Using William the Conqueror’s accounting record
to assess manorial efficiency

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Abstract
Domesday Book data relating to England in the eleventh century possess many attributes of an accounting record, being used by the king for fiscal and control purposes. In the paper, the data are used to further our understanding of the eleventh century English economy. The efficiency of medieval manorial production is compared with that of more modern economies and the impacts of manorialism and feudalism on production are assessed. Evidence is presented that manorial production was not haphazardly organised – as some historians have argued – and manorialism and feudalism, while contributing to the defence of the realm, were a major economic cost.
Introduction

Together with the other ancient surveys that assisted financial accountability, the Roman tax census during the four centuries following Emperor Augustus and the ecclesiastical polyptychs of the eighth and ninth century Carolingian kingdoms, the Domesday Survey occupies a landmark position in accounting history, being used as a working accounting document by the king and public officials to raise taxes, distribute resources and consolidate power (see Godfrey and Hooper, 1996, and Oldroyd, 1997). Based on questionnaires and public enquiry, it was extraordinarily detailed, producing data of unusually high quality. The data, which have many attributes of an accounting record, were compiled into what has become known as Domesday Book. This paper shows that the Domesday record can be used to reconstruct the early English economy and answer penetrating questions about the efficiency and productivity of the economic system and the impacts of feudalism and manorialism – issues of interest to accounting and business historians.

The Domesday research follows a number of themes extant in the accounting history literature. In a number of studies, surviving accounting records have been used to gain understanding and cast light on broader issues of business practice and economic efficiency. Recent examples are McWatters (2002), who analyzed the accounting records of the Kingston Shipping Company Limited to contribute to our knowledge of shipping on the Great Lakes in the early twentieth century, and Ezzamel (2002), who examined the role of accounting practices in the functioning of the redistributive economy of the Middle Kingdom, ancient Egypt. Accounting records and practice have also been presented as evidence to support arguments relating to major social and historical issues. Two examples are the work of Fleischman and Tyson (2000, 2002) and Burrows (2001) on racism in Hawaiian and other sugar plantations and the paper of Funnell (2001) on accounting practice and justice at the time of the Irish potato famine of 1845-7.

In an earlier paper published in Accounting Historians Journal, McDonald (2002), I argued that the Domesday record was used by the Normans to facilitate the collection of taxes and could be examined to reveal how fiscal decisions were made. In the current paper, issues of economic efficiency and the historical issue of the impact of feudalism and manorialism on production are examined. I use the “frontier” (data envelopment analysis), a management science technique, to analyse Domesday estate records and assess the influences of feudalism and manorialism on economic production in 1086. The frontier is also used to assess manorial production efficiency and compare the average efficiency of Domesday production with that of more modern economies. Efficiency is used here in a technical sense – just as accounting profit is a technical term - and its meaning and interpretation requires careful consideration. Nevertheless, the analysis provides strong evidence to counter the claims of some historians that manorial production was haphazardly organised.

The plan of the paper is as follows: the next section describes the Domesday Survey and summarizes Godfrey and Hooper’s argument that the Domesday record is an accounting record that
was used by the king for fiscal and control purposes; next Domesday manorial production is described and the method used to calculate the frontier explained; the following sections discuss the empirical findings on efficiency and the influences of feudalism and manorialism on production.

The Domesday Survey and Accounting History

Domesday Book has long held a place in accounting history. Chatfield (1977, pp. 19-31) referred to the Domesday Survey and described government accounting and accounting practice on estates. Valuations in Domesday Book were used to construct the Pipe Roll or ‘Great Roll of the Exchequer’. Although Chatfield claimed this as the oldest surviving accounting record in English, in fact, as a referee pointed out, it was, like Domesday Book, written in Latin. From 1130, the Pipe Roll provides a 700 year description of payments due to the king, together with payments made and expenses incurred in collecting them.

The feudal system involved the transfer of land rights from the king and tenants-in-chief to tenants and sub-tenants who worked the land. The principal accounting problem was that of vertical communication and verification between principal and agent. In state finance this prompted the development of the “proffer system” of verifying tax collection, while in estate accounting, in time, it resulted in the charge and discharge statement between steward and lord.

Chatfield argued that manorial accounting was influenced both by the self contained nature of the estate – dealing with outsiders often designated ‘foreign’ in the accounts – and administration by proxy. Manorial lords typically held many estates throughout England, the estates being run on a day to day basis by bailiffs or stewards. The accounts mainly supported a stewardship function – a check on the integrity and reliability of bailiffs – but also aided management and control.

In an important paper, Oldroyd (1997) traced accounting practices during the previously neglected Anglo-Saxon period (c. 450-1066) into the Norman period. He acknowledged (p. 14) that Domesday Book “is regarded as a landmark in accounting history, primarily because it heralded a written system of government accounting in England, notwithstanding that it reflected concepts of accountability, decision-making and control” – the latter being a theme discussed in greater detail by Godfrey and Hooper (1996). Oldroyd challenged the view that the Anglo-Saxon period played no part in accounting history pointing to documentary evidence that written English was more important than has been acknowledged by accounting historians, the influence of the Church in fostering accounting practice, and the existence of geld or tax lists that suggest some sophistication in public accounting prior to 1066. He argued that the Normans may have introduced charge and discharge accounting from the Continent and saw a continuity from earlier times through to the post-Conquest period.¹

The Domesday Survey was conceived at the meeting of the Great Council at Gloucester on Christmas Day 1085. Work on the written record, referred to by contemporaries as the Descriptio
but now known as Domesday Book, was probably terminated on the death of William in September 1087. Given its scope and detail, the compilation of the book over a period of some twenty months was an extraordinary achievement and is a testament to the efficiency of the Norman administration which drew on earlier Anglo-Saxon documents especially hidge or tax lists. The counties of England were grouped into (probably) seven circuits. Commissioners were appointed for each circuit. The commissioners were major lay and ecclesiastical lords with only small landholdings in the shires of the circuit. They circulated a list of questions to landholders. Answers were reviewed in the county court by the hundred juries of the county - a form of public audit. County returns were then assembled and the circuit return compiled. These returns were then summarized, edited and compiled into Great Domesday Book by the Exchequer in Winchester.

Domesday Book consists of two volumes, Great (or Exchequer) Domesday and Little Domesday. Great Domesday is a summarized version of six circuit returns and Little Domesday is a detailed original circuit return of the seventh. Little Domesday contains information on East Anglia: Norfolk and Suffolk, and Essex. The general view is that William’s death occurred before this circuit return could be included in Great Domesday. The information in Domesday Book mainly consists of lists of information about manors or estates. The estate information is organised by county and within each county the estates of the king, ecclesiastical and lay lords are presented. A typical manorial entry lists the resources available on the estate in 1086: for example, the number of livestock, and various kinds of labour and ploughteams. It also gives the manorial net income (referred to as the ‘annual value’) and tax assessment. Often there are also data relating to 1066 and sometimes for an intermediate year.2

An example is the entry for Blunts Hall in the Hundred of Witham, Essex. Blunts Hall is listed in Domesday Book as an estate of Count Eustace of Boulogne, a major Norman magnate holding many estates in Essex and throughout England. The Victoria County History of Essex English translation of the entry (Vol. 1, p. 462) reads,

“BLUNDESHALA [Blunts Hall ], which was held in King Edward’s time by 1 free woman as 1 manor and (as) half a hide, is held by the count in demesne.”

This means that the estate was held in 1066 (King Edward’s time) by a free woman (although it is unusual, there are other cases of women holding land), the tax assessment was half a hide, but at the time of the Survey (1086) the estate was held and run on behalf of the Count. There were no sub-tenants. The entry continues,

“Then as now (semper) 1 plough on the demesne and 1 bordar. (There are) 6 acres of meadow. It was then worth 20 shillings; now 10.”
This indicates that the resources available to run the estate in 1066 and 1086 consisted of 1 ploughteam, 1 bordar (a bonded peasant) and 6 acres of meadowland. The net worth or annual value of the manor was 20 shillings in 1066 and 10 shillings in 1086.

The quantification of manorial wealth and the income and tax valuations certainly present the appearance of accounts. Moreover, it is interesting that the responses of landholders to the commissioner’s questionnaire were subject to an audit in the county court. Godfrey and Hooper (1996) have strongly argued that the entries also had an accounting function, seeing them as “a record of William’s kingdom compiled for his own purposes” (p. 42). They state (p. 51) “By providing a valuation and audit of the resources of the feudal tenants-in-chief in 1086, Domesday enabled William and his successors to optimise both their wealth, through fiscal policy and efficient use of the country’s resources, and their power within the feudal structure of medieval England. For the English monarchy of the period, Domesday served both accountability and decision-making needs.” They further comment (p. 39) “Domesday represents a partial extension of the evolution from what might be broadly termed public sector accounting as practiced in both the Roman and Carolingian periods.”

Godfrey and Hooper note that historians have long debated the purposes of Domesday Book. The Victorian historians Round (1895) and Maitland (1897) saw the purpose of the Survey as one of updating the tax system. More recently, Galbraith (1961), pointing out that the entries in the document were arranged within counties to indicate the holdings of William’s tenants, argued that the Book was a summary financial assessment of the wealth and resources of tenants useful for decision making purposes. The current view is that the Survey served many purposes. It was used to revise tax assessments, served as an aid for making state decisions and for controlling the aristocracy, and was a source of information to solve land disputes. According to this view, an important function of Domesday Book was to serve as an instrument of accountability and control.

**Manorial production in eleventh century England**

In feudal theory, the king was charged with the duty of administering the land of the realm. He did this by appointing tenants-in-chief, both lay and ecclesiastical, who held land in return for provision of military support. Tenants-in-chief might grant the use of land to sub-tenants in return for rents or services. The tenants provided protection for peasants and slaves in return for goods and services. Broadly speaking, the peasants worked part of the week for the lord and the remaining time on land allocated to them by the lord, producing food and shelter for themselves; whilst the slaves only worked for the lord who fed and clothed them. All had a prescribed place in society, peasants and slaves usually remained on a particular estate, they were tied to a lord and did not offer their services to others.

Agriculture was the dominant economic activity, with production being carried out on the manor or estate - a largely self contained unit. Grain crops were cultivated in large open fields. The
fields were usually ploughed by oxen ploughteams and the grain ground in local water mills. Particularly in the south-west, livestock husbandry was important. Sheep were the most common livestock and there was a thriving wool industry, which exported to the Continent. The main meat source was pigs. Vegetables were grown in small plots and chickens, goats and bees kept.

The manor was divided into the lord’s demesne and the peasants’ land. The peasants’ land was used by the peasants to sustain themselves. They tended to consume what they produced. The demesne was worked for the lord by peasants and slaves. The output was often traded in local or overseas markets for goods the lord wished to consume such as military hardware, fine clothing and finely crafted furniture. The demesne output was also used to pay taxes, either in kind or coin.

There is little information in Domesday Book on peasant production but a good deal on demesne inputs and output. The annual value of the manor is listed. This was the annual net output (gross demesne production less goods produced to maintain manorial resources) that accrued to the lord from working the manor or, if the manor was leased out, the rent obtained. Domesday Book also lists the demesne resources or inputs. Inputs were essentially fixed in supply in the short run. The manorial system bound bordars and villans to their lord and the manor. The manor was worked by a resident workforce of bonded peasants and slaves. Labour and land markets were largely non-existent.

Security was of paramount importance to the Normans. William had conquered England only twenty years prior to the Survey. After defeating Harold, there was a long period of consolidation punctuated by revolts and civil unrest. The Norman invasion was not a mass movement but was accomplished by an elite and their followers. Some two hundred Norman barons took the land of over four thousand Anglo-Saxon lords, many of whom were exiled or killed. In 1086 there were a number of external threats to the Kingdom from displaced Anglo-Saxons, Scotland and Scandinavia to the north and France to the south. Moreover, internal security required control over the overwhelming majority of the labouring classes - the peasants and slaves.

The institutions of feudalism and manorialism were important instruments for defending the realm. Feudalism clarified the relationship between king, tenant-in-chief and tenant, and linked the holding of land to provision of military service and payment of taxes to finance the military. Manorialism helped to prevent wandering bands of peasants by locking the workforce on estates under the supervision of their lord. While these institutions were effective in enhancing security, they had unfortunate consequences for production. Labour and land were rarely traded and estates tended to be run with their endowed resource mix.4

Input productivity and production efficiency

What were the implications of these institutional constraints for production? The productivity of an input in production depends greatly on the amounts of the other inputs it works with. If, for
example, land is scarce and labour abundant, it is often the case that using an extra unit of land leads to a greater increase in output than when labour is scarce and land abundant. An input is usually more productive when it is scarce relative to the other inputs. As the Domesday estates were run as largely self contained units and they had widely different resources, there are good reasons for expecting that the productivity of inputs would exhibit considerable variation across estates. For example, on an estate well-endowed with land but with only a single ploughteam, one might expect the productivity of the ploughteam to be high relative to an estate with less land but two ploughteams.5

As well as great variation in input productivity across estates, it might be expected that output could be increased if inputs were moved from one estate to another. If, as an example, ploughteams had low productivity on one estate but higher productivity on a second, its reasonable to suppose that total output on the two estates could be increased by moving a ploughteam for a period of time to the more productive estate. The greater the difference in productivity across estates, the greater was the potential gain for increasing total output. It would be interesting if we could estimate the total output gain that could be achieved by moving inputs to more productive estates, it would give us an idea of the economic cost of the institutional arrangements, feudalism and manorialism, that discouraged mobility of inputs.

A somewhat different question is whether, given the existing technology and institutional arrangements, the Normans ran their estates efficiently.

There are fragments of contemporary evidence on this. For example, an entry in The Anglo-Saxon Chronicle describing the Survey (Whitelock, 1961, pp.161-2) may have some relevance. It reads,

“Also he had a record made of how much land his archbishops had, and his bishops and abbots and his earls – and though I relate it at too great length – what or how much everybody had who was occupying land in England, in land or cattle, and how much money it was worth. So narrowly did he have it investigated, that there was no single hide nor virgate of land, nor indeed (it is a shame to relate but it seemed no shame to him to do) one ox nor one cow nor one pig which was there left out, and not put down in his record; and all these records were brought to him afterwards.”

The author of the entry was outraged by the detail of William’s investigation, probably seeing it as an attempt to squeeze still more out of the oppressed English. The detail of the Survey does indicate a keen interest in the economic resources of estates, and, one might conjecture that the English would not have felt oppressed had estate management been slack, but it is unclear what can be inferred about efficiency. Some might argue that the Chronicler’s statement is merely the ranting of a prejudiced observer.
Noke (1981, 1991) describes some evidence. Commenting on estate accounting in a later period (mainly the thirteenth century), he quotes contemporary sources suggesting some laxity of management and poor stewardship by the reeve or bailiff. This evidence points to some inefficiency but how widespread it was and its relevance to the earlier Domesday period is difficult to judge. It also seems somewhat at odds with Noke’s assessment of the charge and discharge accounting procedure current at the time, he states (1981, p.151), “The fact that Charge and Discharge persisted for several hundred years in parallel with the double entry system suggests that it served its purposes well enough.”

Greater insight may be gained by analysing the production data in the Domesday record. For as long ago as Victorian times, historians used it as a major source to understand the political, institutional and social structures and the geography of eleventh century England. Perhaps because of their training, they were more reticent about the Norman economy. Writing some 100 years ago, Round (1895) and Maitland (1897) saw few patterns in economic activity. The tax system was described as “arbitrary” and the relationship between estate annual values and resources appeared somewhat baffling. This view persisted until the middle of the last century. As an example, H. C. Darby, who mapped Domesday England and probably contributed more than anyone to our knowledge of its geography, when describing the entries for Essex, concluded, “Generally speaking, the greater number of ploughteams and men on a holding, the higher its [annual] value, but it is impossible to discern any consistent relation between resources and value.” (1952, pp. 228-9). These scholars conveyed an impression that manorial production was of little interest to the Norman lords. It was seen as being haphazardly organised according to local custom and tradition. The disorganised nature of production was in stark contrast to the Norman’s efficient military arrangements and civil administration.

These conclusions were reached by applying an impressionistic methodology involving generalizing from a few cases. For example, Darby (1977, p. 221) investigating the annual value - resources relationship picked out ten manors from Exeter and Little Domesday Book all with the same annual value. He tabulated the resources of the manors and concluded there was no systematic relationship between resources and values. It is perhaps not surprising that from the hundreds of estate entries a few unusual entries can be found. But do the handful of entries reflect the general picture? To answer this a more systematic and objective empirical approach must be used. Such an approach is followed in the subsequent sections of the paper. I use information relating to almost 600 Essex estates to attempt to answer the question of how efficient Domesday production was, given the contemporary technology and institutional arrangements. I also investigate whether input productivities varied widely across estates and estimate the output cost of input immobility between estates. The analysis employs a widely used management science technique, the frontier.
The Frontier

The Figure illustrates the frontier method in a very simple situation where there is only one input. The three points, A, B and C, describe production on three estates. Estate A uses six units of input to produce two units of output; B, twelve units of input to produce three units of output and C, nine units of input to produce one unit of output. In understanding the frontier concept it is helpful to think of the way an estate operates as a production process with the input unit having a time dimension such as man/years or ploughteam/years. A feature of Domesday production was that on both large and small estates it usually involved the same activity but in different multiples. For example, arable agriculture on the demesne centred on the use of oxen ploughteams and their complement of manpower. Approximately twice as much land could be ploughed with two ploughteams in a day as with one. Roughly speaking then, a doubling of inputs resulted in a doubling of output. Production activity was characterised by constant returns to scale. With constant returns to scale, using estate A’s production process but half as much input, an estate could produce at A’, where output is half at A, and with twice as much input, at A’’. Moreover, by using either more or less input, an estate could operate at other points on the ray from the origin, 0, through A.

Using this argument, we can reason that if an estate adopted estate B’s production process and varied input levels, it could produce on the ray from 0 through B, and if it used estate C’s process, produce on the ray 0 through C. Clearly, estate A’s production process generates the greatest output per unit of input. The ray from 0 through A defines the (efficiency) frontier and can be used to calculate efficiency measures for each estate. If efficiency, \( e \), is defined as the ratio of actual to frontier output expressed as a percentage, the efficiency of A, \( e_A = (2/2).100 = 100\% \), of estate B, \( e_B = (3/4).100 = 75\% \) and C, \( e_C = (1/3).100 = 33\% \).

The efficiency percentages measure actual production performance relative to observed best practice. Based on observed production, they reflect the nature of the production process. What constitutes best practice will depend on the technology available to producers. As improved agricultural methods are developed and used, the frontier will move outwards. Also, if the political and social fabric is modified enabling more flexibility in production, we would expect the frontier to move outwards. In particular, a relaxation of feudalism and manorialism that freed up the movement of inputs between estates has the potential to shift the frontier upwards and outwards.

*Best* practice may not be *good* practice. It is possible that all productions units are poorly organised. Slack management may be universal. However, if some units are well organised, then the best practice frontier will approximate to good practice. If manorial production was haphazardly organised according to local practice, we might expect some local practice to have been quite good, but more importantly, we would expect considerable variation in efficiency. For some estates, production would lie on or close to the frontier but for others, production would be well below it. The average or mean efficiency of estates would be low.\(^6\)
Domesday manorial production

I used Essex estate data to estimate a production frontier. Essex was chosen because the information in Little Domesday Book is more detailed than that in Exchequer Domesday and the Essex entries less complex than those relating to the East Anglian counties. The data relate to production in 1086 on the estates of the lay lords. Comprehensive information is available on 577 estates. Table 1 lists summary statistics. The estate annual value, measuring net output, varied from three to 1,200 shillings (20 shillings to the pound). Three quarters of estates had an annual value of 30 shillings or more and one quarter a value of 140 shillings or more. The mean estate annual value was 108.5 shillings.

The entries list both desmesne and peasants’ ploughteams. Desmesne ploughteams were only used on the desmesne land but peasants’ ploughteams also worked the peasants’ land. The peasants used them to cultivate the lord’s land when they fulfilled their commitments to him. All but nine estates had at least one desmesne ploughteam. Livestock (sheep, swine, cattle and goats) were listed on about 60 per cent of estates. There were different categories of labour. Slaves were present on about 60 percent of estates. Bordars and villans were bonded peasants. Freemen and sokemen, although linked to the lord, had a freer status. Bordars were reported on more than 90 per cent of estates, villans on about 60 per cent and freemen and sokemen on about 10 percent of estates. Woodland, meadowland and pasture were also listed.7

With 577 production units and ten inputs it is not possible to determine the frontier and efficiency measures diagrammatically. Algebraic methods can be used but the calculations are quite extensive. Some 577 linear programming problems, each involving 578 variables and 11 constraints must be solved. Table 2 gives some insight into the nature of the results. Blunts Hall, referred to earlier, with one desmesne ploughteam, one bordar and six acres of meadowland produced an annual value of ten shillings. The linear programming calculations indicate that had the production process of two efficient estates, Maldon and Easton, been used (each for half the time), the annual value could have been increased to 25 shillings. The efficiency measure for Blunts Hall is (10/25).100 = 40%.8

The output cost of feudalism and manorialism

The linear programming calculations also provide measures of input productivity on each estate called shadow prices.9 These shadow prices relate to the production frontier and measure productivity had production on the estate been efficient. Our interest lies in how variable the productivity of each input was across estates as a result of the variability of estate input mixes. Actual productivity could be variable for this reason and also because efficiency varied from estate to estate. The calculated shadow prices relate to production when efficiency does not vary across estates, that is, when best practice is adopted. Their variability only reflects the effect of different estate input mixes.
Table 3 summarizes the shadow price results. They exhibit two key features. First, the sizes of the mean prices conform to expectations about the relative contributions of the inputs to estate production. Demesne ploughteams have by far the highest mean shadow price, 43.1 shillings. As peasants’ ploughteams were only used for part of the week on the demesne, it is not surprising its mean value is lower (7.4 shillings). Of the labour categories, slaves worked full time for the lord and villans and bordars only part of the week. Freemen and sokemen made only a minor contribution to demesne output. The mean shadow prices reflect this (slaves, 12.5 shillings; villans, 8.2 shillings; bordars, 5.5 shillings and freemen and sokemen, 2.8 shillings). The second feature is the high degree of variability of an input shadow price across estates (as indicated by the standard deviations and coefficients of variation). For most inputs, the coefficient of variation exceeds one.

Total output could be increased by moving inputs to more productive production units. By how much could total output on the estates have been increased had inputs been more mobile?

As our interest is in the effect of the input mix on output, we again need to control for the level of estate efficiency. This can be done by calculating total output had all estates followed best practice and comparing this with best practice output had inputs been moved to their most productive use. Total best practice output can easily be calculated. If an estate produced an annual value of 60 shillings and was 50% efficient, then, if it adopted best practice its annual value would have been \((60/50) \times 100 = 120\) shillings. Summing over the 577 estates gives the estate total best practice output. To calculate the estate total best practice output had inputs been mobile, I exploited the constant returns to scale characteristic of production. With constant returns to scale, productivities do not vary with the size of the production unit, only with the input mix. We can, therefore, construct an additional fictitious production unit with input levels equal to the totals for the 577 estates and solve the augmented linear programming problem to find the best practice output level for this unit. This is equal to estate total best practice output had inputs been mobile. The calculations indicate that if inputs had been mobile a 40 per cent increase in annual value would have been possible. This figure is only a rough estimate. Nevertheless, it does indicate the order of magnitude of the output cost. The potential output loss from input immobility was certainly considerable.\(^{10}\)

Was Domesday production poorly organised?

The Essex estate frontier study indicates that 96 (or 17 per cent) of the estates operated at 100% efficiency on the best practice frontier. Mean efficiency of estates, however, was only 64% and over 25 per cent of estates operated at less than 50% efficiency. The most inefficient estate was Paglesham, an estate of Robert Corbutio, which achieved only 16% efficiency. To some these figures may indicate that estate production was indeed poorly organised. Before jumping to conclusions, however, we should compare these results with those of other studies. Perhaps this degree of inefficiency is usual.
From the many efficiency studies reported in the literature (see McDonald, 1998, ch.6.2), two stand out for comparison. They also relate to agricultural production, have a similar level of aggregation of production units and efficiency was calculated using linear programming methods. The first study is the very careful study by Hall (1975) of agriculture in the American South between 1870 and 1880 and the second is a study by Hall and LeVeen (1978) of small Californian fruit and vegetable farms in the 1970s. There is an interesting parallel between the American South in the 1870s and Domesday England in 1086. 1086 is 20 years after invasion by William and the 1870s a slightly shorter period following invasion and major disruption, resulting from the American Civil War and the abolition of slavery. The average efficiency of Domesday Essex estates was 64%. The average efficiency of Southern farms was only 36%. The second study gives us a comparison with production in the modern era. Mean Californian farm efficiency was calculated to be 28%. On average then, Domesday estate production was more efficient than post-bellum Southern farms and small Californian farms in the 1970s. When compared with similar production situations, average Domesday efficiency levels do not seem low.

**Concluding remarks**

Given the contemporary technological and institutional environment, the average efficiency of Domesday Essex estates compares favourably with that obtained from similar but more modern studies. Average efficiency, which measures how close, on average, production was to observed best practice, was 64%, considerably greater than for post-bellum agriculture in the American South (36%) and a sample of small Californian farms in 1977 (28%).

Nevertheless, the pervasive influences of feudalism and manorialism in eleventh century England, whilst providing considerable economic, social and political advantages for the feudal hierarchy, restricted the mobility of inputs, thus imposing a substantial economic cost. It is estimated that, by varying estate input mixes, potential output could have been increased by about 40 per cent. It is not surprising then, that in the twelfth and thirteenth centuries as Norman rule was consolidated and security became a less severe problem, these input rigidities tended to break down (see Britnell and Campbell, 1995).

Domesday Book is now recognised as a landmark in accounting history. It contains accounting data that was used by the monarch and his officials to organise the state, raise revenue and consolidate his position. This paper argues that it also provides information that can be used to reconstruct the Domesday economy and answer significant historical questions - were estates run efficiently? and how did feudalism and manorialism impact on the economy?
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TABLE 1. SUMMARY STATISTICS FOR DATA USED IN STUDY. ESSEX LAY ESTATES, 1086.

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<td>2.2</td>
<td>1</td>
<td>2.8</td>
</tr>
<tr>
<td>Woodland</td>
<td>0</td>
<td>1500.0</td>
<td>105.9</td>
<td>30.0</td>
<td>189.0</td>
</tr>
<tr>
<td>Meadow</td>
<td>0</td>
<td>120.0</td>
<td>12.2</td>
<td>6.0</td>
<td>16.2</td>
</tr>
<tr>
<td>Pasture</td>
<td>0</td>
<td>1100.0</td>
<td>28.3</td>
<td>0</td>
<td>88.6</td>
</tr>
</tbody>
</table>

*Note: Annual values are in shillings. Livestock is a weighted sum of cows, swine, sheep and goats (see note 7). Woodland is measured in terms of the number of swine that could be supported and pasture by the number of sheep that could be supported. Meadow is in acres. The other variables are measured by a count of their number.*
# TABLE 2. CALCULATING BEST PRACTICE EFFICIENCY AT BLUNTS HALL

<table>
<thead>
<tr>
<th>DEMESNE</th>
<th>BORDARS</th>
<th>MEADOW</th>
<th>ANNUAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughteams</td>
<td>(ACRES)</td>
<td>(SHILLINGS)</td>
<td></td>
</tr>
<tr>
<td>ACTUAL PRODUCTION:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blunts Hall</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>MALDON</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>EASTON</td>
<td>1</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>EFFICIENT PRODUCTION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at Blunts Hall:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>.5 Maldon process</td>
<td>.5</td>
<td>.5</td>
<td>0</td>
</tr>
<tr>
<td>.5 EASTON PROCESS</td>
<td>.5</td>
<td>.5</td>
<td>6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>
**TABLE 3. SHADOW PRICES (IN SHILLINGS) FOR 577 ESSEX LAY ESTATES, 1086.**

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Coefficient of variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demesne ploughteams</td>
<td>43.1</td>
<td>17.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Peasants’ ploughteams</td>
<td>7.4</td>
<td>12.0</td>
<td>1.6</td>
</tr>
<tr>
<td>Livestock</td>
<td>0.2</td>
<td>0.4</td>
<td>1.7</td>
</tr>
<tr>
<td>Freemen and sokemen</td>
<td>2.8</td>
<td>5.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Villans</td>
<td>8.2</td>
<td>11.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Bordars</td>
<td>5.5</td>
<td>10.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Slaves</td>
<td>12.5</td>
<td>13.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Woodland</td>
<td>1.3</td>
<td>2.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Meadow</td>
<td>3.1</td>
<td>8.5</td>
<td>2.8</td>
</tr>
<tr>
<td>Pasture</td>
<td>0.6</td>
<td>0.4</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Figure. Measuring the production efficiency of three estates A, B and C.
Notes

1 Other useful reference to accounting in the ancient and medieval periods are Parker (1969), Littleton (1933), Littleton and Yamey (1956), Edwards (1989) and Noke (1981, 1991) and the bibliographies within.

2 For more on the Survey see McDonald and Snooks (1986, sec.2.2), references cited there, and the articles in Williams (1987). For a comparison of the Domesday and modern surveys see McDonald and Snooks (1985c).

3 Domesday Book derives its name from the last function. After William’s death, in land disputes, there was no appeal beyond Domesday Book, the book of last judgement. Land rights could be traced to Domesday Book but no earlier.

4 Although feudalism and manorialism had a pervasive influence on rural life and the organisation of agriculture in Domesday England, they existed in a modified form. Essential features of manorialism include the demesne, upon which the peasants worked in return for protection, housing and the use of land to cultivate their own crops; and labour services consisting of week-work, due on an agreed number of days a week throughout the year, and seasonal boon-work, ploughing, mowing and reaping, as the season required. Peasants were bound to the lord and manor, and the lord enforced his rights over the peasants in a manorial court. In England, however, slaves also worked the demesne, there were freemen and sokemen (with a freer status than bonded bordars and villans) and some wage labour occurred, moreover, feudalism was modified by the existence of land leasing arrangements. These modifications had the effect of partially freeing-up input proportions, even so, Domesday agriculture suffered from poorly developed factor markets and considerable immobility of inputs. (Snooks, 1995, p. 41, for example states “Although the commodity market was well developed by the late eleventh century, factor markets in labour, land and capital appear to have been very restricted in scope and operation.”, and again, p. 54, “In 1086 commodity markets were well established but factor markets were in their infancy.”) For further background information on Domesday England see McDonald and Snooks (1986, Ch1 and 2; 1985a, 1985b, 1987a and 1987b) and McDonald (1998). More comprehensive accounts of the history of the period can be found in many works including Brown (1984), Clanchy (1983), Loyn (1962), (1965), (1983), Stenton (1943), and Stenton (1951). Other useful references include Ballard (1906), Darby (1952), (1977), Galbraith (1961), Hollister (1965), Lennard (1959), Maitland (1897), Miller and Hatcher (1978), Postan (1966), (1972), Round (1895), (1903), the articles in Williams (1987) Aston (1987), Holt (1987), Hallam (1989) and Britnell and Campbell (1995) (especially Snooks, 1995) and references cited in McDonald and Snooks (1986).
There are circumstances in which high substitutability and extensive output trading can lead to equalization of input productivities across estates but these conditions would not seem relevant to the Domesday situation. Inputs tended not to be highly substitutable in production and conditions, such as no barriers to trade and low transport costs, which can lead to input productivity equalization with output trading, were not satisfied. See McDonald (1998, p.140) for further discussion.


The data file was compiled by Eva Aker, the work being funded by a Flinders University research grant. The file was compiled directly from Domesday Book entries in the Victoria County History of Essex which were checked against a facsimile of the Latin transcript and an English translation in the so-called Phillimore edition (Morris, 1975). A general rule of thumb was developed that only entries for which (1) annual value is recorded, (2) either ploughteams or livestock entries (or both) are recorded, and (3) at least one of the four labour variables are recorded, were retained for analysis. In addition, seven other entries were deleted either because they were implausible or incomplete. All livestock, other than horses, were combined into one variable, using market values. The weights for livestock were: cows, 24; swine, 8; sheep, 5; and goats, 4. Sources for underlying market prices include Maitland (1921, p44), Ballard (1906, p27), Round (1903, p367) and Raftis (1957, p62). Horses were excluded because they were used largely for non-productive military and leisure purposes. It was not until the thirteenth and fourteenth centuries that ploughing with horses became common. Horses cost more to keep than oxen because of the cost of shoeing and the need to feed them oats in winter, whereas oxen could survive on hedge clippings, see Postan (1972, p80), Hallam (1981, p54) and Langdon (1982).

Resource levels at Blunts Hall were the same in 1066 as 1086 but the annual value declined from 20 to 10 shillings. We can only speculate on the reasons for this. An annual value of 20 shillings in 1086 would have given Blunts Hall an efficiency of 80%.

An estate’s input shadow price measures the increase in net output that can be achieved by an efficient estate, operating at the estate’s input level, when an extra unit of the input is used in production.
This estimate holds the efficiency level constant. It can be argued that, as total output could be increased by moving inputs not only to achieve a more optimal input mix but also to more efficient estates, an alternative output change is more relevant. This is the increase from observed total output to total best practice output had inputs been mobile. This increase is about 110 per cent. My assessment is that increased input mobility would have only had a minor effect on average estate efficiency but a very significant impact on productivity by improving the input mix of estates. Consequently, I prefer the earlier estimate.

Hall’s study is based on 2117 farms. The main outputs were cotton and corn. Cotton was measured in bales less the value of fertiliser (converted to units of cotton bales) and corn in bushels. The inputs were labour, measured physically in full-time equivalents; workstock, the number of horses, asses, mules and working oxen; the value of implements; total farm acres (used to measure the contribution to final output of land not actually producing crops); and a land quality index. In Hall and LeVeen’s study there were 75 production units. Farm output was the value of aggregate agricultural production and the inputs: acres of land, man-days of family labour, the dollar-value of hired labour, physical capital and material expenses.