanism that came to a halt with the great epidemic. The behaviour of the London market is particularly important in this respect because that is where population growth and urbanization were the most pronounced. Ultimately, this view assigns the crisis of feudalism to an exogenous factor, disease. In referring to managerial attitudes, Stone has argued that at least some medieval landlords acted as proto-capitalists in that they were responsive to maximizing revenues through market sales in order to finance investment, building works, and military campaigns. Their practices left a lot to be desired by the standards of modern capitalists, lacking both a personal interest in day-to-day decisions and any techniques for calculating profitability. This interpretation has been counteracted by a bleaker approach, viewing markets as 'largely localized, episodic, causal and poorly integrated'. In this latter view, forwarded by mainstream historians such as Britnell and applauded by sympathizers of a Marxist viewpoint, a plausible interpretation of the role of medieval markets is that they functioned as outlets for grain surpluses once the primary goal of extravagant consumption has been satisfied; as such, they failed to play a critical role in shaping sustained economic growth.⁵

Campbell's work clearly falls on the side of the optimists. But, at a microeconomic level, in addressing the role of economic rent in shaping production and distribution choices, particularly when it comes to crops, Campbell has wobbled between the purist position of market primacy and statements that assign significance to other factors, in the process creating a considerable degree of ambiguity, as I shall show later. Space limitations preclude any participation in this

⁴ Ibid., p. 112.

⁵ For the exposition of the optimistic viewpoint, see James Masschaele, *Peasants, merchants and markets: inland trade in medieval England, 1150–1350* (1997); D. Stone, 'Medieval farm management and technological mentalities: Hinderclay before the Black Death', *EcHR* 54 (2001); B. M. S. Campbell, *English seigniorial agriculture, 1250–1450* (2000). Mainstream historians who have adopted a pessimistic approach include R. H. Britnell, 'Urban demand in the English economy, 1300–1600', in James Galloway (ed.), *Trade, urban hinterlands and*

market integration, c.1300–1600 (2000), and Mark Bailey, 'Peasant welfare in England, 1290–1348', *EcHR* 51 (1998). The Marxist argument is not monolithic when it comes to the role of markets; for two variations of it see Brenner's and Bois' contributions to T. H. Aston and C. H. E. Philpin (eds), *The Brenner debate: agrarian class structure and economic development in pre-industrial Europe* (1987). The quote comes from John S. Lee, 'Feeding the colleges: Cambridge's food and fuel supplies, 1450–1560', *EcHR* 56 (2003), p. 262.

larger debate. But the discussion of crop choices in the light of von Thunen's model will generate certain implications relevant to this wider debate about the role of medieval markets.

This paper is divided into four sections. The first one summarizes the part of von Thunen's model that is relevant to the theory of crop choices. The second section reconstructs the marginal rent lines for four major grains, revealing a production pattern that ought to have been adopted if producers followed the logic of the model, whereas the third one addresses the question of whether the actual crop choices conform to the results of the theoretical exercise.⁶ The final section evaluates the results in the context of an alternative interpretation which questions the argument underpinning the FTC study.

I

Von Thunen's model seeks to discover the principles that define the typology and functional character of field systems within a uniform plain dominated by the presence of a single urban center whose inhabitants derive their food supplies from its productive hinterland. In a brilliant exposition of partial equilibrium analysis, a precursor of the Marshallian methodology, he sets constant, implicitly or explicitly, a number of parameters within this plain: weather and soil conditions, absence of alternative markets, as well as uniformity in the quality of management and transportation networks. The only variable in his system is transportation cost (i.e., carting cost) which increases with distance from the town, producing a sliding scale in terms of the farm-gate prices received by producers.⁷

Von Thunen's theory of crop specialization may be reduced, like everything else, to a problem of maximizing economic rent.⁸ The economic rent of each crop can be defined as:

$$R = E(p - a) - Efk$$

Where R = rent per acre (dependent variable); k = distance (independent variable); E = yield in quarters per acre, p = market price per quarter, a = production cost per quarter, and f = transportation rate per quarter per unit of distance for each crop (constants or parameters).

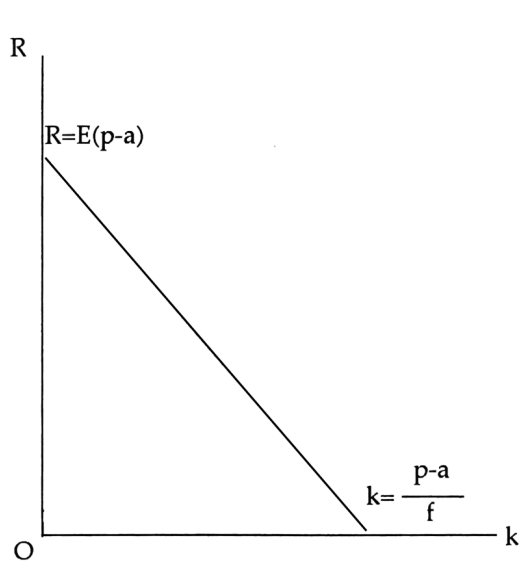
Figure 1A depicts the simplest possible case of deriving the economic rent in an economy with a single crop. The R -intercept gives us the economic rent generated by a plot located in the town, being equal to the yield times the net receipt per acre; the higher the yield and the price (a function of demand) of this crop, and the lower the production cost, the higher up the vertical line the R -intercept is going to be located. The slope of the marginal rent line depicts a linear relationship, given the constants and parameters in the above formula, and it reveals that rent per unit of land is diminished for each unit of distance at a rate equal to the product

⁶ The entire exercise uses data derived from manorial estates, as the FTC study does. The scarcity of relevant data when it comes to peasant holdings precludes a more expanded scope in order to include the peasant sector.

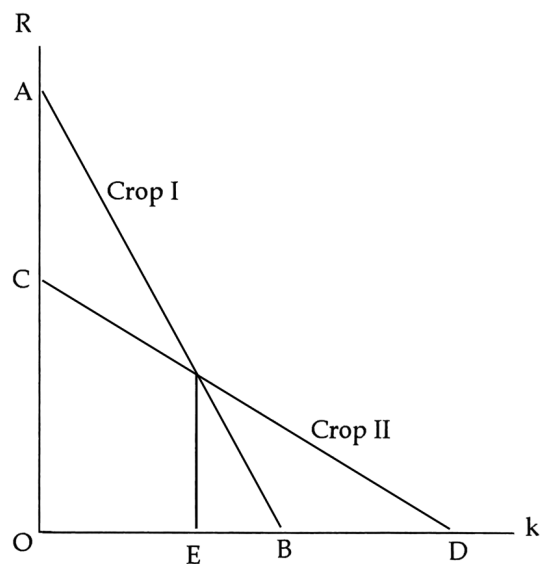
⁷ Von Thunen, *The isolated state*, pp. xxii, xxiv.

⁸ The entire segment on crop specialization relies heavily on Edgar S. Dunn, *The location of agricultural*

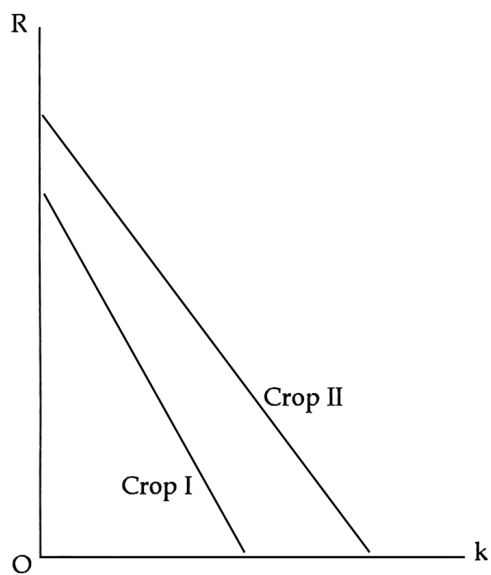
production (1954), esp. pp. 6–27, 38–47, 55–63, 66–75, 93, 99–104; for shorter expositions, see J. R. Peet, 'The spatial expansion of commercial agriculture in the nineteenth century', *Economic Geography* 45 (1969), pp. 284–90, and David Grigg, *The dynamics of agricultural change* (1982), pp. 136–7.



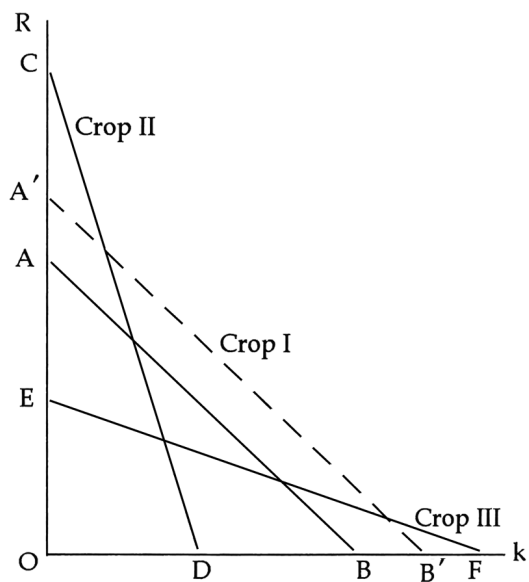
(1A)



(1B)



(1C)



(1D)

FIGURE 1. Crop specialization under von Thunen's model

of the yield and freight rate. Rent is eventually exhausted at the k -intercept where $k = p - a/f$. At this point commercial production ceases and total economic rent is maximized, because that is where marginal rent equals marginal cost.⁹

Figure 1B takes the analysis a step further by looking at an economy producing two crops; crop I yields a marginal rent of AB, and crop II a marginal rent of CD. The major constraint for crop I has now been altered. Instead of being concerned with the point where its marginal rent becomes zero, the problem is now finding the point at which its marginal rent becomes equal to the marginal opportunity cost presented by the rent-yielding potential of crop II. The graph shows that for the distance OE, which in essence is a radius defining a concentric ring, crop I is going to be produced exclusively because its marginal rent exceeds the marginal rent (opportunity cost) of crop II. Reversing the logic, crop II is going to be produced in the zone defined by the distance ED.

It is important to note that ring formation is not a predetermined fact in a multiple-crop economy. Ring formation presupposes two necessary and sufficient conditions, namely, that the R -intercept of a crop has to be higher and its k -intercept has to be lower than the equivalent intercepts of the second crop, as depicted in Figure 1B. These two conditions ensure that the marginal rent line of the first crop will have a steeper slope and that it will cross the marginal rent line of the second crop within the positive quadrant of the graph. To state it differently, the crop with the largest net return at the town must have a higher transport cost per unit-distance if ring formation is to be established. If any of the aforementioned conditions is violated, we can end up with a situation such as the one depicted by Figure 1C where crop I is excluded and crop II dominates the productive hinterland of the town.

Finally, Figure 1D examines how considerations of demand affect market equilibrium in a three-crop economy.¹⁰ Let us assume that the price of crop I increases. This development will increase the R -intercept of crop I and shift its marginal rent line to A'B' resulting in an expansion of its ring and the re-establishment of equilibrium in this market based on the new supply line. However, the expansion of the supply for crop I encroaches upon the supply zones of the other two crops and comes at their expense. If crops II and III are not close substitutes to crop I, their demand will exceed their (diminished) supply leading to an increase of their prices. The presence of disequilibria in the markets for crops II and III will prompt an expansion of their own supplies and a shift of their marginal rent lines to the right in the same fashion as the shift to A'B'. This development will restrict the supply zone of crop I, increase its price, and prompt a new cycle of reaction like the one just described. The point is that the supply and the extent of a crop's ring depend not only on its own price but on the equilibrium prices of all other crops.¹¹

In the end, economic rent is the ordering principle that determines the spatial distribution of crops. Alas, the level of economic rent is determined in reality not only by distance but by

⁹ The horizontal axis is the marginal cost line since rent is expressed net of production costs; see Dunn, *Location of agricultural production*, p. 9.

¹⁰ The principles for ring formation in this figure are precisely the same as in figure 1B.

¹¹ The implication is that the problem of the spatial

extent of production for each crop has to be looked at in the context of a general equilibrium model. Such an attempt will not be made at the present paper; the interested reader, however, can find an abstract formulation of such model in Dunn, *Location of agricultural production*, pp. 18–24.

a host of other factors which have been termed as constants or parameters at the beginning of the analysis, a fact of which von Thunen was fully aware. The issue of variations in soil and weather conditions, for instance, is of paramount importance. To begin with, the chemical balance of soil in terms of nitrogen necessitates the cultivation of legumes, regardless of whether their economic rent falls short of the economic rent generated by grains.¹² Most importantly, the precise nature of soils affects the degree of adaptability of various crops and hence their production costs and yields. Von Thunen noted that 'the lower the fertility of the soil, the more expensive the crop is to produce – and soil of low fertility can be cultivated only when the price of grain is high'.¹³ In other words, declining fertility results in altering the outer boundaries of commercial production, and in distorting the linearity of the marginal rent lines.¹⁴

Another complication arises when there is more than one urban center in the same region.¹⁵ If we are dealing, for instance, with two towns of different population endowments, income distribution patterns, and consumer tastes, the supply zone of the smaller town will cut a wedge into the supply zone of the larger one and it will force an extension of the latter's supply zone. The main complexity arises from the fact that we now have to establish two marginal rent lines for each crop, one for each town. Furthermore, any change in the demand and price of a crop is bound to alter both the ring formation and the equilibrium conditions of both markets since they comprise part of an interrelated system.

All in all, the simultaneous relaxation of every assumption in von Thunen's model renders unavoidable a sense of excessive complexity.¹⁶ In the end, the main weakness of the model is the tremendous burden it places on the time of a researcher when it comes to gathering data for anything but a narrow locality; for medieval England, in particular, the burden is especially keen because of the paucity of records regarding some key variables of the model (e.g., certain grain prices and production costs). Nevertheless, by returning to von Thunen's static partial equilibrium approach and by taking some liberties with extrapolations when using data, an attempt will be made to test the claim advanced by the authors of the FTC study that maximizing economic rent was the key determinant of crop choices on the part of manors located within London's hinterland.

¹² The cultivation of a crop with low economic rent may also be warranted when it functions as an input to animal husbandry, is the preferred choice for human consumption, or when it helps in reducing overall farming costs while is produced in conjunction with another crop. For instance, spring grains may generate a lower rent compared to winter grains (or the other way around), but there may be savings realized by including them in the annual routine since they spread the demand for labour and capital inputs throughout the year.

¹³ Von Thunen, *The isolated state*, p. 30. He noted that, as fertility and yields decline, costs decline proportionately less because certain types of cost are fixed (at the same time, he assumes that variable costs decline by the same proportion as yields).

¹⁴ Dunn argues that we are likely to end up with

concave curvilinear rent functions, that is, economic rent will decline at a decreasing rate with distance; but he adds that the principles which establish ring formation for various crops, as well as the conditions for spatial equilibrium remain essentially unaltered; see Dunn, *Location of agricultural production*, pp. 39–43.

¹⁵ This complication arises only when the supply zones of these towns overlap. For visual representations of how the supply zones and rings may look like, see *Ibid.*, pp. 59–63; also, von Thunen, *The isolated state*, pp. 171–4, 215–22 where he discusses this and other complications when some of his assumptions are relaxed.

¹⁶ The list of factors which add to the complexity of the model is not limited to the ones mentioned in the previous two paragraphs. Von Thunen, for instance, brings up the presence of alternative transportation networks, such as the existence of a navigable river.

II

The hypothesis regarding crop specialization in the London region can be tested by calculating the economic rent for each grain type and the distance at which it was exhausted by transportation cost (see Figure 1). Economic rent at the farm-gate is given by the expression $R = E(P - A_1)$, whereas the distance at which it was exhausted can be found by using the expression $k = (P - A_2)/f$, where R = economic rent per acre, E = yield per acre (in quarters), P = price per quarter, A_1 = production cost per quarter, k = distance in miles, A_2 = production cost plus dealers' profits per quarter, and f = transportation cost per quarter per mile.

Estimates for the production cost of each grain type are presented in Appendix 1 along with information on the sources regarding yields and prices. Some brief discussion, however, is necessary regarding the cost of different transportation modes. Beginning with land carriage, the standard method was to specify a rate per quarter depending on the type of grain and the distance travelled.¹⁷ A rate of 0.317*d.* per quarter of wheat per mile has been adopted based on a sample provided by Masschaele.¹⁸ Subsequently, the cartage rates for the other types of grain have been extrapolated based on their weights relative to wheat.¹⁹ The same method followed for the calculation of river and coastal shipments, indicates that the unit cost of the former was

¹⁷ A less preferred method was to hire a cart by the day in which case it became necessary to specify the loading capacity of the cart and the distance to be travelled in a day; see James Masschaele, 'Transport costs in medieval England', *EcHR* 46 (1993), p. 269. For the loading capacity of carts, see *id.*, pp. 269, 276, and Campbell, *English seigniorial agriculture*, p. 214. Campbell's estimates have been used in this paper.

¹⁸ Masschaele, 'Transport costs', pp. 270–1, 277–8. It should be noted that only data from Essex, Hertfordshire, Kent, and Oxfordshire (Table 1) have been utilized – as opposed to his entire sample which includes counties beyond the core of the London region since rates there were lower – deriving a figure of 1.9*d.* per ton-mile. The latter figure has been adjusted in three ways. First, it was converted to cost per quarter per mile; second, it was adjusted based on a quarter of wheat equal to 424 lbs, as opposed to 384 lbs adopted by Masschaele, in order to keep consistency with the weights adopted by the authors of the FTC study; third, it was adjusted to include the cost of overnight stays which is not taken into account by Masschaele. Payments to either *famuli* or customary tenants performing carrying services were very common and included the cost of food when day trips were undertaken or an additional amount when overnight stays were involved, specifically for the 'expenses of men and horses'. Evidence for these extra payments comes from the Wiltshire manors of Monkton Deverill and Longbridge Deverill. Two sorts of payments were made, one for ½*d.* per quarter of wheat and barley when

the destination was up to 10½ miles away, and 1*d.* per quarter when the distance was over that limit but never exceeding 20 miles. The only explanation for the difference in payments is that it involved the cost of overnight stays given the fact that approximately 10 miles seems to have been the normal distance that could be travelled by carters allowing them to return back home the same day. The method that has been used to incorporate the cost of overnight stays is to add 0.025*d.* to the cost of transporting a quarter of wheat, barley, and rye per mile (that is, divide 0.5*d.* by 20 miles, the normal distance travelled in a day); the added cost per mile for oats has been derived as 0.018*d.* This simplistic method has been chosen in order to retain the linearity of the marginal rent lines in graphical analysis. See Masschaele, *Peasants*, pp. 203–4; D. L. Farmer, 'Two Wiltshire manors and their markets', *AgHR* 37 (1989), pp. 5–7; D. Postles, 'Customary carrying services', *J. Transport Hist.* 5 (1984), p. 7; D. L. Farmer, 'Marketing the produce of the countryside, 1200–1500', in E. Miller (ed.), *The agrarian history of England and Wales*, III, 1348–1500 (1991), pp. 350–2. On the other hand, the cost of renting granaries, which could be quite substantial, was not included in the calculations since it would presumably have been covered by the dealer. For references to such costs, see Edward Miller and John Hatcher, *Medieval England: towns, commerce and crafts, 1086–1348* (1995), p. 151; Farmer, 'Marketing the produce of the countryside', p. 351.

¹⁹ Campbell, *English seigniorial agriculture*, p. 215 (Table 5.04).

TABLE 1. Transportation costs of various grains (in pence per quarter per mile)

<i>Mode of transport</i>	<i>Wheat</i>	<i>Barley</i>	<i>Oats</i>	<i>Rye</i>
Cart	0.317	0.275	0.216	0.305
River	0.108	0.093	0.073	0.103
Coastal shipping	0.030	0.026	0.020	0.028

Source: see text.

one-third and the latter one-tenth of that for overland transportation.²⁰ The overall impression, however, is that transportation cost, including land cartage, was not a major obstacle in commercial transactions, although the validity of this statement hinges on the level of grain prices and the distances travelled.²¹

The figures for the transportation costs of various grains are summarized in Table 1 and are used (along with data on yields, prices, and production costs) to derive the level of economic rent for each crop and the distances at which they were exhausted (Table 2 and Figure 2).²² The results of this theoretical exercise will be contrasted with the actual patterns of crop production and distribution in the London region, to assess the claim that economic rent was the primary determinant of such patterns. In the author's view two tests seem particularly pertinent: first, whether the actual distances from which London drew its supplies are in line with the results of Table 2; second, and even more important, whether manorial estates ended up producing and selling the grains with the highest economic rents and, if so, whether

²⁰ Regarding river transportation, only the figures for the river systems of the Essex and Kent coastlines, and of Thames have been utilized (Table 2) since the rest of the data cover waterways outside the core of the London region; see Masschaele, 'Transport costs', pp. 271–3. It should be noted that the authors of the FTC study also provide their own estimates of transportation costs; they have not been utilized, however, for several reasons. First, when it comes to land cartage, they rely heavily on data from Essex and Hertfordshire where the rates were higher than elsewhere and despite the fact that they cite figures from other parts of the London region; including the latter figures produces results almost identical to those of Masschaele. Second, Masschaele's figures on the cost of river and coastal shipments are preferable because they include loading and unloading charges, as opposed to the authors of the FTC study that include them in only one of their entries; these handling charges were much higher when boats were used compared to carts, i.e., 0.91d. vs. 0.25d. per quarter of wheat. As a result of overestimating cartage costs and underestimating the cost of water transportation, the authors of the FTC study present a wider gap regarding the cost differential of the two modes. See Campbell *et al.*, *Medieval*

capital, pp. 60–3, 193–8; also Campbell, *English seigniorial agriculture*, p. 270 (n. 41). For a sample of transport costs in other parts of the country, see Masschaele, *Peasants*, pp. 207–10; D. L. Farmer, 'Prices and wages', in H. E. Hallam (ed.), *The agrarian history of England and Wales*, II, 1042–1350 (1988), pp. 742–3; Campbell, *English seigniorial agriculture*, p. 270.

²¹ Masschaele, 'Transport costs', pp. 273–4; Campbell, *English seigniorial agriculture*, p. 215 (Table 5.04).

²² It ought to be stressed that the gradient of each crop line in Figure 2 is based on average figures. The overall robustness of the calibration could, in theory, have been checked by assigning some margins of error to the underlying parameters in order to calculate the confidence interval around each line, just as we would do for a regression line. However, the results of such an exercise would have been highly tentative given the incomplete series of prices for crops other than wheat and of production costs for individual manors. Moreover, such an exercise, even if feasible, would most likely affect the cross-over point of the barley and rye lines, given the proximity of their intercepts. But it is highly unlikely that it would affect the relative position of the wheat and rye lines, given the considerable gap that separates them.

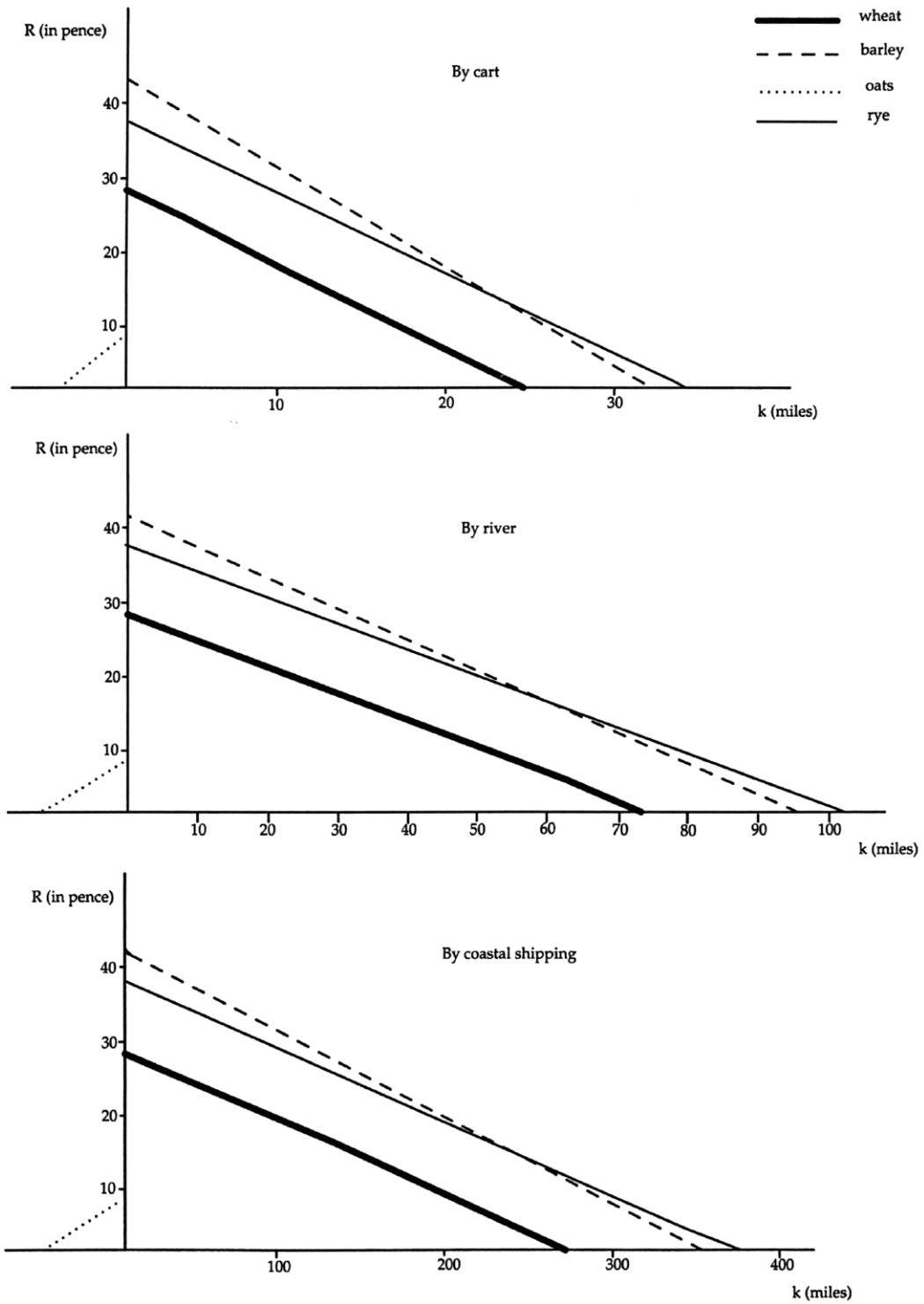


FIGURE 2. Stylistic depiction of marginal rents in the London region, various rents

TABLE 2. Economic rent at the farm gate and the distance at which is exhausted, various grains and modes of transportation (figures in quarters, pence, and miles)

	<i>Wheat</i>	<i>Barley</i>	<i>Oats</i>	<i>Rye</i>
Economic rent	Rw = 1.31 (70.24 – 48.25) = 28.8	Rb = 2.15 (53.38 – 33.72) = 42.26	Ro = 1.6 (30.2 – 25.21) = 7.98	Rr = 1.71 (58.29 – 36.2) = 37.77
Distance (cart)	Kw = (70.24 – 62.29) ÷ 0.317 = 25	Kb = (53.38 – 44.39) ÷ 0.275 = 32.69	Ko = (30.2 – 31.25) ÷ 0.216 = -4.86	Kr = (58.29 – 47.85) ÷ 0.305 = 34.22
Distance (river)	Kw = (70.24 – 62.29) ÷ 0.108 = 73.61	Kb = (53.38 – 44.39) ÷ 0.093 = 96.66	Ko = (30.2 – 31.25) ÷ 0.073 = -14.38	Kr = (58.29 – 47.85) ÷ 0.103 = 101.35
Distance (sea)	Kw = (70.24 – 62.29) ÷ 0.030 = 265	Kb = (53.38 – 44.39) ÷ 0.026 = 345. 76	Ko = (30.2 – 31.25) ÷ 0.020 = -52.5	Kr = (58.29 – 47.85) ÷ 0.028 = 372.85

Sources: Table 1 and Appendix 1.

the spatial configuration of each grain type within the London region conforms to the logic depicted in Figure 2.

III

London was a bustling metropolis by 1300, with a population (according to the FTC study) approaching 100,000 inhabitants, generating a total demand in the range of 165,000 quarters of assorted grains (for food, drink, and fodder), which required approximately 137,000 acres to produce them.²³ Its grain requirements, however, would have to be drawn from a wider area, because a large quantity of grains produced within its supply zone would have been consumed locally or used to procure the needs of overseas markets (Flanders, Norway) and secondary urban centres, most notably Oxford, Ipswich, Yarmouth, Norwich, King's Lynn, and Boston. It has been estimated that each one of these towns drew supplies from a radius of 8–12 miles around them, as was the case for Norwich with a population of around 25,000 in 1330.²⁴

The first test as to whether the results of the FTC study conform to patterns predicted by

²³ The figure for London's grain requirements is the mean of a wider range and corresponds to an annual per caput mean of 1.65 quarters. For this information, as well as estimates on the amount of calories per bushel of various grains, see Campbell *et al.*, *Medieval capital*, pp. 35, 41, 72.

²⁴ Hence, the capital's needs would be met mainly by southern Oxfordshire, southern and eastern Berkshire, Hertfordshire, southern Bedfordshire, most of Essex, and northern Kent. On the other hand, irregular supplies would be forthcoming from parts of Kent, Sussex,

East Anglia, the axis of Lynn-Boston and its interior, and areas lying beyond Henley along the Thames, Henley being the end of effective navigation for Thames; supplies from these places would be drawn upon once every 4–11 years, depending on the price of grains in London and the level of traders' profits. When it comes to the south-eastern coastline, in particular, it was cheaper to dispose of grains to Flanders and Norway from parts north of Colchester (Essex) and east of Faverham (Kent) than to London. See *Ibid.*, pp. 9–10, 14, 24, 47, 68, 70–1, 77, 143–4, 173, 181–2, 195, 197–8.

von Thunen's model is to look at the distances involved in provisioning London with grains. In contrast to the methodology of the present study, which specifies the exact distance at which economic rent for each grain was exhausted given different modes of transportation, the authors of the FTC study define some broad limits. Specifically, 'London's grain supply area in normal years appears to have extended to include market towns up to 20 miles from the city when only land transport to London was available'.²⁵ The estimate is a bit more specific when it comes to wheat, the most commercialized crop, whose regular supply came from as far as 18 miles, and occasionally extending up to 26.5 miles from the capital.²⁶ These figures conform fairly well with the results of Table 2 according to which the economic rent of wheat was exhausted at 25 miles from London, whereas the limits for barley and rye, when carts were used, were around 33 or 34 miles, somewhat above the 20 miles of the regular supply zone specified by the FTC study but still within the realm of reason when irregular supplies are taken into account. The aforementioned comparison is mainly relevant when it comes to the provisioning of the capital with wheat, barley, and rye, but the conformity of results extends also to oats. Campbell's conclusion that the 'commercial production [of oats] had to be geared in the main towards the provisioning of local markets' is clearly supported by the figures of Table 2 which show that a modest economic rent could be earned only when sales were made directly by producers at the farm gate.²⁷

When it comes to river transportation and coastal shipping, there is a less satisfactory convergence of results between the present paper and the FTC study due to the adoption by the latter of much lower transportation rates. The main implication is that, if these lower rates were adopted, the limits at which economic rent was exhausted would have been more distant from the capital. On the other hand, the FTC study specifies the provisioning limits of London 'up to about 60 miles *as the crow flies* when water transport could be used' (my emphasis);²⁸ this figure is not terribly different from the *actual* distances of Table 2, at least when it comes to river transportation which was the most common means of conveying grains across water.²⁹

It should be noted that actual distances travelled by boats and, especially, carters, often exceed the limits specified in Table 2. The logic of the model presented in the previous section can easily incorporate such exceptional cases by allowing for regional differences in production costs, yields, and dealers' profits; by prices exceeding the adopted averages for various crops at any given year; by taking into account the cheaper (but not free) transportation cost involved with the use of customary services which would have allowed direct marketing by eliminating

²⁵ Ibid., p. 173.

²⁶ The two figures were extrapolated in the following way: Campbell and his associates argue that the regular supply of wheat to London would be derived from an irregularly-shaped area whose outer limits were defined by a transportation cost of 6.3*d.* per quarter of wheat, whereas irregular supplies would be forthcoming from an isopleth whose outer limits extended up to 9.3*d.* per quarter. These two figures are subsequently divided by the cartage cost adopted by the authors thus defining the two isopleths in terms of mileage. See Ibid., pp. 60–1,

esp. Figure 7.

²⁷ Campbell, *English seigniorial agriculture*, p. 224.

²⁸ Campbell *et al.*, *Medieval capital*, p. 173.

²⁹ According to the figures of Table 2, using the Thames would have allowed the provisioning of the capital with wheat from locations a few miles beyond Henley, whereas barley and rye could be shipped from almost as far as Abingdon. Coastal shipping could have pushed the limits all the way north to the Yorkshire coastline, south to Devon and Cornwall, as well as continental markets.

the dealers' profit; and by the value of certain shipments in which economic rent was not an issue, as was the case with the provisioning of the royal army or household.³⁰

The more pertinent question is not whether the present paper agrees with the results of the FTC project when it comes to outlining the geographical limits of London's supply zone. Despite the broad agreement on this issue, the second and most crucial test is whether the quantitative extent of production and commercial disposal of crops, as well as their spatial dispersal within that supply zone, conform to the logic of von Thunen's model. In terms of the former aspect of this test, and assuming economic rent was the sole criterion of cropping choices, one would expect the productive hinterland of London to be dominated by barley and to a lesser extent by rye (see Figure 2). There are other factors (not relating to the objective of profit maximization), to be discussed in the next section, that would justify the production of wheat and oats without rendering von Thunen's principles irrelevant. One would expect, in this case, a more balanced allocation with barley still being the leading crop, followed by the cultivation of fairly substantial shares of the other three grains. Alas, this expectation is not justified. In reality, wheat and oats, the two crops with the lowest economic rents, generated, by far, the highest levels of output (36.7 and 33.1 per cent respectively), with barley and rye being far behind (12.3 and 6.6 per cent respectively).³¹ Not only did barley and rye occupy fairly small shares of the grain acreage, but their commercial disposal trailed far behind that of wheat: less than a third of barley and rye (32 and 29 per cent respectively) was sold, as opposed to 48 per cent of wheat;³² in fact, 'less wheat than any other grain was retained for consumption on the

³⁰ Sheriffs' accounts, for instance, reveal the cartage of wheat from Cambridge to London (50 miles) and of various grains from Bedfordshire to Carlisle on behalf of the king whose purchases were dictated by military and consumption imperatives. Use of customary services also allowed the cartage of grains at longer distances by eliminating the dealers' commission and reducing the cost below that charged by hired carters. The utilization of such methods allowed Ibstone to transport oats to Henley or Wycombe, and the manors of Shillington and Higham Gobion in Bedfordshire to sell wheat to London, despite the fact that they were located beyond the specified limit of 25 miles. Beyond the London area, Exeter also drew supplies of wheat from as far as 30 miles (e.g., Taunton) when customary services were involved. For these types of arrangements and the distances involved, see R. A. L. Smith, *Canterbury Cathedral Priory: a study in monastic administration* (1943), pp. 119–23; Miller and Hatcher, *Medieval England*, p. 150; D. Roden, 'Field systems in Ibstone, a township of the south-west Chilterns during the later Middle Ages', *Records of Buckinghamshire* 18 (1966), p. 56 (n. 46); James A. Galloway and Margaret Murphy, 'Feeding the city: London and its agrarian hinterland', *London J.* 16 (1991), p. 7; Postles, 'Customary carrying services'; Mark Bailey, *A marginal economy?*

East Anglian Breckland in the later Middle Ages (1989), p. 157; E. Miller, *The abbey and bishopric of Ely* (1951), pp. 84–6; Maryanne Kowaleski, 'The grain trade in fourteenth-century Exeter', in Edwin Brezette DeWindt (ed.), *The salt of common life: individuality and choice in the medieval town, countryside, and church* (1995), pp. 2–3, 9–10, 23–5, 28, 30–1, 44–5; Campbell *et al.*, *Medieval capital*, p. 173; Masschaele, *Peasants*, pp. 203–7; Farmer, 'Prices and wages', pp. 742–3; id., 'Marketing the produce of the countryside', pp. 348–9, 354, 363–4, 367–9. For the fluctuations in London wheat prices, see Campbell *et al.*, *Medieval capital*, pp. 200–2.

³¹ For illustration purposes, rye and its mixtures were grown, to one degree or another, in six out of ten demesnes but they were the leading crop on only 9 per cent of them. In contrast, wheat was grown on 95 per cent of database demesnes (a total of 198) and it was the leading crop in slightly over half of them. See Campbell *et al.*, *Medieval capital*, pp. 39 (Table 1), 121–2, 124.

³² Ibid., p. 146 (Table 15); see also B. M. S. Campbell, 'Measuring the commercialization of seigneurial agriculture, c.1300', in Richard Britnell and B. M. S. Campbell (eds.), *A commercializing economy: England 1086 to c.1300* (1995), pp. 156–7, 161. The figures refer to receipts net of tithe and seed.

demesne' despite its lower economic rent.³³ The only crop that was less commercialized than barley and rye was oats (22 per cent).

Furthermore, and beyond the quantitative degree of grain production and disposal, the spatial pattern of such choices fails to reveal a neat pattern. The authors of the FTC study produce some very helpful maps referring to individual crops, in which they classify manors based on the percentage of a particular crop in terms of total grain acreage. Choosing the top two categories in each map, referring to a crop that occupies 37.5 per cent or more of the total grain acreage, provides a neat method of testing patterns of regional specialization, or lack thereof. Once again, there is little coincidence with the expectations raised by the graphs of Figure 2 because there is no evidence of a neat pattern of ring formation. This is particularly evident in the distribution of manors specializing in the production of wheat and oats which were spread in virtually every part of London's supply zone, both in landlocked areas and also closer to water routes. When it comes to the production of barley, most of the few manors that specialized in it were located downstream of London along the north-eastern coastline of Kent, whereas the distribution of the few manors specializing in rye was more erratic with only some of them concentrated upstream along the Thames; in other words, even in the case of barley and rye we do not see the formation of 360° concentric rings around London defined by transportation cost isopleths.³⁴

The more relevant criterion, in terms of whether concentric rings were formed, would be production specialization in conjunction with the location of manors that disposed commercially the greatest quantities of each grain. The authors of the FTC study reproduce another set of maps outlining the commercial profile of manors included in their database. In contrast to the expectations of Figure 2 (heavy sales of barley in the majority of the supply zone, closer to London, and rye sales from the outlying periphery), the relevant maps of the FTC study reveal a very blurred picture of disposal for every single grain, with sales generated both from landlocked areas and along water routes throughout the entire region.³⁵ The only difference in this set of maps is the density of manors which is far more pronounced in the case of wheat, the most commercialized crop, as opposed to barley, oats, and rye.³⁶

In concluding this section, it is clear that the authors of the FTC study fail to recognize these discrepancies because they do not subject their data to a rigorous analysis that takes into account all the variables and parameters relevant to the spatial determination of economic rent for each grain along the lines suggested in the previous section. In regard to rye, for instance, Campbell argues that 'the range over which [it] could be effectively marketed was ... less than that of wheat, since its comparable weight but lower price meant that it was less able to bear the costs of carriage'. And, in regard to barley, 'it could be marketed at a greater distance than

³³ Campbell *et al.*, *Medieval capital*, p. 167.

³⁴ *Ibid.*, pp. 115–25, esp. figures 12, 14, 15, 16.

³⁵ Looking at manors that sold 40 per cent or over of the receipt of a particular type of grain, net of tithe and seed, the same criterion used by Campbell. It is interesting to note that in some cases heavy specialization in the production of a crop does not translate to high levels of commercial disposal. For illustrative purposes,

the production of barley was mainly concentrated in northern and eastern Kent but intermanorial transfers within monastic estates meant that this area appears less prominent in terms of its commercial disposal. See *Ibid.*, pp. 163–4; also Campbell, *English seigniorial agriculture*, pp. 206–7 (Table 5.03).

³⁶ *Ibid.*, pp. 160–70, esp. figures 24, 26, 27, 28.

rye' and even challenge wheat, assuming it was malted, because in its latter state it commanded a higher price at a lower transportation cost.³⁷

These statements clearly reveal a misunderstanding of the concept of economic rent since its level hinges not only on prices and transportation costs but also on yields per unit of land and production costs per unit of commodity. It is true that wheat commanded higher prices than barley and rye and that its transportation cost was not much higher than those of the latter two crops. On the other hand, the production costs of barley and rye were much lower for two main reasons: first, their lower prices and higher yields per seed meant that seed requirements for the production of a unit of output (e.g., quarter) were lower; second, their higher yields per acre meant that the same unit of output could be obtained from a smaller fraction of an acre compared to wheat translating to lower labour costs (see Appendix 1). In the end, Campbell and his associates' reliance on the notion of economic rent appears highly problematic and thus it makes it necessary to broaden the discussion in order to include other potential explanatory factors.

IV

In the author's view, it is doubtful whether a model that relies primarily on market forces is an adequate instrument for explaining crop choices in the context of medieval agriculture. Instead, the interpretation of the evidence ought to include a set of multiple factors, mutually consistent, that both elaborate and expand the theoretical framework of the FTC project. The present section will provide the basic outlines of such an alternative methodology without subjecting it to a test through the use of data; such a task would entail a project of considerable scope and complexity (and perhaps of dubious feasibility when applied to a large scale), well beyond the objectives of the present paper.

An initial set of predisposing parameters

Figure 2 portrays the formation of two rings with a single crop grown in each of them, that is, barley in the ring near London superseded by rye at some distance. This seasonal monoculture, however, entails risks by rendering an estate susceptible to price fluctuations and thus necessitates a more expanded crop diversification. In addition, choosing to cultivate both a winter- and a spring-sown crop would produce the benefit of realizing savings since the use of labour and equipment is spread throughout the year, as opposed to a single season. It follows that 'the advantages of specialization do not actually prevent the formation of belts, nevertheless they prevent the production in these belts of only the single commodity whose name they bear'.³⁸

The benefits of diversification were sufficiently 'common sense' to have led manorial officials to pursue it. But what criteria became relevant in choosing specific crops? The role of edaphic (i.e., soil) conditions was a factor of great importance. We cannot establish a strict correlation between crop choices and soil types, particularly in the case of manors that contained different

³⁷ Campbell, *English seigniorial agriculture*, pp. 220, 223.

³⁸ August Losch, *The economics of location* (1954), p. 20; see also pp. 88–9.

soil types; we do not know which land segments were cultivated and with which crops. Nevertheless, there is little doubt that there was a bias towards certain soil types when it comes to three of the main grains: barley on light to medium silts and loams, rye on shallower and lighter silts and loams, and oats on heavy or water-logged soils.³⁹

Edaphic conditions were a significant predisposing factor but the presence of certain discrepancies (e.g., rye was not invariably grown on the aforementioned soil types) indicate that there was room for some others. Rye and, to a lesser extent, oats were used as liveries and payments in kind to the manorial workforce.⁴⁰ Most importantly, a very large quantity of certain grains had to be grown and set aside for animal and human consumption. In terms of the former, oats was the preferred choice for fodder given that its production cost was far lower than any other grain (see Appendix 1). Wheat, on the other hand, was the premier grain when it came to consumer preferences, based on its attributes of calorific content, baking qualities, and taste.⁴¹ Finally, a certain quantity of barley and oats had to be grown to be malted as ale.⁴²

These three factors (edaphic conditions, consumption imperatives, payments to the workforce) go a long way in explaining the pattern on the production side, that is, the heavy dominance of wheat and oats at the expense of barley and rye. But they still fail to solve the puzzle of why wheat was the most commercialized crop, as opposed to barley and rye, despite its lower economic rent.⁴³ A re-evaluation of the evidence on the role of market forces in driving disposal decisions is therefore the next step of this alternative interpretative framework.

The London grain trade: one market or many?

The heavy commercialization of wheat seems to contradict the notion that manorial reeves acted as rational economic agents – pursuing profit maximization through crop disposal – and creates a major stumbling block to acceptance of the relevance of von Thunen's model. This conclusion is inescapable in the context of the premise that the London region was a single, unified, and well-integrated market. But was it? Here I will re-examine the question of market rationality on the part of manorial officials in light of some evidence which points strongly, though not conclusively, towards the presence of a cluster of fragmented markets within the London region. It will be argued that some wheat prices in the London region may have been well above average thus generating the most profit, despite the fact that wheat had the highest production cost.

To elaborate this point we need to review the scenario depicted in Figure 1D, in which an increase in the price of crop I increases its R-intercept and shifts its marginal rent line to the right, thus encroaching upon the rings of other crops. This scenario may have been realized during the pre-plague decades but not in the context of a single, unified regional market (as

³⁹ As was the case on Romney Marsh, the coastal marshes of Essex, and Hertfordshire. See Campbell *et al.*, *Medieval capital*, pp. 116, 120, 122, 177; Campbell, *English seigniorial agriculture*, p. 225. 'Soil infertility also explains the greater prominence of oats' in Breckland; see Bailey, *A marginal economy?*, p. 138.

⁴⁰ Campbell *et al.*, *Medieval capital*, pp. 116, 122, 165.

⁴¹ Campbell, *English seigniorial agriculture*, p. 214.

⁴² For instance, a significant portion of the barley cultivated in the manors of Canterbury Cathedral Priory was kept for internal consumption; see Campbell *et al.*, *Medieval capital*, p. 121.

⁴³ The very low level of sales when it comes to oats is not an issue since both this author and the FTC study agree on its limited marketability.

depicted in Figure 2) dominated by the London wheat price functioning as 'the datum from which prices in all other parts of the territory were derived',⁴⁴ at a descending scale as distance and transportation cost increased. Instead, the rightward shift of wheat's marginal rent line at the expense of those of barley and rye may have taken place in isolated cases in the context of fragmented markets within the London region. This is suggested by the fact that wheat prices in some parts of the region were either similar to or, occasionally higher than, the London price. Specifically, the authors of the FTC study pointed out that 38 per cent of the manors in their sample recorded wheat prices higher than those in London during the period 1288–1315. The regional distribution of these demesnes is highly significant: most of them were concentrated in Kent, Surrey, Essex, Middlesex, south Buckinghamshire, eastern Hertfordshire, and around Oxford.⁴⁵ The case of Wargrave manor is indicative of these anomalies. The manor was located just a couple of miles south of Henley and its surplus wheat had ready access to the London market along the easily navigable segment of the Thames. Nevertheless, as Figure 3 shows, wheat prices at Wargrave were higher in 11 out of the 24 recorded years; and even when Wargrave prices were lower, the difference was wide enough to allow coverage of transportation cost and the emergence of an economic rent in only five years.⁴⁶ These types of anomalies are

⁴⁴ M. Chisholm, *Rural settlement and land use* (1968), p. 33.

⁴⁵ Campbell *et al.*, *Medieval capital*, pp. 63–8; Campbell, *English seigniorial agriculture*, pp. 355–6. Work on this subject, however, has produced ambivalent results. Farmer, for instance, produced regional groups of wheat prices showing them to be below the price in the Lower Thames valley (presumably synonymous with London) and to an extent that would have allowed those regions to cover the transportation cost involved in sending wheat to London. It should be noted, however, that the specific price series covers only four years and, most importantly, his broad regional groupings mask anomalies that would have become apparent with a more closely-focused approach. Such an approach is offered by Galloway in terms of wheat price differentials between London and some key locations which functioned as collection and embarkation centers for grains finding their way to the London market (Abingdon, Henley, Maidstone, Shoebury). This study does find a descending scale of prices between London and the aforementioned locations in the periphery of its supply zone. Nevertheless, the price sample refers to only a single year (1295) and, furthermore, whether the price gap between London and the other locations was sufficient to generate an economic rent, and thereby induce sales to the London market, depends on the transportation rate we adopt; using Masschaele's rates adopted in this study would not have been sufficient to induce wheat sales to London. See Farmer, 'Prices and wages', pp. 743–4; James Galloway, 'One market or many? London and the grain trade in England', in Galloway (ed.), *Trade*, pp. 28–30.

⁴⁶ That depends, once again, on the transportation rate that is adopted. Galloway argues that the transportation cost for a quarter of wheat between Wargrave and London was 3.3d. which, if accepted, would have rendered profitable the sale of wheat to the London market in nine (out of 24) years. It should be noted, however, that Galloway also verifies that Wargrave prices were higher 'at some periods' and this conclusion was extended both by him and Farmer to several other manors of the Winchester bishopric, most of them in the upper Thames valley. See Farmer, 'Marketing the produce of the countryside', pp. 367–9; Galloway, 'One market or many?', pp. 29–31. The prices of Figure 3 have been derived from M. M. Postan (with statistical notes on Winchester heriots by J. Titow), 'Heriots and prices on Winchester manors', in M. M. Postan (ed.), *Essays on medieval agriculture and general problems of the medieval economy* (1973), pp. 174–8 (Table 9.1); Campbell *et al.*, *Medieval capital*, pp. 200–2. All dates are those at the end of the accounting year to which the figures relate. Figure 3 is intended to show broad trends, as opposed to precise differentials because the authors of the two studies cite prices which are not directly comparable. On the one hand, Campbell and his associates cite prices, mostly dated, from different London markets for a particular year out of which an unweighted average has been calculated. On the other hand, Postan and Titow provide a mean annual price extracted from individual sales cited in the Winchester pipe rolls which are virtually never given a within-year date. The issue of the dating of prices plays a role in determining the respective averages because as the time progresses following a harvest prices

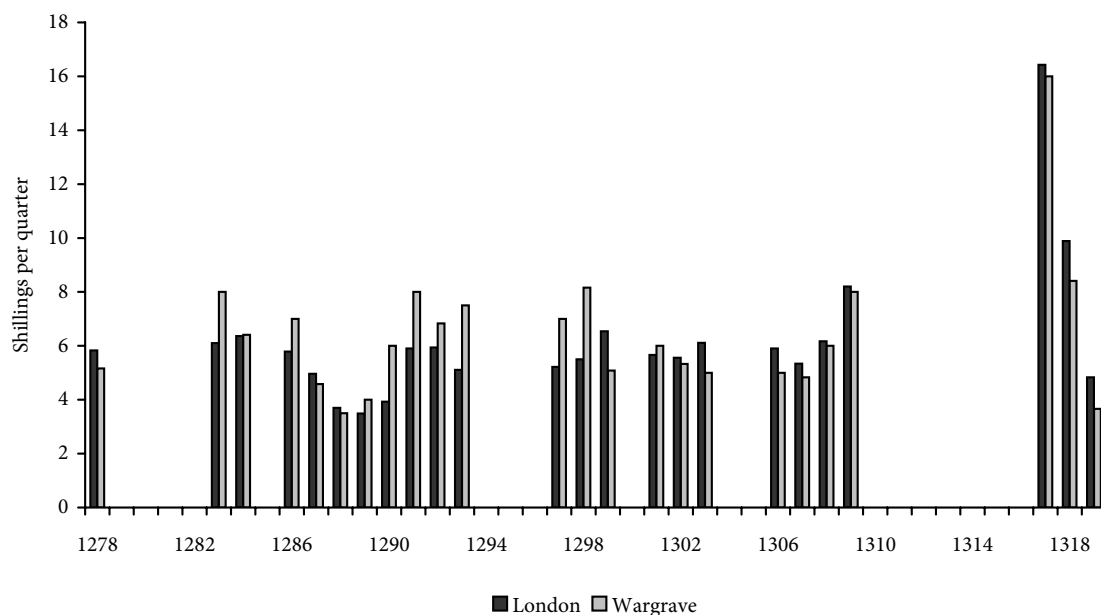


FIGURE 3. Wheat prices in London and Wargrave, 1278–1319

characteristic of not only the years around the turn of the fourteenth century but also the second quarter of it.⁴⁷

The interpretation of this evidence is not an easy task but certain remarks can be offered in the context of an ongoing debate regarding the nature of medieval markets. Price movements are reflections of the interaction between supply and demand. Given the fact that the latter is fairly constant in the short-run, the high end of regional discrepancies in the price of wheat ought to have been the outcome of local scarcities due to supply deficiencies. It is interesting to note that those areas which recorded some of the highest wheat prices happened to be the same that also recorded some of the lowest wheat yields, namely, Middlesex, Surrey, Essex, and Hertfordshire. The high prices recorded in Kent and the western segment of the Thames valley (Buckinghamshire, Oxfordshire) do not reflect a low level of productivity since wheat yields were either much or modestly higher respectively;⁴⁸ they may still indicate, however, a difficulty on the part of suppliers to respond to a market demand forthcoming, in addition to London,

Note 46 *continued*

tend usually (but not invariably) to climb. This problem may create a minor issue in the results when the price differential between the two locations is small. Nevertheless, it will certainly not change the overall conclusion that London prices were often lower and that, even when higher, the price gap was not large enough to cover transportation cost and generate an economic rent.

⁴⁷ Farmer's data show that wheat prices in some parts of the London region during the period 1326–48 were

either virtually identical to those in the lower Thames (presumably synonymous with the London price), as was the case in the upper Thames region and Essex, or lower (Chilterns) but not to an extent sufficient to cover transportation cost; on the other hand, prices in Kent were higher. Once again, however, Farmer's methodology should be treated with caution for the same reason pointed out in n. 45; see Farmer, 'Marketing the produce of the countryside', p. 373 (Table 4.6).

⁴⁸ Campbell *et al.*, *Medieval capital*, pp. 125–8.

from a dense local population and continental markets (in the case of Kent) or from Oxford (in the case of the western Thames region).

This uneven and erratic pattern of price formation, both in regional and temporal terms, indicates the presence of high economic rents for wheat within some clusters which may well have induced sales at the local level – without the London price being relevant in this case – in the end rendering it the most commercialized crop at the expense of barley and rye.⁴⁹ The latter two crops would still have been produced and sold in some minimum quantities given that this scenario need not have had universal applicability in the London region, and given the factors previously discussed such as crop diversification to minimize risks, the influence of edaphic conditions and, most importantly, the need to produce barley for ale and the requirement for rye to pay the manorial workforce.

Overall, the evidence seems to point towards the formation of fragmented and localized markets, as opposed to a single unified one whose price structure was dominated by London's demand. This conclusion is further reinforced by the presence of significant fluctuations in the price of wheat, another criterion that is often cited to test the lack of market integration;⁵⁰ and it points towards a 'weak mercantile organization' at the level of interregional trade.⁵¹

Granted the growing evidence pointing towards the lack of integration of medieval markets, it has to be admitted that this statement is still in the process of transitioning from a conjecture to being fully validated. Assuming there is merit to it, however, can one argue that manorial officials acted rationally in pursuing the cultivation and sales of large quantities of wheat? In other words, if the Thunenesque logic is not applicable in the context of a single market, is it relevant in the context of many, fragmented markets?

The problem with this line of argument is that there were no systematic efforts in manorial accounts to calculate total or unit production cost, particularly its most prominent component (i.e., labour cost), or profit per unit of output.⁵² The implication is that manorial officials may

⁴⁹ To be precise, wheat's economic rent not only had to be high but, in addition, higher than those of other grains in order to dominate local markets. The appropriate method of analysis in pursuing further this conjecture would be a general equilibrium model that incorporates multiple local markets; the construction of such a model, however, goes well beyond the scope of this paper.

⁵⁰ Evident, for instance, in Figure 3 in regard to both London and Wargrave; see also A. J. S. Gibson and T. C. Smout, 'Regional prices and market regions: the evolution of the early modern Scottish grain market', *EcHR* 48 (1995), p. 261; Galloway, 'One market or many?', pp. 34–5; Bailey, 'Peasant welfare', pp. 235–6.

⁵¹ R. H. Britnell, *The commercialisation of English society, 1000–1500* (1993), p. 100.

⁵² Interestingly, some estates located in highly commercialized East Anglia and Kent did adopt a form of balance sheet that resembled modern notions and procedures for the calculation of profits. Specifically,

there was an effort to inquire into the sources of profitability, particularly by distinguishing its arable and pastoral components. Eminent examples of such efforts have been documented for Norwich Priory under the leadership of Henry of Lakenham, the lay estates of Clare and Bigod, as well as Canterbury Cathedral Priory. Nevertheless, beginning in the 1330s, these efforts were not characterized by continuity since accounting practices reverted back to the cruder, older methods, while the 'high-farming' phase was still going on. Generally, and Campbell concurs on this, manorial accounts were drawn in such a way as to avoid fraud, as opposed to calculating profit and its sources. See Campbell, 'Measuring the commercialization of seigneurial agriculture', pp. 191–2; see also E. Stone, 'Profit-and-loss accountancy at Norwich Cathedral Priory', *Trans. Royal Hist. Soc.* 12 (1962), and H. P. R. Finberg, *Tavistock Abbey: a study in the social and economic history of Devon* (1951), pp. 219, 243, 248; Stone, 'Medieval farm management', pp. 613, 632.

have been deciding on crop choices by taking into account only prices and transport costs, two variables easily perceived and compared, but failing to incorporate in their judgments differences in production costs. Given the level of complexity involved in calculating the latter (see Appendix 1), they may have abstained from such calculations, coming instead to the conclusions that the production costs of different crops were similar and that wheat was the most profitable crop, given its higher price and a transportation cost gradient similar to that of other grains.

In the end, if the price differential between wheat and rye or barley in these localized markets was wide enough to counterbalance the former's higher production cost, manorial officials may have been taking the right decisions in terms of crop choices but based on a faulty methodology. If that is the case, the furthest one can go is to argue that some manorial officials may have possessed commercial astuteness and traits of proto-capitalist behaviour, but not the level of sophistication that characterizes the decisions of capitalist producers and which is demanded by von Thunen's model.

V

The present paper had limited objectives and scope, that is, to expose the conceptual flaws found in the FTC study by applying a particular model to explain the choice of crops among manorial estates in the London region. The resolution of this issue bears relevance to the controversy about the role of markets in driving production and disposal strategies on the part of manorial estates. Despite the fact that the demesne sector accounted for no more than a third of the total arable area and that peasant involvement in the market was likely to have been driven by different motives and constraints, the rewards of further work on this subject would be enormous.

In the form of some final thoughts, it would be useful to reiterate the main points of contention and agreement and suggest some venues for further research. The present paper and the authors of the FTC study are in agreement when it comes to the role of certain predisposing factors, such as ecology and soil type, that 'influenced rather than determined the pattern of cultivation' in the London region.⁵³ But beyond these predisposing factors, the real issue of contention is the role of market forces. For analytical purposes, it would be useful to discuss this role in determining production and disposal decisions separately, although the two were obviously related.

In terms of production decisions, Campbell's position on this issue has generated the semblance of conceptual contradictions given his statements that 'the basic consumption needs of seigneurial households still had first claim upon demesne production on many estates';⁵⁴ nevertheless, 'it was the market via its influence upon economic rent which largely determined the crops produced'.⁵⁵ Campbell's apparent ambivalence on this issue may stem from his failure to appreciate that estate owners did not simply engage in 'basic' consumption; instead, their

⁵³ Campbell *et al.*, *Medieval capital*, p. 176.

⁵⁴ Campbell, 'Measuring the commercialization of seigneurial agriculture', p. 186, emphasis added; see also *id.*, 'Matching supply and demand: crop production and

disposal by English demesnes in the century of the Black Death', *JEcH* 57 (1997), pp. 847–8, 853.

⁵⁵ Campbell, *English seigniorial agriculture*, p. 203.

consumption reached extravagant levels. Dyer, among others, has documented varying, but still extraordinary, levels of expenditure, depending on the number of retained servants (from a couple to several dozen in the case of higher nobility) and guests visiting periodically during the year, and the degree of travel of the lord and his companions from manor to manor, in the process 'eating the estate produce or using up the accumulated cash for rents'.⁵⁶ The most prominent cost of such lifestyles was the amount spent on food, which could amount to between a quarter and half of a household's budget, although even more extravagant levels have been recorded. Dyer stresses that estate owners were 'influenced by ideas about consumption that put emphasis on largesse' and despite the fact that he qualifies his statement by noting that such ideas were 'tempered always by a practical restraint and occasional moral qualms',⁵⁷ nevertheless, 'basic' in terms of characterizing seigneurial consumption is clearly a misnomer. The evidence regarding excessive consumption has become even stronger through the work of Biddick, which established that cropping practices in several manors were strongly correlated to consumption patterns but not to prices.⁵⁸

When it comes to the role of markets in shaping disposal strategies, the FTC study notes that

a concentric pattern of specialization in the production and sale of different types of grain ... on the lines of that predicted by the von Thunen model, is approximated in only a part of the region which supplied London with grain ... [but] that pattern lacks the immediate spatial clarity envisaged in the idealized world of his Isolated State.⁵⁹

In fact, it has been argued here that the lack of clarity is far more pronounced, assuming the London market is treated as a single entity. It is useful to reiterate once more that the Achilles' heel of the FTC study is its faulty methodology, that is, its presumption that the production costs of different crops were the same and, therefore, economic rents were largely determined by selling prices. It made no attempt to calculate such production costs.⁶⁰

⁵⁶ C. C. Dyer, *Standards of living in the later Middle Ages: social change in England, c.1200–1500* (1989), pp. 27–108. The quote is from p. 54.

⁵⁷ *Ibid.*, p. 91.

⁵⁸ Correlation coefficients between cropped acreages and the consumption levels of wheat (but also of other grains) were very high among several manors of the Winchester bishopric, whereas correlation coefficients between cropped acreages and prices were, by and large, either very low or negative, including manors that were within London's core supply zone (e.g., Brightwell, West Wycombe, Witney); see Biddick (with Bijleveld), 'Agrarian productivity', pp. 106–13. This study refers to the early thirteenth century; however, see also Biddick, *Other economy*.

⁵⁹ Campbell *et al.*, *Medieval capital*, p. 178.

⁶⁰ Unfortunately, the same faulty methodology is followed in other studies that touch upon the same subject. In a study of Hinderclay manor, Stone concludes that

sowing strategies 'were very effective' by correlating the sown acreages of each crop with the movement of their prices and how the latter affected gross returns per acre, in the process ignoring relative costs. Of course, economic rent (or profit) is not synonymous with gross returns per acre. An even more objectionable methodology is followed in Lee's attempt to test the relevancy of von Thunen's model in the provisioning policies of two Cambridge colleges during the period 1450–1560. Lee maps the distances between Cambridge and different points in its hinterland where provisions came from, in the form of fuel and food supplies (including wheat and malt barley, the only two crops he considers), and then simply contrasts the zoning pattern that emerges with that outlined in von Thunen's model. No attempt is made to calculate the economic rents (or even to look at relative prices) of the different commodities. See, Stone, 'Medieval farm management', pp. 619–25; Lee, 'Feeding the colleges'.

The present paper wishes to suggest two alternative, but largely irreconcilable, explanations whose validity can only be assessed with further research. First, the evidence discussed here regarding the spatial configuration and erratic nature of wheat prices suggests that there is no such thing as the London grain market but a configuration of fragmented localized markets, lacking institutional maturity. Were the marginal rent lines of crops in local markets different from the ones drawn in this paper because London prices were irrelevant? Von Thunen's model is a useful analytical tool in resolving this issue if it is applied to individual manors with enough data to reconstruct the various parameters and variables of the model. It is plausible, I suspect, that some manorial officials may have acted as proto-capitalists taking production decisions based on unsophisticated judgments, that is, focusing on the movement of relative prices, as opposed to adopting a modern methodology of profit calculation. If so, choices would be 'irrational' (from a neoclassical point of view) but the role of markets would be relevant to a degree still to be determined.

But another possible explanation, hardly explored by any scholar, is the relationship between the type and volume of crop disposal, on the one hand, and the degree of seigneurial prerogatives on the part of individual estates, on the other. Campbell's analysis of the *IPMs* and the *Nonae* Rolls has revealed that only a fairly modest portion of seigneurial revenues were contributed by the exploitation of demesne lands (30 per cent), the remaining coming from rents, tithes, and banalities.⁶¹ In other words, manorial wealth was based much more on property ownership and political prerogatives and compulsion than on managerial skills. It is important to note that revenues from demesne lands declined in significance as we move from the estates of the gentry, crown and nobility to those of greater clergy and it is useful to recall that the presence of the latter was particularly noticeable in the London region. We would not be violating common sense by stating that there may have been an inverse relationship between the size of seigneurial prerogatives and the incentive for landlords to use the market as a source of wealth creation; in other words, access to these prerogatives may have created a widespread, though not necessarily universal, indifference towards profit maximization, the reverse also holding true. Despite the fact that these two sources of wealth creation are not necessarily contradictory, unresponsiveness to the presence of economic rent in the market place did not incur the same penalties as in a capitalist economy; in contrast, in the abstract world of the *Isolated State*, producers would have to act in a fashion much more similar to modern economic agents. In the end, pursuing this line of research may prove that the attempt to apply von Thunen's model is problematic even in the context of fragmented markets in the London region.⁶²

⁶¹ B. M. S. Campbell, 'The agrarian problem in the early fourteenth century', *Past and Present* 188 (2005), p. 19, Table 3.

⁶² Campbell has talked in his various publications

about the role of institutional rigidities, relegating them to a factor of secondary importance, but has never elaborated on this term and its impact on production decisions.

APPENDIX 1
Production and distribution costs of various grains

TABLE A1. Production and distribution costs per quarter of various grains (all figures in pence)

	<i>Wheat</i>	<i>Barley</i>	<i>Oats</i>	<i>Rye</i>
Harvesting ^a	3.47	3.47	3.47	3.47
Gleaning ^b	0.19	0.11	0.15	0.14
Carting and stacking ^c	0.2	0.17	0.14	0.19
Threshing and winnowing ^d	2.5	2	0.87	2.5
Carting and spreading manure ^e	1.14	0.69	0.93	0.87
Carting and spreading marl ^f	7.83	4.74	6.39	5.97
Ploughing ^g	3.16	1.91	2.57	2.41
Sowing ^h	0.19	0.11	0.15	0.14
Harrowing ⁱ	0.38	0.23	0.31	0.29
Weeding ^j	0.57	0.34	0.46	0.43
Total labour cost ^k	19.63	13.77	15.44 (9.05)	16.41
Capital cost ^l	5.54	3.89	4.36 (2.55)	4.63
Seed ^m	18.70	13	11.32	11.87
Administrative cost ⁿ	4.38	3.06	3.11 (2.29)	3.29
Total production cost	48.25	33.72	34.23 (25.21)	36.2
Dealers' profit ^o	14.04	10.67	6.04	11.65
Production cost + dealers' profit	62.29	44.39	40.27 (31.25)	47.85

Notes:

^a Harvesting cost is found by taking one quarter (= 8 bushels) and dividing by 5, that is, the number of bushels one worker can reap in one day. There are a number of methods for extrapolating productivity rates per acre and per man-day when it comes to harvesting but I have adopted estimates provided by Walter of Henley; for a discussion of these methods, see Harry Kitsikopoulos, 'Standards of living and capital formation in pre-plague England: a peasant budget model', *ECHR* 53 (2000), p. 255.⁶³ The product of the division (1.6) gives us the number of man-days needed to harvest a quarter of grains and it is subsequently multiplied by a daily wage of 2.17*d*. The latter figure is derived from the decennial means of reaping wages during the period 1250–1347 based on a very comprehensive sample provided by Farmer; see his 'Prices and wages', p. 768 (Table 7.7). Farmer's figures refer to reaping cost per acre, which has been converted to a daily wage by dividing his average by 2.5, that is, the number of man-days needed to reap one acre (again following Walter of Henley).

^b In the absence of reliable data on gleaning, a productivity rate of 6 acres per man-day has been adopted (assumed to be a reasonable approximation), and a daily wage of 1.5*d*., since that was the typical remuneration of a common worker during the pre-plague period; for the latter, see Dyer, *Standards*, p. 117, and N. W. Alcock, 'An East Devon manor in the later Middle Ages', *Trans. Devonshire Association* 102 (1970), pp. 171–2. The area necessary to glean

⁶³ Stone provides a few figures from Wisbech manor showing that the productivity rate varied in the range of 3.90–7.42 bushels per man-day depending on the composition of the labour force in terms of hired labour vs. customary services, the former being more productive; see D. Stone, 'The productivity of hired and customary labour: evidence from Wisbech Barton in the fourteenth century' *ECHR* 50 (1997), p. 652.

in order to obtain one quarter of wheat, barley, oats, and rye was 0.76, 0.46, 0.62, and 0.58 acres respectively, given the gross yields per acre for each crop cited in Campbell *et al.*, *Medieval capital*, p. 40 (Table 2, column 4, internal method). The gross yields used in this paper are inclusive of tithe. I have decided to include it because tithe may be a deduction from the point of view of an individual manor but not for the London region as a whole, which is the focus of the paper. That is because some manors did have to pay tithe but others were in receipt of it or had both to pay it while at the same time they were receiving it. Unlike seed – which is a genuine cost item from the point of view of the region as a whole, since it is lost in production – the quantity of tithe grain was retained within the region and ‘was an important source of commercial supply ... sometimes exceeding in volume the amount sold directly by the demesnes’; see *Ibid.*, p. 74, esp. n. 113. Finally, even if yields net of tithe were used, it would not affect the relative positions of the marginal rent lines in Figure 2 since the deduction would be proportionally the same for each grain, that is, ten per cent of the harvest.

- ^c In the absence of a comprehensive set of data, the daily wage of a carter (1.17*d.*) has been calculated by finding an arithmetical average from figures referring mainly to annual wages in several manors and then dividing by 270 days (that is, excluding Sundays and holidays). The following sources were used: Farmer, ‘Prices and wages, 1350–1500’, p. 480; K. Ugawa, ‘The economic development of some Devon manors in the thirteenth century’, *Trans. Devonshire Association* 94 (1962), p. 670; Ian Kershaw, *Bolton Priory: the economy of a northern monastery, 1286–1325* (1973), p. 55. The productivity rate varied based on the distance between the fields and storing facilities, but it is assumed to have been the loading, transporting, and unloading of two cartloads (2,400 lbs) per man-day; for the loading capacity of medieval carts, see Campbell, *English seigniorial agriculture*, p. 214. The cost of carting a quarter depended on the weight of each grain type. One quarter of wheat was 424 lbs, of barley 368 lbs, of oats 288 lbs, and of rye 408 lbs; see *Ibid.*, p. 215 (Table 5.04). Each one of these weights has been divided by 2,400 and then multiplied by 1.17.
- ^d The figures are based on payments in two manors cited in Campbell *et al.*, *Medieval capital*, p. 112, n. 5. In the absence of rye figures, the one for maslin was used, a mixture of wheat and rye. An arithmetical average was taken for the barley and oats figures.
- ^e The productivity rate can only be conjectured but a reasonable extrapolation can be derived from manorial practices. At Balsham carrying 2½ cartloads of dung was considered to be one day’s labour service; see H. E. Hallam, ‘Farming techniques: eastern England’, in Hallam (ed.), *Agrarian History*, II, p. 285. It follows that it would take about one man-day to both cart and spread one load. In the absence of reliable data, a daily wage of 1.5*d.* has been assigned (as in note b) but the latter figure has been adjusted to the acreage necessary to produce one quarter of each grain type (by multiplying the respective figures in note b above with the daily wage).
- ^f The cost of marling, easily the most expensive task in the agrarian routine, is fairly well-documented in manorial records. A cost of 8.59*s.* (103.08*d.*) per acre has been calculated, as an arithmetical average, and then the latter figure has been adjusted to the fraction of an acre necessary to produce one quarter of each grain type (see entry 2 above); the product was multiplied by 0.10 based on the assumption that marling was undertaken once every 10 years, as was the practice among some estates (e.g., Bury St. Edmunds). The data were extracted from the following sources: Hallam, ‘Farming techniques: eastern England’, pp. 285–6, and ‘Farming techniques: southern England’, in Hallam (ed.), *Agrarian History*, II, pp. 347–8; Eleanor Searle, *Lordship and community: Battle Abbey and its banlieu* (1974), p. 291; Smith, *Canterbury*, pp. 136–7; M. Mate, ‘Medieval agrarian practices: the determining factors’, *AgHR* 33 (1985), p. 23; P. F. Brandon, ‘Farming techniques: south-eastern England’, in Hallam (ed.) *Agrarian History*, II, p. 314, and *id.*, ‘Demesne arable farming in coastal Sussex during the later Middle Ages’, *AgHR* 19 (1971) p. 134; and Campbell, *English seigniorial agriculture*, p. 360.
- ^g Productivity rates, when it comes to ploughing, varied between half and one acre employing a team of two men; a rate of 0.75 acres per day has been adopted here. The daily wage of the ploughman was estimated by taking the annual wage, estimated by Thorold Rogers, and dividing by 270 days (as in note c above). It comes to 1.56*d.* or 3.12*d.* for the team. The latter figure has been adjusted to the acreage needed to produce one quarter of each grain type (see note b above). For relevant sources, see Searle, *Lordship*, p. 308, n. 9; J. Langdon, *Horses, oxen and technological innovation: the use of draught animals in English farming from 1066–1500* (1986), pp. 160–1; C. C. Dyer, *Lords and peasants in a changing society: the estates of the bishopric of Worcester, 680–1540* (1980), p. 102.
- ^h There are no sufficient data when it comes to productivity rates or daily wages regarding sowing; in light of it, a rate of 6 acres per man-day at a daily wage of 1.5*d.* has been adopted (representing the typical wage of a common worker) and the latter has been adjusted to the acreage needed to produce one quarter of each grain type (see note b above).

- ⁱ There is very meager evidence when it comes to the productivity rate for harrowing. A reference regarding labour services in an Essex manor indicates a rate of two acres per man-day. However, given the low productivity of labour services, as opposed to wage labour, and the fact that later evidence (from the nineteenth century) suggests double this rate, it has been decided to adopt a rate of three acres per man-day; see Langdon, *Horses, oxen, and technological innovation*, pp. 162–3. The lack of sufficient data on wages forces us to adopt the generic figure of 1.5*d.*, which has been adjusted to the acreage needed to produce each grain type (see note b above).
- ^j Productivity rates for weeding can be derived by dividing piece rates by daily wages. In this case, however, a figure of two acres per man-day was adopted based on evidence from Wisbech manor which shows some variation around this figure depending on whether hired or customary labour was used. The daily wage is taken as 1.5*d.* and then adjusted to the acreage needed to produce each grain type (as in note b). See Stone, 'Productivity', p. 652; C. C. Dyer, *Warwickshire farming, 1349–c.1520: preparations for agricultural revolution* (1981), p. 15.
- ^k Total labour cost for oats is calculated with and without (the figure in parenthesis) the cost of marling. The acreage under oats was rarely, if ever, treated with marl. The same distinction is made in subsequent entries.
- ^l The capital cost figures have been calculated by assuming that they comprised 28.25 per cent of total labour cost based on a weighted average of the respective proportions of the two kinds of cost at the 12 manors of Bolton priory and three manors of the earl of Devon (Tiverton, Topsham, Plympton). See Harry Kitsikopoulos, 'Urban demand and agrarian productivity in pre-plague England: reassessing the relevancy of von Thunen's model', *Agricultural History* 77 (2003), pp. 517–21 (Appendix B); Kershaw, *Bolton priory*, pp. 31–3, 35–7, 47–9, 58, 119.
- ^m The calculation of seed is based on gross yields and seeding rates cited in Campbell *et al.*, *Medieval capital*, p. 40 (Table 2, columns 1 and 4) but adjusted to get the seed requirements for the production of one quarter of each grain type. Grain prices have been found by first calculating the London wheat price (1288–1309) at 70.24*d.* per quarter from data cited in *Ibid.*, pp. 200–2 (Table 18). Subsequently, the prices of other grains were derived based on their price ratios relative to wheat (during the period 1288–1315) cited in Campbell, *English seigniorial agriculture*, p. 239 (Table 5.07, entry on FTC counties).
- ⁿ Calculated by adding 10 per cent to labour and capital cost (including the value of seed) which conforms to a similar estimate by Gregory Clark, albeit in relation to enclosure projects; see his 'The cost of capital and medieval agricultural technique', *Explorations in Economic History* 25 (1988), p. 278.
- ^o Assuming a 20 per cent commission on the final price. Disposing grains by selling to dealers was more common than direct marketing through the use of customary carting services; see Galloway and Murphy, 'Feeding the city', pp. 6–7.