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RECONSTRUCTING URBANIZATION OF A PENNINE FRINGE
TOWNSHIP THROUGH COMPUTATIONAL CHAINING OF LAND
TAX RECORDS: MOTTRAM IN LONGDENDALE 1784–1830

PETER BIBBY

Abstract This paper uses Land Tax records to attempt to reconstruct the pattern of urbanization in a Pennine fringe township which formed part of the Lancashire cotton complex during the early industrial revolution. It uses logic programming to articulate rules to develop a longitudinal approach which chains together individual Land Tax records for successive years to identify perduring property objects, which are then located geographically using the pooled descriptors drawn from the returns. It investigates not only house repopulation, but also the character of new property development, of subdivision and amalgamation of holdings and the changing control of housing. It allows a remarkably detailed reconstruction of change in the particular locality, revealing events that have gone unnoticed. Pent-up demand associated with proto-industrialization combined with the self-interest of a major absentee landlord to allow a flurry of small scale construction between 1785 and 1805; property then converted to workers' housing with the onset of industrial urbanism. More generally, it is suggested that a computational approach of this sort allows for a more serious engagement with a source all too often dismissed as unpromising. The paper concludes by drawing out implications of the work for more traditional approaches to interpreting Land Tax returns.

Keywords: Land Tax, logic programming, house repopulation, Pennines, proto-industrialization

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introduction

This paper explores the feasibility of using Land Tax returns to examine urbanization of a particular locality over the period 1784–1830. It attempts to chain together individual Land Tax records for successive years to identify enduring property objects, and to locate them geographically using any of the pooled descriptors within the returns. It also seeks to identify change and development as these property objects divide or combine. More tentatively it attempts to move beyond the phenomenal level, beginning to examine the relationship between these physical changes and broader changes in economic organization.

Urbanization universally involves a reduction in direct economic dependence upon the land through the adoption of more indirect methods of production, and also the accretion of buildings. The form of any urbanization- that is the scale and configuration of the physical effects, the balance of working time assigned to direct agricultural production and the organization of all forms of production is historically specific. The particular locality of concern - Mottram-in-Longdendale- a township in the Pennine fringe in the north eastern ‘panhandle’ of the former county of Cheshire perhaps epitomized in 1780 the mutual dependency of domestic textile production and dairying. A ‘cold and inclement’ place, where ‘the herbage is sour and turns to rushes’ if not sufficiently limed¹, Mottram shared the archetypal preconditions for the emergence of the classic dual economies discussed by Thirsk². Its place in the geographic division of labour did not entail severance from the land, but a system of land use and development similar to that held by Defoe to typify the country around Halifax in which

‘as every clothier must keep a horse, perhaps two, to fetch and carry for the use of his manufacture . . . then every manufacturer generally keeps a cow or two, or more, for his family, and this employs the two, or three, or four pieces of enclosed land about his house’³

It has long been appreciated that by the late eighteenth century the Pennine fringe was studded with cottages and adjoining crofts, intercalated within a mosaic of larger holdings -still too small to provide adequate income by agriculture alone⁴. Dependence on agriculture had been reduced not only through domestic spinning and weaving, but engagement in crafts and trades such as tailoring and shoemaking.⁵ Population growth had been accommodated ‘not so much [by] an urban increase but a thickening of the population over the countryside’ as farm units were successively fragmented⁶, a process which continued by the 1840s producing spaces

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‘dotted with villages and groups of dwellings, and white detached houses, and manufactories presenting an appearance somewhat like that of a vast city scattered amongst meads and pastures, and belts of woodland’⁷

Such specific configurations might be seen through the lens of the proto-industrialization thesis, their dispersed domestic industry reliant on distant markets, their need for greater capital inputs and changes in the organization of production driving subsequent industrialization⁸. Indeed, Mottram formed part of the South East Lancashire cotton complex, producing for markets in Ireland, America and Europe and considered by Walton to bear all the ‘stigmas of the classic proto-industrial model’⁹. A specifically proto-industrial perspective on this dual economy might suggest that this landscape might be subject to intense demographic pressure and raise questions about the lines of continuity with an emerging industrial urbanism, although the grand narratives turn away from such patterns of economic organization (and physical development) after 1800, as Walton has argued proto-industrialization without industrial urbanism was not necessarily a ‘dead-end’¹⁰. Moreover, because the mechanization of weaving lagged so long behind the spinning branch, weaving continued to be undertaken by ‘nearly identical household units of production’¹¹ which composed Bamford’s vast scattered city. Nevertheless, at least one local family active within the traditional dual economy- the Sidebottoms – became a major industrial capital within the township. Part of the challenge in this current paper involves attempting to assess how changes in patterns of land-use and development that might be imputed from the Land Tax returns might variously have contributed to intensification of a proto-industrial pattern or to the constitution of an urban-industrial ensemble.

Within the confines of a single township, however, competition for land implies that development of one form necessarily excludes others, and the perspectives of specific landowners become important. Despite Levine’s view that a landlord-dominated proto-industrial village would be a contradiction¹², two thirds of the land in this particular township was controlled by a single absentee landlord. The tendency to fragmentation of farm units found here and frequently associated with proto-industrialization¹³ cannot be ascribed in this instance to partible inheritance. It must be understood in relation to the Tollemache family’s perception of their interests, to the perceptions of their stewards, which are central to what follows, and also in relation to the contemporary discourse of estate management which ran seamlessly into political economy. Practice on the Tollemache estate ran counter to contemporary conventional wisdom regarding the proper size of cottage grounds and the desirable size of farm units on landed estates which usually favoured large farm units. Although a counter position was championed by Nathaniel Kent¹⁴ and the potential of an alternative ‘cow and cottage economy’ was

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promoted by the Society for Bettering the Condition of the Poor, this was denounced by Malthus as it might lead to a general diminution in means of subsistence, and feared by others because of its association with Jacobinism¹⁵.

Much of what follows therefore is concerned with attempting to identify different moments of urbanization variously associated with different patterns of social organization, in circumstances where physical property was continually being put to new uses. Running through this long period of adaptation is an intriguing idealistic continuity between the principal landlord's fragmentation of holdings in the last two decades of the eighteenth century and the celebrated advocacy of cottage farms by his successor, Lord John Tollemache. This paper does not prioritize the views of the Tollemache estate, but inclines towards a market perspective, imagining a marketized cottage economy. Tollemache interests shaped the supply of land, but the pattern of demand was driven by the same forces that led to fragmentation under proto-industrialization. No common remained in the township, and the pressure to proletarianization is seen as the squeezing out of particular households' claim on land, through the market. Investigation of these possibilities proceeds by attempting to infer physical change and change in the organization of holdings by chaining Land Tax records, and by attempting to impute the function of property by gathering information about occupiers through nominal record linkage to a range of further sources.

The following sections first introduce the Land Tax returns and the idea of chaining them, sets out the relations to previous studies, and the centrality of the value of the sum assessed in constructing chains and the need to link to the physical. Subsequent sections seek to identify the influence of first national legislative and second local administrative practice on the values assessed, so as to filter out extraneous influences not attributable to physical change or change in occupancy.

land tax and land tax chains: introduction

To readers familiar with the Land Tax returns, the foregoing may seem quite unreasonably ambitious. Any attempt of this sort requires a detailed understanding of the Land Tax assessments for the period, described in some detail by Ginter¹⁶. Land Tax was introduced in Great Britain in 1692, initially being levied not only on the annual rental value of real property, but on assessments of (personal) sources of income other than land and buildings. From 1745 the returns were used to establish entitlement to vote in county elections, and as Clerks of the Peace for counties were between 1780 and 1832 required to keep copies for electoral purposes, they survive in large numbers for that period in County Record Offices. The information within the returns is minimal (see Figure 1). Adopting Ginter's terminology, these 'duplicates' for any year and township comprise a series of 'line entries' providing the name of the proprietor,

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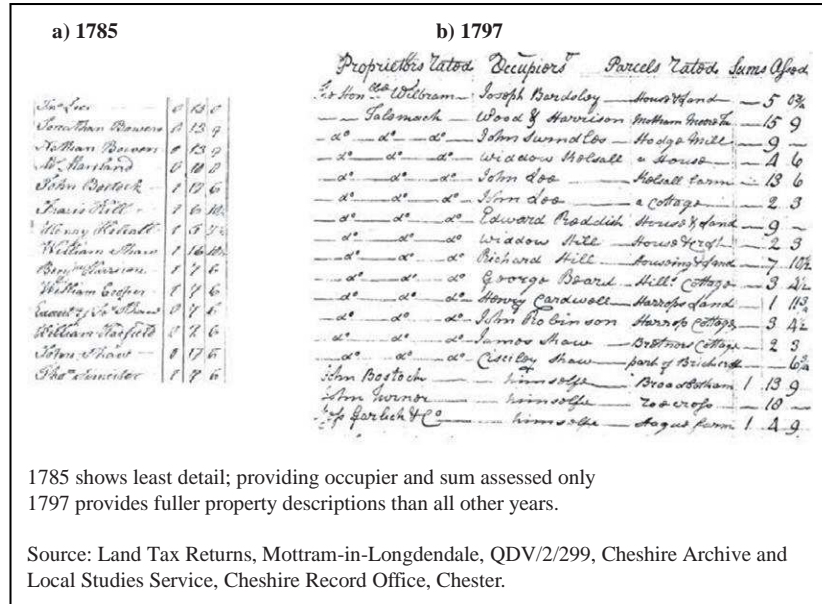


Figure 1. Land Tax Duplicates (Extracts); Mottram-in-Longdendale Township; a) 1785; b) 1797.

the occupier, the sum for which they were liable, and very often a description of the property ‘bundle.’

The returns do not appear to have been used to explore urbanization, let alone competing forms. Indeed Turner and Mills’ collection of studies based on the Land Tax maintained a clear distinction between urban applications and rural applications¹⁷. The crux of the present work involves matching the line entries longitudinally into chains, gathering together the scanty information about particular holdings to reveal their successive occupiers, to identify new development and to track the reconfiguration of individual holdings over time. Although Land Tax returns have often been used in local studies to point to changes in occupation of particular properties of interest¹⁸, they have rarely been used systematically to enrich information about enduring entities. There are exceptions. Hunt, for example, attempted to track holdings over time to identify tithes (where this was not stated)¹⁹; Henstock linked Land Tax line entries over time more systematically to examine ‘house repopulation’ in Ashbourne, a Derbyshire market town²⁰. There do not, however, appear to have been studies which attempt to reconstruct the changing pattern of physical development and occupation of land and property by tackling the far more difficult task

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of examining the amalgamation or subdivision of particular bundles, and the systematic identification of new property.

This study attempts that task, through a computationally realized extension of Henstock's approach. While Henstock's study was designed to examine the succession of occupiers of a fixed set of property objects, deliberately excluding the rural area and abstracting from land parcellation, the present work allows for far more complex patterns of succession. One way of visualizing the central task is to imagine the individual line-entries as a set of vertices; and then consider the problem of specifying a set of edges, that is linkages between line entries for successive years, so as to construct a directed graph showing the history of the various property objects within the township. Under the idealized Fixed Property Objects assumption, each line entry would refer to one of a fixed number of unchanging properties. Each separate property could be represented by a disjoint subgraph, a simple 'chain', with only the occupiers changing (suited Henstock's prime purpose).

With physical development and reorganization of agricultural holdings, however, the township 'Land Tax graph' and the constituent sub graphs for different holdings take the form of 'trees'. When tracking individual bundles, any tendency for yeoman holdings to give way to large scale capitalist farms²¹ would imply tree structures, with fewer disjoint graphs, different chains joining together over time as holdings were combined.

Conversely, when tracking individual properties, if there was a tendency for holdings to fragment (in a manner frequently associated with proto-industrialization), the number of disjoint subgraphs would be maintained, though more would take the form of trees. This paper sketches out a method for reconstructing the entire Land Tax graph for the township as a set of chains, each chain corresponding to a series of line entries. When properties are combined, chains join (or more strictly one is absorbed into the other). When a property is divided, loosely speaking a chain splits; strictly a new additional chain begins. Not surprisingly, when reconstructed, the actual graph for the township proves to be a hybrid, though the tendency to fragmentation dominates (as will become evident in Figure 3a).

Identification of the succession of line-entries forming any particular chain rests principally on the limited information which they themselves contain, and it is important that the character of this information is understood. It is the identification of enduring property objects which is crucial, and although the bundle descriptions might seem the most obvious indicators of continuity, returns for many years include no such description. Where they are present, most descriptions take relatively uninformative generic forms such as 'house and land' or 'cottage and croft.' Moreover, in a given year the same property name (eg 'Hague Farm') may occur in several line entries. Hence continuity must also be sought in the names of proprietors and occupiers and in the sum assessed.

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The approach to forming chains taken here rests crucially (but not solely) on consideration of the sum assessed. Under idealized conditions, unchanging property bundles should be expected to have unchanging tax liability, whatever changes of ownership or tenancy might occur. Similarly, one might expect that where two bundles had been amalgamated, the corresponding line entries would be replaced the following year by a single one with sums assessed combined. Where a bundle had been divided, it would likewise seem reasonable to anticipate that in the following year new line entries would show apportioned liabilities. The approach developed centres on the articulation and testing of rules expressing such continuities. These idealized conditions include the maintenance of a stable legal and administrative system, fixity of valuations and poundages and fairness and consistency of local practice.

The fundamental assumption (implicit in Henstock's study) that liability can be added and divided as suggested rests on a principle embedded in English law and custom from the time of commutation of feudal services into money values. The principle is set out as a dialogue in an early nineteenth century commentary: 'Q: What if the tenant since that statute enfeoff a stranger of part of the land? A: Then the stranger shall hold of the lord per particular [sic] morum, viz. the rent shall be apportioned; as if there be twenty acres of land, and twenty shillings rent, the purchaser shall hold by three shillings rent, for three acres: but if there be an entire service that cannot be apportioned, as a horse, a hawk, the lord shall have the whole'²². In this particular locality, evidence of such apportionment is found at least from the 1360s²³.

The next sections consider firstly stability and change in the Land Tax regime over the period in question and secondly the nature of valuation and administrative practice in the particular township. Together they form a basis for identifying potential discontinuities and for constructing modified and augmented line entries, compensating where possible for administrative changes and hence exposing substantive changes in value.

influences on individual assessments: the land tax regime

Critical aspects of the statutory provisions and their implications for the present work are summarized in Table 1. In principle at least, the greatest difficulty in interpreting any individual Land Tax assessment lies in understanding its place within a system in which individual townships were required to return a fixed sum in accordance with a hierarchy of quotas, irrespective of physical change. County quotas were set in statute (annually before 1798), while Commissioners at county level were statutorily required to set quotas for Hundreds or Divisions in proportion to assessments of 1692, and to set township quotas without statutory instruction. These quotas are usually regarded as having been fixed in practice from 1698²⁴

Table 1. Potential sources of change in reported land tax liability.

Change in Liability Arising From Issue		Note Significance and Treatment
Changed Valuation	Prerogative of local assessors	²⁵ Local revaluation in 1822. Specific adjustments applied (see text)
Changed Poundage	20% statutory maximum; otherwise prerogative of local assessors	²⁶ Imputed from returns; standardised values calculated (see text)
Change in Asset Classes Recorded	Land, buildings, tithes and official salaries identifiable in the township returns. No effect on quota locally.	²⁷ Official salaries and tithes excluded from analyses
Treatment of Property worth Less than £1	Statutory provisions refer to wealth of individual; not value of parcel. Lower assessments are recorded locally	²⁸ Property included in analyses regardless of value; inconsistencies investigated (see text)
Redemption of Liability and Exoneration	Individuals buying out their liability were exonerated from further payment and property not subject to reassessment. Those exonerated are listed in the township returns	²⁹ Exoneration of Sidebottom Bros means the development of the Broadbottom colony cannot be tracked
Redemption of Liability by Third Party	In principle, property on which liability was redeemed but where owners or occupiers were not exonerated remained listed and subject to reassessment	³⁰ No known instances in the township
Provision for Redemption by Ecclesiastical and other Bodies	Provisions made under various statutes for ecclesiastical and other bodies to sell property in order to redeem Land Tax liability	³¹ Church's liability locally redeemed from 1818, and further change not traceable. Possible land sale

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Reduced Liability following Appeal	Clear provisions for appeal against assessment throughout but no surviving local appeal documentation	³² Some falls between 1822 and 1823 might result from appeal after 1822 revaluation
Double Taxation of Roman Catholics	Roman Catholics were in principle liable to double taxation, though this may not have occurred in practice. There were no known Catholic households locally	³³ Ignored
Revaluation of individual properties to reflect in situ change	Occurred in principle, but doubted in practice by contemporary commentators and later analysts	³⁴ Very large number of upward in-situ revaluations evident (see text)
Complete omission of influential owners or occupiers	Occurred in principle, but doubted in practice by contemporary commentators and later analysts	³⁵

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Generally, reconciling physical growth with fixed quotas represented a significant challenge. The geographically inequitable nature of quotas which took no account of population shifts since the 1690s was much discussed³⁶. Although this poses major problems for comparing assessments between townships, for present purposes it is more important to understand how or if equitable treatment of those with interests in new and existing property might be achieved within a township. Writing in 1798, Lord Fitzwilliam believed:

It occurs most frequently that a land tax rate levies a sum considerably beyond the sum payable to Government as the land tax of the district. This has arisen from various causes, but principally from new property arising within the district, as for instance a House is built. The House immediately becomes liable to bear its proportion in the Landtax of the district. The Assessors rate it regulating the sum, we suppose, by the known Standard of some antient house of equal size. To keep the levy down to the precise demand of Government upon the district every article of taxed property within the district ought to be relieved in its just proportion on such an occasion, but this has not been the practice.³⁷

Other commentators, by contrast, were quick to suggest that new property avoided the tax and that newly developing areas contributed little.³⁸ In principle, local revaluations and adjustment of local poundages might have been used to bring the township quota and assessments of individual properties into alignment. Specific local adjustments evident in the Mottram returns are examined in the next section.

Beyond the general difficulties implied by fixed quotas, account must be taken of discontinuities arising from arrangements introduced from 1798 allowing the redemption or purchase of Land Tax liability in order to ease the debt crisis arising from engagement in the Napoleonic wars. At this time, the Land Tax formerly agreed annually became perpetual, the quotas became statutory, and a series of further measures was introduced to encourage redemption of debt in return for lump sum payments. The main consequence for the present investigation is that incremental development of particular sites in the township was obscured where land tax liability had been redeemed. Apart from the Church (after 1818), only two land holders in the township bought exoneration; John Bostock and the Sidebottom brothers. From 1804 they redeemed their liability respecting holdings at the southern limit of the township, precluding the use of the returns to track development year-on-year within the Sidebottom's cotton works and their adjoining Broadbottom colony. When the Sidebottoms later secured further land, they again redeemed their Land Tax liability, and so subsequent incremental development was again obscured.

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Table 1 draws attention to additional aspects of the legislation which might potentially introduce discontinuities and affect the possibility of completing Land Tax chains. No substantial effects are identified, but the significance of the approach taken in this study (regarding treatment of tithes and official salaries; and of properties with an annual value of less than £1) is considered further in the course of the work.

influences on individual assessments: locally determined changes in poundage and valuation

Previous work, particularly that due to Ginter, stresses the extent of the variation in local practice, indicating that localities had considerable autonomy to undertake valuations, to set poundages, and to alter timing of collection and so forth. This section seeks to identify any such changes which might have to be accounted for in attempting to construct Land Tax chains. In the absence of surviving documentation explicitly discussing practice within Mottram township, the following paragraphs draw inferences from the returns themselves.

Systematic changes in poundage are found between 1780 and 1798. Inspection reveals that assessments of individual properties in the township vary in a predictable manner year-on-year. Thus any property taxed at 2/6d in 1788 might be expected to be assessed at 2/7d in 1789, 2/8d in 1794 or 2/3d in 1799, signalling changes in local poundage. From 1799 until 1821, local poundage appears fixed at 1s 1½ d in the pound (ie 5.625%). This conclusion is permitted by the inclusion of ‘annual values’ for each property on 1813 return. In forming the chains, therefore, annual multipliers are used to estimate standardized liability for the years 1784–1821 on the basis of the 1799 local poundage.³⁹

The source of the annual values shown in the 1813 return is unknown, although both the modern and contemporary literature suggest that it is likely to be the survey of 1692 which formed the original foundation for the quotas.⁴⁰ The valuational rents implied by the annual Land Tax assessments are referred to below as Notional Annual Value (or NAV0 by way of shorthand). In analysing and discussing development and change it proves more convenient to refer to these implied values rather than the land tax payment due. NAV0 for a bundle is typically about half the rateable value for the corresponding property in 1818 (the only year in the period considered for which a rating list survives)⁴¹. The specific values of NAV0 recorded usually increase in steps of 10s (£0.50), suggesting the rough and ready character of the valuation. NAV0 for a cottage and ‘croft’ (a small parcel of land) was typically £2 exactly, with few bundles showing lower values. In the spirit of Lord Fitzwilliam’s comment above, new property might be easily rated by local assessors.

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From 1822, although the township quota remained fixed, the basis of the individual assessments changed significantly. The assessments of 1822 have no arithmetic relationship to those of earlier years (except in the case of properties where liability was exonerated which remained constant). Quite different valuation principles are implied which remained in place until 1830, shifting the relative values of land and buildings and transferring a greater part of the burden of the tax onto the manufacturing interest. The valuation(s) underlying the new Land Tax assessments of 1822 do not survive, but their principles are presumed similar to those underlying the surviving rating valuations of 1818, to which they are closely related statistically. There is, however, a sharp contrast between the rough and ready valuations of NAV0 and the number of gradations in value found from 1822 (referred to here as NAV1)⁴². Perhaps it is no coincidence that this shift occurred the year after the death Wilbraham Tollemache, Earl of Dysart, the principal landowner since 1770. Certainly, this discontinuity was limited to the township, not affecting the neighbouring townships or Stockport Division more generally.

Because of the changed valuation principles applied after 1821, a different approach must be taken to standardization. To extend the chains beyond 1821 in a consistent manner, a specific assessment conversion factor is used for every 1821–1822 transition. These factors are also used to produce estimates of NAV0 for each bundle from 1822 onwards, by applying them to the later Land Tax assessments. In the few cases where new property was built after 1822, the value of NAV0 is set at 95% of the NAV1 value⁴³

overall change in aggregate assessment 1784–1830

On the basis of the foregoing, a modified version of the line entries was produced including standardized assessments and NAV0 estimates. Aggregations of these provide an initial picture of the overall trajectory of development (see Figure 2). Series A represents the constant quota. The actual sum of the individual assessments represented by Series B (unadjusted and including liability in respect of tithes and salaries) in fact diverged from the quota even where this was not reflected in the reported totals. Ginter treats such returns as ‘defective’ and warns against their use.⁴⁴ Nevertheless, it is clear that these divergences were transparent and approved by those Commissioners serving the Stockport Division who allowed the assessments. Subsequent analyses of the chains, in fact confirms the internal integrity of the aggregations. It is suggested that the latitude displayed should be seen as part of the actual approach to accommodating the tension between fixed quotas and local equity in circumstances of growth.

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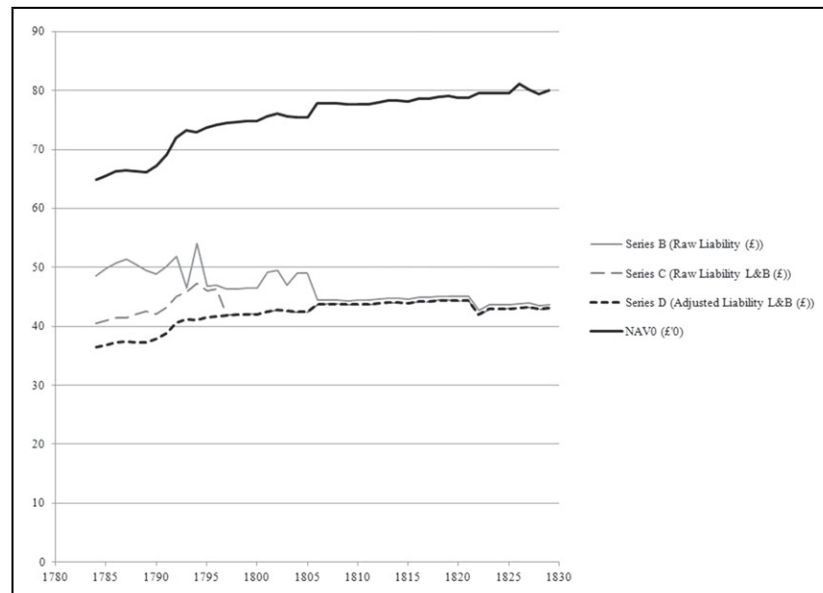


Figure 2. Land Tax Aggregates; Mottram-in-Longdendale Township; 1784–1829.

Series C shows the total sums actually assessed in respect of land and buildings alone, highlighting the effect of the shift to a new valuation in 1822. Excluding tithes and official salaries seems desirable in principle, as explained above. In this specific instance their exclusion seems straightforward. They had not been commuted into land, were owned by the Bishop of Chester, and were leased to absentees.⁴⁵ From time to time, excisemen were resident in the township, and in principle there is a possibility that as their contribution to meeting the quota rose and fell, the contributions of other taxpayers might alter correspondingly. It is clear, however, from Figure 2 that no such adjustments were made.⁴⁶ Series D adjusts C, removing the effect of local variations in poundage, all occurring before 1798. Series D summarizes the core facts represented by the adjusted line entries used to generate the chains. The final series shown, NAV0, tracks the imputed notional value of property on the basis of the old valuation.

These initial analyses clearly demonstrate that at least some new physical development was recorded year on year, and reveal a continual rise in aggregate valuational rent, contrary to initial expectations given fixed quotas. Changes in local poundage aside, two of the possible forms of local revaluation discussed

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by Ginter are found⁴⁷; the one-off revaluation of 1822, and the continual reassessment on which the following analyses depend.

nature of the physical objects corresponding to the line entries

Having attempted to ensure as far as possible that any change in the standardized values reflects either a physical change or a change in occupancy, the next step is to attempt to understand the likely physical character of bundles with a particular value in order firstly to link the Land Tax records to other information, and secondly to gain an appreciation of the character of unlinked bundles. General principles distilled from Ginter's analysis form the starting point:⁴⁸

- i) bundles cannot be assumed to be either functional 'wholes' (such as farm units), or geographically contiguous parcels,
- ii). specific buildings cannot be assumed to be individually represented; but may instead be 'clumped' and represented in line entries along with other buildings (whether contiguous or scattered), and
- iii). there may be an untaxed residuum and hence many buildings may not be included (either individually or within a composite line entry).

On the initial assumption that a bundle will usually correspond to a 'holding' defined by a specific lease or deed, information about its physical character - in the case of property owned by the principal landlord- might be found within Tollemache estate documentation. Nearly all holdings on that estate fell into one of three types; property let on fourteen-year leases, property let on annual 'cottage tenancies', and property leased for 99 years determined by three lives. Very little documentation survives for the annual cottage tenancies though it appears that they typically included more than one dwelling and encompassed small parcels of land, the tenants serving as gatekeepers, subletting property and controlling access to clusters of dwellings.⁴⁹ The legal power to grant 99-year leases was only secured by the principal landlord in 1786 by a private parliamentary Bill, which proved a pivotal moment in the physical development of the township.⁵⁰

In the case of agricultural land leased from the Tollemache estate, the relation between the physical character of a bundle and its assessment is readily understood. Property held on 14-year lease included parcels of agricultural land which themselves might or might not be contiguous and which might include disjoint cottage property. These leases ran concurrently, the period examined being covered by five allocations or 'tacks' made in 1771, 1785, 1799, 1813, and 1827 with associated surveys being undertaken in the preceeding year. For years when a survey took place, the Land Tax liability of a bundle may be compared with the area and rent of the corresponding holding. Restricting attention to 1799 and cases where a one-to-one match between a holding and a line-entry can

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be identified, a strong correlation between assessment and rent is found (0.76), but a much stronger one with acreage (0.986). A rate of tax per hectare for the township may be estimated by regression using area measures for holdings on the Tollemache estate in 1799:

$$T = \alpha_0 + \alpha_1 A + \epsilon$$

where T represents the Land Tax Assessment,

A is the area of undeveloped parcels let,

α_0 and α_1 are parameters to be estimated, and

ϵ is an error term

$$\text{Land Tax} = 0.181 + 0.065 * \text{Hectares}$$

Statistically, variation in acreage accounts for 97.3% of the variability of the Land Tax assessment (or equivalently of NAVO). With tax payable estimated at 6.5p per hectare as above, the notional annual value (NAVO) of agricultural land in the township would be \$1.15 per hectare (or 46p per acre). This relationship is used to guide the matching of Land Tax and estate documentation more generally and to make rough estimates of the acreage of holdings outside the Tollemache estate for the period up to 1821⁵¹.

The intercept in the above expression (18.1 pence) is interpreted here as the Land Tax typically payable on the built property within a holding leased for fourteen years- equivalent to an annual value of £3.22 (NAVO), representing say 4.4 bays of building.⁵² Although the value of buildings has been largely ignored in estimating area equivalent Land Tax assessments, it should not be discounted. Gregory King's estimates⁵³ imply that in 1692 the assessed value of land and buildings were in the ratio 13:3. In the Pennine fringe, where holdings were typically very small, this lack of attention seems difficult to justify.

Only limited inferences can be made about the nature of built property, especially property with £2.00 NAVO (the usual minimum in the township). This is because very few holdings leased for terms of 14 years had values as low as this, and no descriptions of annual cottage property survive. The area/tax relationship discussed above suggests that one form might be a one-bay cottage with three acres of land. Some other possibilities appear. Descriptions of Phoebe Stead's 14-year holding grandiosely styled Taylors Hospital stands as an example- a house, a shop, a cottage and a wash house (with a NAVO of £2) beside the turnpike road at the Lane End tollhouse, makes no explicit reference to a croft or any garden ground.

It is clear that some property went untaxed. The potential scale and nature of this untaxed residuum might be crudely gauged by comparing receipts for cottage rentals for the Tollemache estate in 1785 with Land Tax entries for the same year. Assuming that any bundle represents a holding, and that the 'tenant' and the 'occupier' should always be identical, any cottage tenancy without a corresponding line entry might be considered to have gone untaxed. Of the 36

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Tollemache cottage tenancies of 1785, 30 can be found immediately on the Land Tax returns. Some of the mismatch should be expected to be attributable to divergence between recorded occupiers and tenants, and the accuracy with which the residuum can be measured depends on the approach to matching. Tollemache cottage tenancies without a corresponding a line entry all have a (market) rent of £2 per annum or less, and three of these six have a rent of under £1. As all the property on 14-year lease can be matched, and most of the cottage tenancies, for 1785 that portion of the rental income for the estate attributable to property identifiable in the Land Tax returns accounts for 99.4% of the total. The untaxed residuum would therefore appear of no significance in terms of aggregate rental value, although it may be of more significance in terms of tracking development.

The untaxed residuum might result from a particular interpretation of statute, from deliberate local policy, from oversight or from the simple play of power. These possibilities have slightly different implications for the attempt to construct Land Tax chains. Any principle that bundles with an annual value less than £1 were exempt from Land Tax either from 1798 or throughout-supposedly grounded in statute- is disputed,⁵⁴ and the practice in Mottram township was evidently to tax such parcels in some circumstances both before and after 1798. Over the entire period, 111 entries are found with values of NAV0 less than £1, the smallest value being 4s (£0.20) for 'part of Brick Croft' in 1796. Even assuming that market rent rather than valuations rent were the appropriate measure and that this might be four times higher, the £1 threshold would still not be exceeded in that case. A literal interpretation of successive statutes would suggest that the value test should be applied to the entire property of the person assessed, rather than the specific bundle. On this reading, the undeveloped houseplot at Brick Croft was liable because of the value of the occupier's entire holding (which amounted to £8 NAV0 within the township).⁵⁵ Subsequent sections take this further by exploring circumstances where chains appear to break down as existing property ceases to be or starts to be taxed.

constructing chains: overview

Assembly of the chains, and establishment of the links between them to construct the entire Land Tax graph is achieved by applying a series of a 'rules' to 'facts' drawn primarily from the line entries. The facts and rules together might be thought of as a knowledge base, coded in the logic programming language Prolog⁵⁶ which serves as an 'inferencing engine'. It might be thought of as a computational theorem prover which can be made to draw out the implications of knowledge of very different forms (including topological, geometric and grammatical relations) provided that knowledge can be expressed either as facts or rules.

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The ‘facts’ derived from the line entries with some preprocessing take the form `landtax(Case,Year,Proprietor,Occupier,Bundle,Tax)`, for example

```
landtax(13, 1784, [wilbraham, tollemache], [john, shaw], [], 0.787501).
landtax(1120, 1799, [wilbraham, tollemache], [widow, stead], [cottage],0.15).
landtax(1121, 1799, [john, bostock], [john, bostock], [broadbottom], 1.6875).
```

Spellings of personal names are standardized at the outset. Where the line entry records the occupier as ‘tenants’ or similar, this is replaced by the proprietor. Tax is expressed in pounds, the standardized measure being used for the years 1784–1821. As shown above, Proprietor, Occupier and Bundle description are represented as Prolog lists, allowing various required natural language processing tasks using definite clause grammars.⁵⁷ An empty list, [], indicates that the line entry has no property description. Where possible, property descriptions are added to line entries originally lacking them by recursively copying descriptions from the previous (or following) year, provided that the specific combination of occupier name and (standardized) tax matches uniquely.

Facts based on the line entries are supplemented by further Prolog facts based on a body of other material (summarized in Table 1) which might be used both to locate the bundles to which particular line entries refer, and to guide the construction of chains. This encodes some estate documentation, facts recording familial relationships derived from parish registers, enumerators’ books from the 1841 census and the tithe apportionment survey of 1846. Other historic sources, such as wills, have been used to corroborate linkages, confirming reconstructed events, but are not stored as Prolog facts.

Most of the effort in the project lies in the specification and re-specification of rules. Taken together the rules seek to identify the most likely successor(s) to any line entry. In terms of the graph metaphor, this involves identifying the ‘edges’ most likely to link line-entries (vertices). A bundle in year t might be succeeded by one or more bundles in year $t+1$ if their aggregate values were equal (subject to some tolerance). From the various sets of linking arcs that meet this minimal condition, further rules are designed to identify the most likely links by scoring potential arcs principally in terms of continuity - a composite based on continuity of occupier, of proprietor and of bundle continuity. Each time the procedure is run, (that is the rules are applied to the facts), links are made and chains are extended computationally if the scores merit. Where two or more candidate links score equally as potential ways of extending a chain, or where no candidates score sufficiently highly, no link is made, but documentary evidence is reconsidered or more sought. As possibilities are resolved, linkages between line entries in these uncertain cases are recorded as specific facts and assigned superior scores. Incomplete matches (ie those which do not maintain value in full) can also be recorded by the analyst as specific facts, ‘pseudobundles’ being

Table 1. Detailed sources of supplementary information.

Topic	Scope	Dates	Content	Source	Application
Valuation, Surveys, Particulars of estates	Tollemache Estate	1771,1799, 1813,1826	Names, areas, rents, tenants of land parcels	Cheshire CRO	Locating Land Tax bundles
Leases (99 years)	Tollemache Estate	1786 onwards	date, lessee, property description	Cheshire CRO	Identifying expected new construction
Register of Leases	Tollemache Estate	1814,1837	date, lessee	Cheshire CRO	Identifying assignees
Cottage Rentals	Tollemache Estate	1785		Cheshire CRO	
Tithe Apportionment	Township	1846		Cheshire CRO	Locating Land Tax bundles
Census Enumerators' Books	Township	1841			Locating Land Tax bundles
Household Heads	Township	1700–1820	dates of marriage, burial, business partnerships	Parish Registers	Assessing Continuity
Wives	Township	1700–1820		Parish Registers	Assessing Continuity
Children	Township	1700–1820	dates of baptism, link to HOH	Parish Registers	Assessing Continuity
Tollemache Estate Map	Tollemache Estate	1771- 1826		Reconstruction	Locating Land Tax bundles
Sale plan	Part of Tollemache estate	1841		Cheshire CRO	Locating Land Tax bundles
Highway Rate Book	Township	1818		Tameside Archives and Local Studies	
Toponymy	Township	throughout	subareas	All the above	Restricting chain formation

created to account for discrepancies. By repeated application of the procedures problems reduce and chains are defined.

The rule-based inferencing deployed has parallels with the approach of expert-systems⁵⁸, but crucially the rules used must rely largely on consideration of statute, contemporary texts and modern scholarship rather than ‘expertise’.⁵⁹ An assessor’s awareness of local practice and his understanding of matters taken for granted in everyday life are all missing. Posited rules rely instead on abduction⁶⁰ - ie on positing a hypothetical relation (concerning admissible arithmetic mismatch, for example) and then testing it by applying it to the facts. To develop rules in this manner is to explore what must be true for the particular outcomes to be possible and this extends from admissible arithmetic mismatch towards the more general tacit knowledge at the core of social relations. If posited rules admit too many possibilities, they are of little immediate value as they suggest too many plausible chains. If they admit too few possibilities, chains will not form at all. Progress depends on repeatedly respecifying rules, which serves not only to construct the chains, but also to reconstruct some of this tacit knowledge to a limited degree as discussed below. Not only therefore is there a symmetry between the specification of rules and the resulting outcomes, but the rules provide pointers to how language and legal provisions must have been interpreted.

At any particular stage in the analysis, there may be competing ways of extending a chain, and this opens up new approaches to making sense of undated endorsements, crossings out and annotations in estate documentation for example. Potential paths may be supported by and illuminate such minutiae. The approach, however, is very unforgiving. Chains break down where posited rules cannot be satisfied. This might result from failure to identify consistency in local practice correctly, from the inconsistent practice of assessors, or simply from error in data preparation. In more familiar quantitative analyses of Land Tax concerned with aggregates, to overlook a single line entry, to duplicate one or to mistype a value, though undesirable, is of relatively little consequence. In attempting to chain individual records, the emphasis is largely on the difference between line entries and such errors are crucial. The overall approach demands the presumption of order is absolutely maintained until it is no longer possible.

following the value: introduction

The first group of rules express principles for defining summations of individual Land Tax assessments for a given year to compare with a specific assessment the following year. Each line entry is assigned a unique identifier, and considered to denote a property bundle with the same identifier. In terms of the graph, this corresponds to a specific vertex (node). On the basis of very restrictive assumptions about how property may be broken up, an initial Identity [1] is

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posited in which L_j , the Land Tax liability in respect of bundle j , can be related to liability with respect to bundles present in the previous year by the expression:

$$L_j = L_i + \sum_{k \in m} L_k - \sum_{l \in s} L_l + C_j - D_j + R_j + A_j + Z_j \quad (1)$$

where

m is a set of bundles merged with i ,

s is a set of bundles split from i ,

C_j represents liability in respect of new development observed in bundle j

D_j represents a reduction in liability corresponding to physical change (devalorisation of capital) in bundle j , or the outcome of an appeal in respect of property forming (part of) that bundle,

R_j is a revaluation adjustment that takes a specific parcel for all bundles dated 1822 and is 0 otherwise,

A_j represents an adjustment for rounding errors and other very small changes in liability, and

Z_j represents an adjustment for all other attributes of bundle j , its proprietor and its occupier which affect change in liability from one year to the next.

The following sections elaborate the principle underlying [1], and extend it, first relaxing the assumptions about property subdivision and second accommodating matters of administrative practice which emerge.

Identity [1] considerably extends the logic implicit in Henstock's study of Ashbourne⁶¹, which presumes that almost invariably an (important) special case of [1] will hold, in which there will be no material change in physical character from year to year. In this Fixed Property Object case, a single line entry j for a particular year would be found in place of entry i the previous year and (without wholesale revaluation), L_i and L_j would be identical and all the other terms on the right hand side of [1] would be 0. Even in the Ashbourne study, however, it was necessary to recognize 'occasional subdivision of properties' and one case of amalgamation, and hence to identify bundles corresponding to sets m and s in [1], and in these cases, the principle that liability could simply be summed and divided ('and resolved by simple arithmetic') was implicitly accepted.⁶² It should be appreciated that in Equation [1], the distinction between bundle i (the predecessor) and bundles in the set m is one of convention.

Identity [1] moves beyond the Fixed Property Object case by considering change in the building stock. In the case of construction of a new cottage all terms on the right hand side other than C_j will be 0. By D_j , the possibility of devalorization, or of successful appeal is admitted, but without any expectation that these effects would be substantial. The tolerance, A_j , avoids including changes which might be considered de minimis. Initially set at $\pm£0.0083$ (2d), it was later reduced to $\pm£0.004$, 'filtering out' change with a notional annual value (NAV0) of less than $1/6d$ ⁶³

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Identity [1] allows that bundles may be combined or split, but only in very restricted ways. Under [1] a bundle found in any particular year must either comprise one or more bundles recorded in the previous year, or be part of a single bundle from the previous year. It is, however, quite possible that a bundle comprises parcels which were never explicitly represented as bundles. It is far from adequate, however, as it does not admit the possibility that a parcel might cease to be part of one bundle and become part of another.⁶⁴

A totally general solution would be to treat any Land Tax bundle as a mereological sum of atoms of real property at an instant in time⁶⁵. Identity [1] would be re-written without a specific 'predecessor' L_i and replacing sets m and n by sets of infinitesimal property elements. Within mereological calculus any objects may have a sum, though following Quine those which are not useful are discounted.⁶⁶ Implementation would obviously be impractical and moreover the formulation would suggest a world that were infinitely and immediately plastic. A less comprehensive approach might define potentially useful sums by recognizing that property transfers may be hidden wherever (subject to some tolerance) some set of bundles found in one year carries the same aggregate Land Tax liability as another set of bundles the following year. This would imply a large but finite set of sums, rather than an infinite set of combinations of atoms of real property.

In the work reported, a more modest extension of [1] has been applied. 'Useful sums' have been defined only in three very restrictive sets of circumstances:

- when there is a possibility that property objects would (from an endurantist perspective) be treated as changing in value (eg where a taxpayer name or bundle name remains constant)
- when the specific value of a bundle suggests that an apportionment has occurred (ie falls outside the set values usually encountered), and
- when the value of a particular bundle cannot be expressed as the sum of the values of a series of bundles in the year previous or following.

Relaxing the highly restrictive assumptions of Identity [1], L_j , the Land Tax liability in respect of bundle j might be related to liability with respect to bundles present in the previous year by summation of liability for 'property elements' or simply 'elements' for short. An element may be either a bundle as [1] or part of a bundle recognized as a 'useful sum'. On this basis, a revised identity is defined:

$$L_j = \sum_{k \in m} V_k - \sum_{l \in s} V_l + C_j - D_j + R_j + A_j \quad (2)$$

where

$$V_k = L_n p_{nk}$$

and

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m is a set of elements merged with i ,
 s is a set of elements split from i ,
 V_k is the liability assigned to element k ,
 L_n is the standardised liability carried by bundle n ,
 p_{nk} is the proportion of the standardized liability for bundle n assigned to element k

inter-temporal adjustments

In applying [1] and [2] it became clear that modification was necessary to capture intertemporal adjustments made by local assessors, which frustrate the formation of chains and shift the interpretation of individual line entries.

At least three such types of adjustment are found. The first accounts for vacant property. A second form of adjustment, entirely unanticipated within the literature, is found to occur in some circumstances after the death of an occupier, and is assumed to allow for an executor to settle an individual's affairs. In these cases an occupier's name may disappear from the Land Tax return, but one or more lagged assessments may subsequently be recorded after a gap (in the name of the deceased and at the former level). Hence following ten deaths in 1800 for example, new occupiers for the respective bundles are recorded in both 1801 and 1802, before a final lagged assessment for the deceased occupier is recorded in 1803. Third, it appears that further lagged assessments were recorded, consequent on the second group. In these cases the liability of those entering on property vacated on the death of the previous occupier was set at the level appropriate to the bundle that they themselves had previously occupied. (Beside these three sets of adjustments are very small year-on-year changes where occupancy appears continuous, which are filtered out in Equations [1] and [2] by the A_j tolerance).

likelihood scores

In principle (though not procedurally), the computational exercise is concerned to identify for each particular line entry, all summations which might satisfy [2]. The attempt to reconstruct change involves choosing between them, which demands further rules, and perhaps suggests a probabilistic approach. Although such an approach was not finally preferred, consideration of probability forms a useful stepping stone to explaining the procedures adopted. Restricting attention to the Fixed Property Object case, and without any further information, the probability that line entry j (dated $y + 1$) with liability L_j would succeed line entry i (dated y) might be considered to depend on n , the number of line entries dated $y + 1$ with a liability equal to L_j . The probability p_{ij} that j would succeed i might be estimated as 0 if $L_j \neq L_i$ or $1/n$ otherwise. This might be thought of as a uniform prior probability of succession. Given the crude nature of the valuations, there are many cottages assessed at £2, while far fewer smallholdings

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share a specific value. The prior probabilities of succession under these assumptions are thus far higher in the latter case. This principle is easily extended to consider not only the frequency with which a particular value is recorded, but the number of bundles with that value owned by a particular landowner.

Of course, the line entries provide substantive evidence relevant to assessment of the probability of a particular linkage. In the spirit of Henstock, it is assumed that the similarity of line entries year-on-year should influence the degree of belief that occupation continued. A Bayesian approach to assessing the probability of a particular linkage developed on this basis might consider not only the prior probability of succession, but estimate two further probabilities. The first would be that of finding the observed degree of similarity between line entries if they really did represent the same property. Technically, this is the likelihood that the succession occurred. The second would be the probability of finding that degree of similarity otherwise. On the basis of these three values, the probability of the particular transition might be estimated⁶⁷.

Although Henstock judged the similarity of line entries year on year (implicitly allied to the likelihood of the transition), he did not consider the three probabilities. Estimation of the likelihood of specific transitions was attempted in the present study, but this proved impractical.⁶⁸ Moreover, as the work progressed it appeared that rather than assigning a probability to each potential succession, it might be possible and preferable to identify a single most likely solution. Indeterminacy, rather than being commuted into probability, has driven the search for additional evidence. The approach taken does not estimate likelihood as such, but assigns a likelihood score to each potential succession based primarily on similarity.

The likelihood score for a particular summation rests on four groups of considerations; similarity, structural priority, the broader evidence of related lagged summations and the ordering of the line entries within the return. Each of these considerations is outlined below. The values taken by the scores are illustrated in Table 2 and examples of scores assigned to particular potential transitions are provided in Table 4.⁶⁹ An overall succession score is calculated for any summation, by combining the likelihood score with the prior probability of the transition (which varies with the prevalence not only of the sum assessed, but of the other details - the proprietor being particularly significant in practice). The goal is to find the best overall succession score for each bundle. It should be understood, however, that identification of the 'best' summation of elements in year t corresponding to any particular line entry i in year $t-1$ does not depend solely on the overall succession scores for line entry i . It also depends on the scores associated with all other summations, such as that for line entry k , in year $t-1$ which might 'compete' for the same elements in year t . Potential changes involving the same bundle or element are mutually exclusive; if a given bundle or sub-bundle forms part of one summation, it cannot participate in another.

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Table 2. Similarity component scores.

	Sequence	Related Parts	Simplicity	Proprietor Similarity	Occupier Similarity	Bundle Similarity	Continuity Score
Possible							
Values							
Minimum	0	0	$-\infty$	0	0	0	∞
Maximum	1	1	2	2	2	2	0
Forced	3	3	3	3	3	3	-3
Calculated							
Values for							
All Tested							
Summations							
Average	0.22	0.09	-0.06	1.70	0.10	0.86	8.18
Minimum	0	0	-1	0	0	0	0
Maximum	1	1	2	2	3	3	16
Calculated							
Values for							
Best Tested							
Summations							
Average	0.46	0.10	1.90	1.75	0.90	1.26	2.37
Minimum	0	0	-1	0	0	0	0
Maximum	1	1	2	2	3	3	11
Values for Best							
Tested							
Summations							
(including forced)							
Average	1.82	1.65	2.49	2.42	2.02	2.19	-0.50
Minimum	0	0	-1	0	0	0	-3
Maximum	3	3	3	3	3	3	11

Notes

Scores for individual components increase with similarity.

Values under 'All Tested Summations' refer to the scores for the relevant components of similarity between any given line entry and all its potentially matchable line entry summations (ie those for which Land Tax liabilities are equal subject to a tolerance, and which do respect all other constraints).

Values under 'Best Tested Summations' refer to the scores for the relevant components of similarity between any given line entry and the potentially matchable line entry summation (s) with the best (ie lowest) continuity score (combining similarity and structural priority).

Values under 'Forced' Summations refer to the scores assigned to the relevant components of similarity between any given line entry and that identified by the analyst as the preferred line entry summation (to which a continuity score of -3 assigned).

Table 3. Similarity scores; examples.

Type	Structure	Sequence	Related Parts	Simplicity	Proprietor	Occupier	Bundle	Score	Line Entry	Potentially Matching Summation
split	0	1	1	1	2	2	1	0	[[4825, 1795, [wilbraham, tollemache], [james, stead], [cottage, and, croft], 0.253125]]	[[904, 1796, [wilbraham, tollemache], [james, stead], [house, and, land], 0.125625], [926, 1796, [wilbraham, tollemache], [james, stead], [house, and, land], 0.1275]]
continuation	0	1	0	2	0	1	2	1	[[4122, 1827, [edward, hollingworth], [william, heap], [part, of, roe, cross, farm], 0.2875]]	[[4253, 1828, [john, roberts], [james, heap], [part, of, roe, cross, farm], 0.2875]]
continuation	0	1	0	2	1	3	2	1	[[1243, 1800, [john, swindells], [john, swindells], [summerbottom, and, lands], 0.604167]]	[[1346, 1801, [john, dale], [john, dale], [summerbottom, and, lands], 0.604167]]
continuation	0	1	0	2	2	0	2	1	[[1374, 1802, [wilbraham, tollemache], [wilbraham, tollemache], [brick, croft], 0.0125]]	[[1475, 1803, [wilbraham, tollemache], [thomas, hill], [part, of, brick, croft], 0.0125]]
continuation	0	1	0	2	2	1	1	1	[[955, 1797, [wilbraham, tollemache], [occupation, [plasterer], thomas, harrop], [house, and, garden], 0.28125]]	[[1058, 1799, [wilbraham, tollemache], [ann, harrop], [house, and, land], 0.28125]]
continuation	7	0	0	2	2	2	2	1	[[1011, 1797, [wilbraham, tollemache], [john, lee], [kelsall, farm], 0.675]]	[[1110, 1799, [wilbraham, tollemache], [john, lee], [kelsall, farm, and, cottage], 0.7875]]
continuation	7	0	0	2	2	2	2	1	[[1700, 1805, [wilbraham, tollemache], [jonathan, hadfield], [hurstclough, farm], 0.5]]	[[1802, 1806, [wilbraham, tollemache], [jonathan, hadfield], [hurst, clough], 0.50625]]
merge	0	1	1	2	2	0	2	1	[[1525, 1803, [john, bostock], [john, bostock], [broadbottom], 1.6875]]	[[1423, 1802, [john, bostock], [john, bostock], [broadbottom], 1.51875], [1424, 1802, [john, bostock], [william, and, george, sidebottom], [broadbottom], 0.16875]]
merge	0	1	1	2	2	0	2	1	[[1529, 1803, [widow, wood], [widow, wood], [silver, spring], 0.59375]]	[[1430, 1802, [widow, wood], [john, harrison], [roe, cross], 0.297917], [1431, 1802, [widow, wood], [edward, chadwick], [roe, cross], 0.297917]]
continuation	7	0	0	2	2	2	1	2	[[3042, 1818, [wilbraham, tollemache], [john, langwith], [foundry], 0.1125]]	[[3165, 1819, [wilbraham, tollemache], [john, langwith], [], 0.16875]]
split	0	1	0	2	1	0	2	2	[[1226, 1800, [widow, wood], [widow, wood], [silver, spring], 0.59375]]	[[1329, 1801, [joseph, wood], [john, harrison], [roe, cross], 0.297917], [1330, 1801, [joseph, wood], [edward, chadwick], [roe, cross], 0.297917]]
split	0	1	1	1	2	0	1	2	[[52, 1784, [wilbraham, tollemache], [james, harrop], [], 0.900001]]	[[66, 1785, [wilbraham, tollemache], [jonathan, bowers], [], 0.618751], [117, 1785, [wilbraham, tollemache], [senior, james, harrop], [], 0.28125]]

Table 4. Continued.

Type	Structure	Sequence	Related Parts	Simplicity	Proprietor	Occupier	Bundle	Score	Line Entry	Potentially Matching Summation
continuation	0	0	0	2	0	0	2	3	[[2410, 1813, [edmund, kershaw], [nathan, bowers], [harryfields], 0.6875]]	[[2618, 1814, [william, and, george, sidebottom], [william, and, george, sidebottom], [harryfields, farm], 0.6875]]
continuation	0	0	0	2	2	0	2	3	[[2704, 1815, [edward, hollingworth], [daniel, mercer], [roe, cross], 0.9]]	[[2803, 1816, [edward, hollingworth], [robert, heap], [roe, cross], 0.9]]
merge	0	0	0	2	2	0	1	3	[[2637, 1814, [james, hurst], [james, hurst], [], 0.595833]]	[[2421, 1813, [james, hurst], [occupation, [innkeeper], thomas, chadwick], [roe, cross], 0.297917], [2422, 1813, [james, hurst], [occupation, [innkeeper], thomas, chadwick], [roe, cross, land], 0.297917]]
invention	4	1	0	1	2	0	1	4	[[363, 1790, [wilbraham, tollemache], [edward, moss], [], 0.45]]	[[284, 1789, [wilbraham, tollemache], [wilbraham, tollemache], [], 0.337499], [4901, 1789, [wilbraham, tollemache], [neddy, holt], [], 0.112501]]
continuation	3	0	0	2	2	2	1	5	[[4831, 1795, [joseph, bardsley], [joseph, bardsley], [house, and, garden], 0.148125]]	[[932, 1796, [joseph, bardsley], [joseph, bardsley], [house, and, garden], 0.140625]]
lagged continuation	1	0	0	2	1	2	2	5	[[1431, 1802, [widow, wood], [edward, chadwick], [roe, cross], 0.297917]]	[[1633, 1804, [joshua, wood], [edward, chadwick], [roe, cross], 0.297917]]
split	0	0	0	-1	2	0	1	6	[[4849, 1795, [wilbraham, tollemache], [robert, bennett, and, james, harrop], [house, and, land], 0.27]]	[[842, 1796, [wilbraham, tollemache], [john, swindells], [hodge, mill], 0.028125], [897, 1796, [wilbraham, tollemache], [john, lee], [cottage], 0.1125], [926, 1796, [wilbraham, tollemache], [james, stead], [house, and, land], 0.1275]]
lagged merge	1	0	1	1	2	1	1	7	[[956, 1797, [wilbraham, tollemache], [widow, stead], [cottage, and, croft], 0.253125]]	[[798, 1794, [wilbraham, tollemache], [james, stead], [house, and, land], 0.126562], [817, 1794, [wilbraham, tollemache], [james, stead], [house, and, land], 0.126562]]
continuation	0	0	0	2	2	0	0	8	[[2241, 1810, [wilbraham, tollemache], [james, shaw], [garlick, cottage], 0.1125]]	[[2358, 1811, [wilbraham, tollemache], [robert, bennett], [late, hills, barn], 0.1125]]
lagged continuation	1	0	0	2	2	0	1	8	[[4888, 1785, [wilbraham, tollemache], [samuel, doxon], [], 0.337499]]	[[255, 1787, [wilbraham, tollemache], [joel, howard], [house, and, land], 0.3375]]
lagged continuation	1	0	0	2	0	0	1	9	[[4797, 1795, [john, reddish], [john, reddish], [cottage], 0.1125]]	[[1131, 1799, [john, sidebottom], [robert, bennett], [silent, mill], 0.114583]]
lagged merge	1	1	0	-1	2	0	1	10	[[1311, 1801, [wilbraham, tollemache], [john, reddish], [house, and, land], 0.675]]	[[952, 1797, [wilbraham, tollemache], [robert, bennett], [harrops, land], 0.140625], [963, 1797, [wilbraham, tollemache], [thomas, lowe], [cottage], 0.225], [965, 1797, [wilbraham, tollemache], [enoch, bretnor], [croft, late, woolley], 0.196875], [1012, 1797, [wilbraham, tollemache], [john, lee], [cottage], 0.1125]]

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The overall succession score for the ‘best’ summation for any bundle is assessed against a threshold. Where the threshold is satisfied, necessary new links are created to extend the chain(s). Where the overall score is not considered determinate, no links are made but more evidence has been sought from other documentation.

similarity: proprietor and occupier names

Three dimensions of similarity - of the names of the proprietor, of the occupier and of the bundle description - are assessed, extending to the several occupiers of the several potential bundles or elements in the case of merges and splits. Assessment of similarity makes use of elementary natural language processing techniques using the Definite Clause Grammars (DCG) extension of Prolog. Each dimension of similarity is assigned a score between 0 (no similarity) and 3 (identity). The limited value of the bundle descriptions underlies the emphasis on proprietor and occupier names.⁷⁰

Assessment of the similarity of personal names extends beyond direct matching to consider possible transfer to family members, business partners, and in the case of 99-year leases, assignees using sources referenced in Table 1. Well-understood problems of nominal record linkage apart, matching proprietor names proves straightforward, save insofar as account must be taken of Tollemache long leaseholders, who were not consistently treated as proprietors. As the principal landowner did not dispose of the freehold property in the township over the period, a specific rule discounted any summations implying such transfers.

Using similarity of occupiers’ surnames to frame judgments about likelihood of succession makes implicit assumptions about security of tenure. Locally, where property was held on fourteen year lease, there seem to be strong expectations of tenant right of renewal, and of nominating a successor, which seem matched by equally strong presumptions in contemporary treatises on estate management. This is not clear in the case of annual tenants.⁷¹

similarity: bundle descriptions

Comparisons of bundle descriptions may entail assessment of the compatibility of generic property descriptions with each other, of the compatibility of generic descriptions with topographic proper names (definite descriptions), and of the compatibility of topographic proper names with each other. Particular attention is given to the compatibility of parts with each other (where property units are being divided or combined).

Generic property descriptions are recognized as such and compatibility of pairs of generic property descriptions is assessed by decomposing noun

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phrases (eg 'house, mill and land') into their components and applying similarity constraints based on implied physical changes. This prevents, for example, any built property being part of a summation corresponding to an undeveloped bundle (described as say 'lands'). As work progressed, these 'physical' constraints were loosened (allowing compatibility of 'cottage' with 'house' or 'cottages', for example) in recognition of the far from precise way such generic terms were actually used.

Topographic names are treated as a special class of noun phrases. They are regarded as attributes of the places to which they refer rather than as rigid designators⁷², so several bundles in one year may be described as 'Hague Farm,' while 'Harrop Edge' is treated as identical to 'part of Harrop Edge'. The tendency for the referents of names to drift implies that allusions to topographic features, holdings and localities are not easily distinguished. Few presumptions are therefore made about the assumed extent of places denoted (for example, 'Nogon,' or 'Lane End'). For this reason too, the phrase 'in Mottram' in the township returns was treated as having no specific import (ie 'X in Mottram' or 'X at Mottram' are treated identically to 'X' alone).

Assessment of the similarity between a topographic name and a generic description is relatively straightforward where the proper name has both a proper element and a generic element which indicates a building (eg 'Woolley Cottage'), or takes a related form (such as 'a cottage, late Platts'). By analogy with the matching of personal names above, a similarity score of 3 is assigned to matches such as that between 'Woolley cottage' and 'Wooleys cottage', but a score of 2 is assigned to that between 'Woolley cottage' and 'cottage'. In treating names of this specific type, comparisons are also made between the proper element of the bundle description and the name of the preceding occupier (potentially allowing a higher score of 3 to be assigned). This form can even justify merges (in the case of the description 'Barbers cottage, Bretnors field'). Acknowledging once again typical transference of reference from landscape features to buildings, there is, however, no assumption that topographic names such as 'Harrop Edge' or 'Dolly Meadow' necessarily denote parcels of undeveloped land, and so matches including built property are permitted. Thus the score for a match between such a name and a generic cottage, house or land remains 1.

A specific approach to topographic matching was designed to exclude the implausible without attempting an exhaustive assignment of bundles to geographic locations which patchy knowledge would not permit. A difficulty particularly of historic applications of GIS is that it can be difficult to hold information that is not placeable. To make best use of the locational information inherent in such terms as 'at Lane End', a number of sublocalities were identified with which particular bundles might be associated (deliberately without any further definition). Hence 'Mudd,' 'New Mudd', 'Mudd Island' and also 'Dolly

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Meadow' were treated as having the property of association with the sublocality, Mudd. Most bundle descriptions do not imply association with any sublocality, but when two line entries are compared, both of which can be associated with sublocalities, a match is considered implausible if the implied sublocalities differ. This allows use to be made of locational knowledge while maintaining the overall strategy of building relationships between historic textual data while permitting locational reference to be deferred.

structural priority

In casually comparing two line entries for successive years believed to refer to the same proprietor and occupier, higher liability in the later year might be attributed either to development or expansion. Both possibilities fit the endurantist intuition that the value of a persisting object had increased. Contrarily, it would also be consistent with an individual having relinquished occupation of one bundle and entered into another comprising entirely different property. Structural priority refers specifically to the following predispositions about which changes in landscape and occupancy are more or less likely:

- i) a there is no evidence in the Tollemache estate documentation of any abandonment of buildings a 'fall' in liability is presumed to imply transfer of property, unless it is impossible to identify any plausible set of corresponding increases;
- ii) while the possibility of loss of value or appeal are admitted, they are treated as outcomes of last resort;
- iii) give relative values of land and buildings, and on the evidence of property constructed, any increase in the value of an apparently continuing holding greater than £3(NAV0) is presumed to result from transfer rather than construction and must be offset by a fall in liability of another holding;
- iv) give the overall precedence accorded to transfers over new development, a penalty of 1 applied to any other in situ development; and
- v) although summations that satisfy [2] might include any number of property elements and imply any configuration of property, a penalty is imposed which increases with the number of property elements combined within or carved out of a bundle.

The penalties associated with summations not preferred by principles i, ii and iii prevent the associated linkages being formed automatically. In the absence of preferable options chains will remain incomplete and further review will be necessary.

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ordering

The ordering of line entries within a return played an important role in Henstock's longitudinal matching, as before 1815 the Ashbourne returns followed a consistent street sequence. Ordering is of much less significance in the present study because (alphabetic listings apart) different topographic orderings were followed in different years. The sequence numbers added to each line entry allow order to be exploited, however. For any line entry, expected sequential positions for the previous and following years may be calculated. When the expected position differs from the actual position by less than three entries, the likelihood score is adjusted.

lagged summations

When considering succession from or to a particular line entry, summations are identified and likelihood scores calculated not only for entries in the year immediately following (or preceding), but also for more distant years (termed 'lagged summations'). This allows identification of the various intertemporal effects outlined and assists in identifying those holdings repeatedly divided and recombined, or whose occupiers alternate. The scores assigned preclude lagged summations ever being preferred to non-lagged ones (thereby preventing jumping through time).

results: chains, geographic reference and audit

Each time the procedures are run, (ie the rules are applied to the facts), a series of chains is created, together with the link information required to produce an entire graph. Each chain represents a continuous path between bundles through time. An example of a chain is provided in Box 1, while the entire reconstructed graph is illustrated in Figure 3a (a, b and c), the thickness of the edges in Figure 3a being proportional to the associated notional annual value (NAVO). The information associated with each chain includes together with the successive estimates of NAVO, the content of the line entry corresponding to successive vertices (and also a reference to its geographic 'patch' as described below). It also includes the imputed circumstances of the chain's origin, of its termination, and of critical events within it (such as gaining value from, or losing value to another chain) together with matched information from Tollemache estate documentation where applicable (as in Box 1).

Each chain is identified by the number of its starting vertex, that is the unique reference of the specific line entry. A chain may originate by being 'split from' another chain, or be treated as 'expected built' in the case of properties matched with a Tollemache 99-year building lease. The origin of chains starting in

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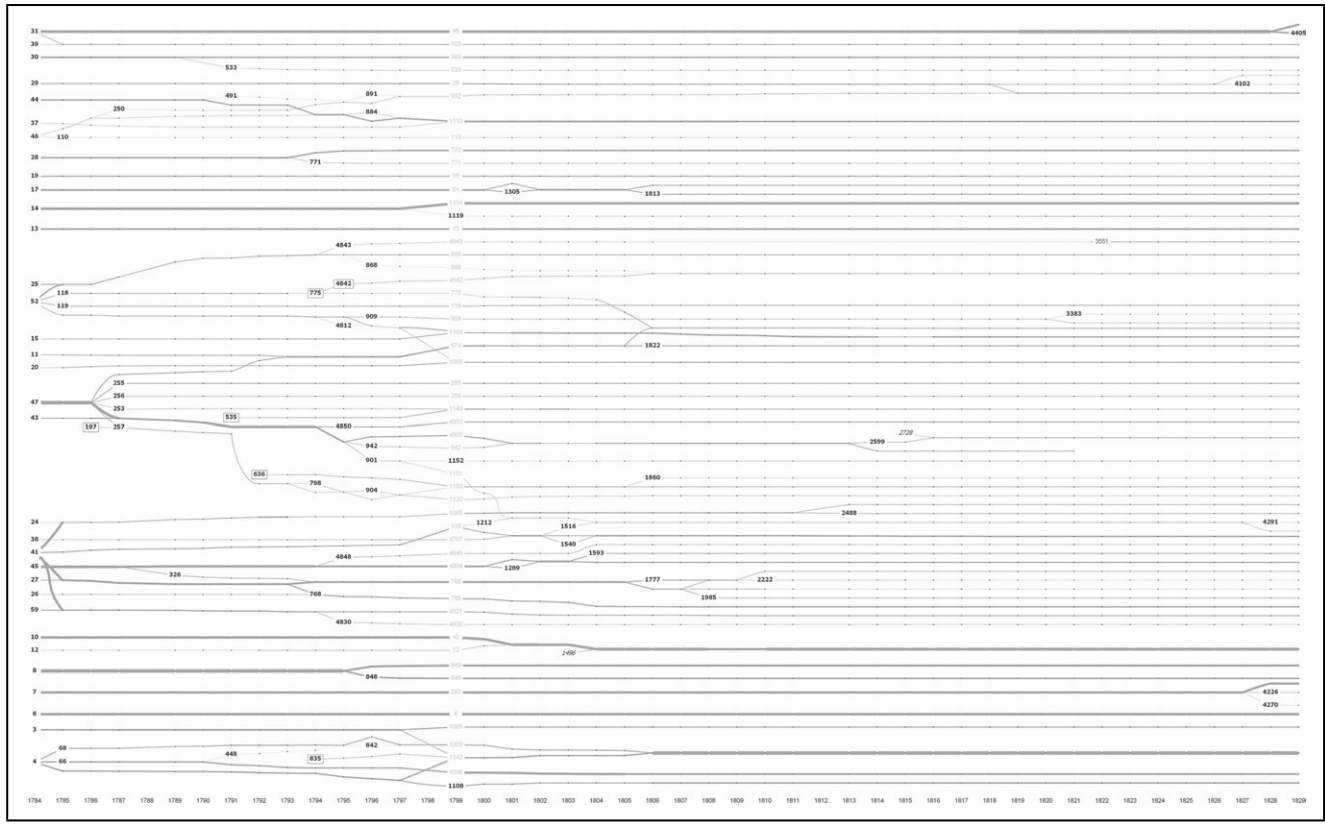


Figure 3a. Mottram-in-Longendale Land Tax Graph 1784–1829; Tollemache Estate; larger properties extant in 1784.

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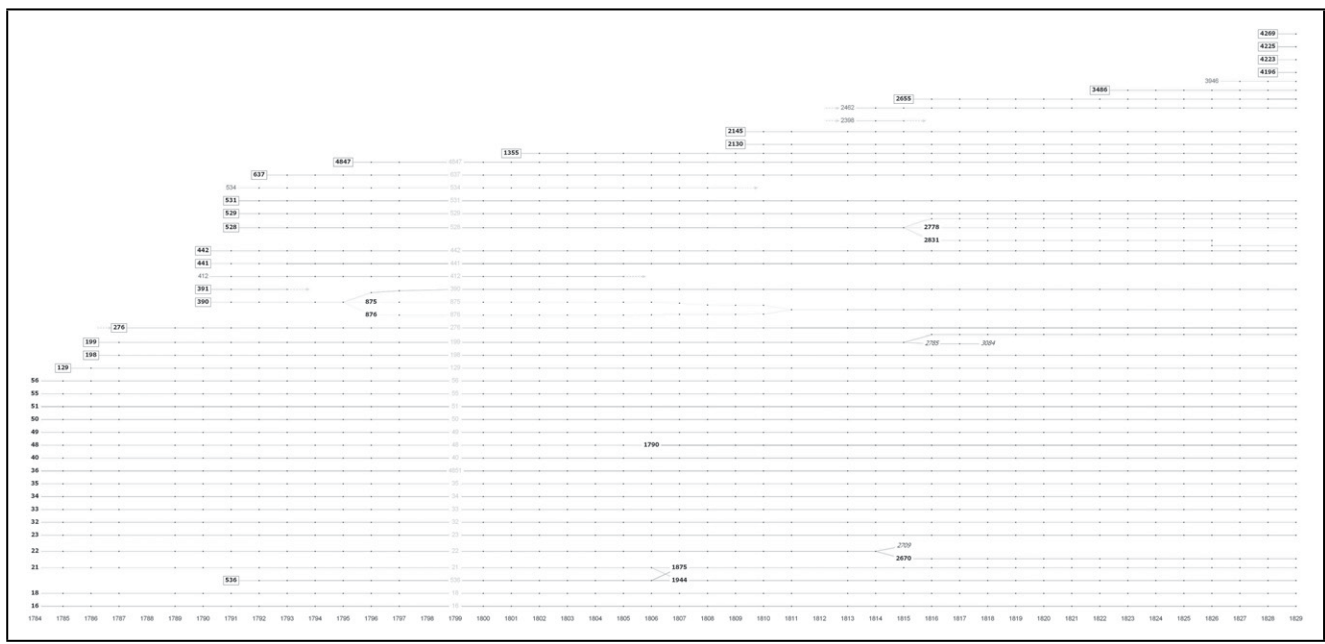


Figure 3b. Mottram in Longendale Land Tax Graph 1784-1829; Tollemache Estate; smaller properties and holdings created after 1784.

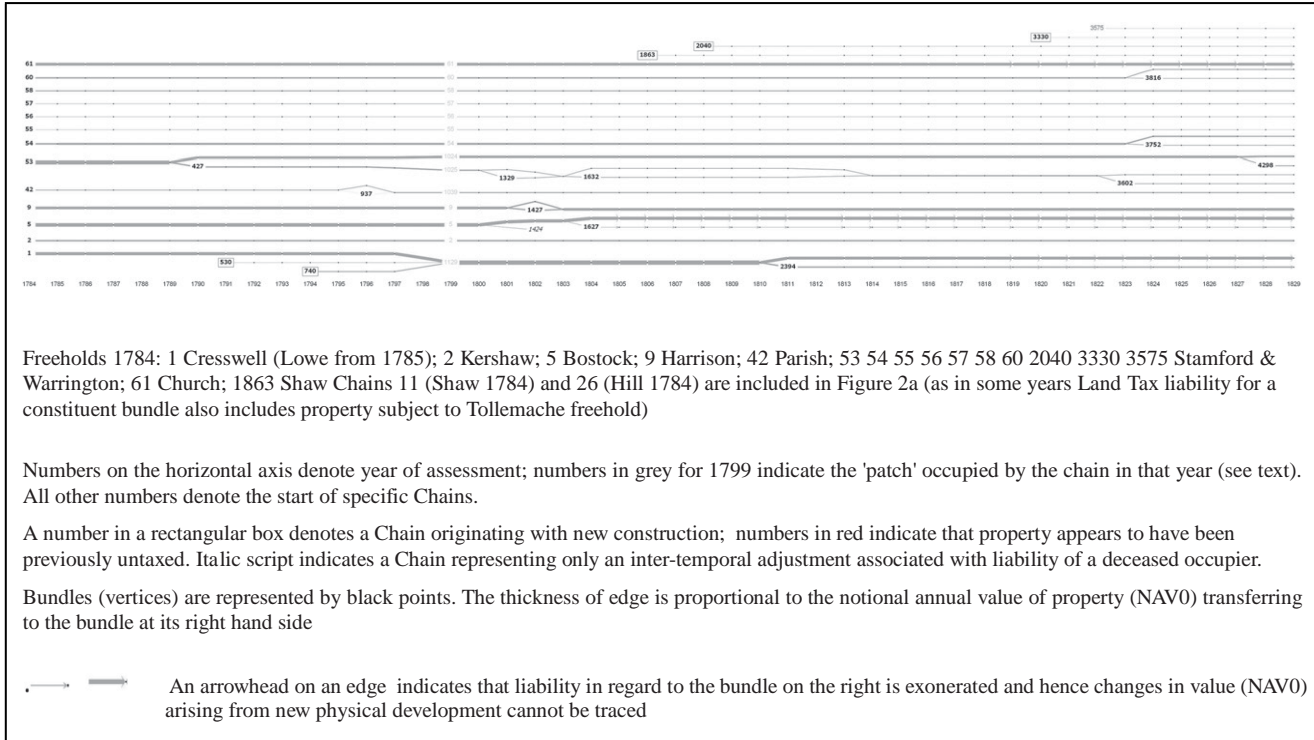


Figure 3c. Mottram-in-Longdendale Land Tax Graph 1784-1829; bundles controlled by other freeholders.

Box 1: A Specific Chain: Chain 10; Cooper Holding At Hague; Tollemache Estate H

Each chain is represented as a Prolog list. Each element in that list provides information for a specific year. Each element is itself a list which takes the form [Identifier,Year.Proprietor,Occupier,Bundle, TollemacheParcels, Sum_Assessed, NAV0, Patch].Where a Bundle corresponds to a series of parcels on the Tollemache estate, these appear as a list in the Tollemache Parcels slot (italicized here), otherwise [] appears. The information about any Tollemache parcel is also ordered as a list of the form [Identifier, Alpha, Num, Parcel, Sqmetres, Value]. Alpha and Num together (eg h8), refer to the missing estate map. The reconstructed version of this map forms a key source for the map of Land Tax patches for 1799 included as Figure 6.Chain 10 remained with the Cooper family, throughout but was augmented by addition of William Oldham's Old Gate in 1804 (involving an intertemporal adjustment).[[10, 1784, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [74, 1785, [wilbraham, tollemache], [william, cooper], [hague, farm], [[100, h, 8, [great, arney, road], 16617.4, 14], [101, h, 9, [little, arney, road], 6576.15, 20], [102, h, 10, [long, croft], 5918.53, 25], [103, h, 11, [dodds, butts, and, little, brow], 6095.58, 20], [104, h, 12, [top, of, arney, road], 1011.72, 25], [105, h, 13, [wheat, croft], 303.515, 40], [106, h, 14, [higher, croft], 961.129, 40], [107, h, 15, [wall, hey, meadow], 16086.3, 35], [108, h, 16, [sick, meadow], 4173.32, 25], [109, h, 17, [new, meadow], 9434.24, 20], [110, h, 18, [brow, above, house, and, homesites], 1947.55, 40], [93, h, 1, [higher, banks], 19247.9, 5], [94, h, 2, [middle, banks], 9484.83, 5], [95, h, 3, [lower, banks], 1315.23, 8], [96, h, 4, [lowermost, banks], 20335.5, 5], [97, h, 5, [catt, tor, meadow], 14315.8, 10], [98, h, 6, [farmost, field, and, wood], 14771.0, 5], [99, h, 7, [middle, field], 10623.0, 20]], 1.2375, 22.0, 10], [142, 1786, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [212, 1787, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [290, 1789, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [369, 1790, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [456, 1791, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [552, 1792, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [652, 1793, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [752, 1794, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [4767, 1795, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [851, 1796, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [1003, 1797, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [1101, 1799, [wilbraham, tollemache], [william, cooper], [hague, farm], [[100, h, 6, [farmost, field, and, wood], 14771.0, 5], [101, h, 7, [middle, field], 10623.0, 20], [102, h, 8, [great, arney, road], 16617.4, 14], [103, h, 9, [little, arney, road], 6576.15, 20], [104, h, 10, [long, croft], 5918.53, 25], [105, h, 11, [dodds, butts, and, little, brow], 6095.58, 20], [106, h, 12, [top, of, arney, road], 1011.72, 25], [107, h, 13, [wheat, croft], 303.515, 40], [108, h, 14, [higher, croft], 961.129, 40], [109, h, 15, [wall, hey, meadow], 16086.3, 35], [110, h, 16, [sick, meadow], 4173.32, 25], [111, h, 17, [new, meadow], 9434.24, 20], [112, h, 18, [brow, above, house, and, homesites], 1947.55, 40], [95, h, 1, [higher, banks], 19247.9, 5], [96, h, 2, [middle, banks], 9484.83, 5], [97, h, 3, [lower, banks], 1315.23, 8], [98, h, 4, [lowermost, banks], 20335.5, 5], [99, h, 5, [catt, tor, meadow],

14315.8, 10]], 1.2375, 22.0, 10], [1201, 1800, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 10], [1291, 1801, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.44583, 25.7036, 1291], [1392, 1802, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.40625, 25.0, 1291], [1505, 1803, [wilbraham, tollemache], [william, cooper], [hague, farm], [], 1.2375, 22.0, 1505], [1596, 1804, [wilbraham, tollemache], [william, cooper], [cottage], [], 1.40625, 25.0, 1596], [1697, 1805, [wilbraham, tollemache], [william, cooper], [cottage], [], 1.40625, 25.0, 1596], [1799, 1806, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.40625, 25.0, 1596], [1903, 1807, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.40625, 25.0, 1596], [2007, 1808, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.40625, 25.0, 1596], [2112, 1809, [wilbraham, tollemache], [william, cooper], [house, and, land], [], 1.10625, 19.6667, 1596], [2249, 1810, [wilbraham, tollemache], [jo, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [2294, 1811, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [2431, 1813, [wilbraham, tollemache], [betty, cooper], [house, and, land], [[100, h, 5, [catt, tor, meadow], 14315.8, 14], [101, h, 6, [farmost, field, and, wood], 14771.0, 8], [102, h, 7, [middle, field], 10623.0, 20], [103, h, 8, [great, arney, road], 16617.4, 16], [104, h, 9, [little, arney, road], 6576.15, 24], [105, h, 10, [long, croft], 5918.53, 30], [106, h, 11, [dodds, butts, and, little, brow], 6095.58, 25], [107, h, 12, [top, of, arney, road], 1011.72, 25], [108, h, 13, [wheat, croft], 303.515, 24], [109, h, 14, [higher, croft], 961.129, 40], [110, h, 15, [wall, hey, meadow], 16086.3, 40], [111, h, 16, [sick, meadow], 4173.32, 45], [112, h, 17, [new, meadow], 9434.24, 30], [113, h, 18, [brow, above, house, and, homesites], 1947.55, 40], [208, v, 1, [old, gate], 14695.2, 18], [96, h, 1, [higher, banks], 19247.9, 8], [97, h, 2, [middle, banks], 9484.83, 12], [98, h, 3, [lower, banks], 1315.23, 10], [99, h, 4, [lowermost, banks], 20335.5, 6]], 1.40521, 24.9815, 1596], [2550, 1814, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [2666, 1815, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [2780, 1816, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [2897, 1817, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [3007, 1818, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [3125, 1819, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [3246, 1820, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [3361, 1821, [wilbraham, tollemache], [betty, cooper], [house, and, land], [], 1.40521, 24.9815, 1596], [3480, 1822, [john, tollemache], [betty, cooper], [house, and, land], [], 0.967708, 24.9815, 1596], [3609, 1823, [john, tollemache], [betty, cooper], [house, and, land], [], 0.967708, 24.9815, 1596], [3729, 1824, [john, tollemache], [betty, cooper], [house, and, land], [], 0.967708, 24.9815, 1596], [3851, 1825, [john, tollemache], [betty, cooper], [house, and, land], [], 0.967708, 24.9815, 1596], [3972, 1826, [john, tollemache], [betty, cooper], [houses, and, farm], [], 0.967708, 24.9815, 1596], [4097, 1827, [john, tollemache], [betty, cooper], [houses, and, farm, at, Hague], [], 0.967708, 24.9815, 1596], [4228, 1828, [john, tollemache], [thomas, and, holland, cooper], [houses, and, farm, at, Hague], [], 0.967708, 24.9815, 1596], [4371, 1829, [john, tollemache], [thomas, and, holland, cooper], [houses, and, farm, at, Hague], [], 0.967708, 24.9815, 1596]]

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1784 is described as ‘censored.’ All other chains are initially considered to have an ‘unknown’ origin, though most have subsequently been reclassified as ‘new built’. Chains may end when they are merged into another chain, or in 1830 after which they are ‘censored’, or in ‘unknown’ circumstances. The extent and character of these unknown origins and terminations is considered below.

Inherent within each chain is an imputed development history, complemented by a locational history. A chain comprises one or more subchains each corresponding to a geographic patch. The geographic footprint of a chain obviously alters as holdings are combined or divided, but each of the subchains that stretch between such events corresponds to a fixed (though initially unknown) geographic patch. The specification of subchains, and hence of patches, rests on the separation of those changes in notional value arising from change in geographic extent from those others due to physical development and intertemporal adjustments.

Potentially, therefore, a chain might be thought of not as a one dimensional object attenuated through time, but a three dimensional object - the additional dimensions allowing representation of its footprint at the time of each successive Land Tax assessment.⁷³ The final processing step - locating the patches geographically - is largely distinct from generation of the chains, and predominantly involves clerical rather than computational effort. This matching rests on the one hand on the information in the chains themselves, and on the other the availability of appropriate cartographic sources. The locational evidence attached to the chains is of two forms. The first derives from matches with estate documentation which (where appropriate) associate the names of parcels held on 14-year lease with specific patches, and from matches with property subject to 99-year lease. The second comprises the successive descriptions of enduring features provided by the chains themselves. Although many individual bundle descriptions (when present) may be uninformative (eg ‘cottage’) or now untraceable, an entire chain frequently provides one or more recognizable descriptions (eg ‘cottages on Pingot Lane’). Problems remain in locating cottage property which are discussed below. As in Henstock’s study of Ashbourne, there is some reliance on the Tithe Map (of 1846 in this case). A computational reconstruction of a lost Tollemache estate plan produced for a sister project relying on higher quality plans of the 1840s and a range of other material provides the other principal cartographic resource.

audit: can the chains be completed?

Although later sections attempt to draw out emergent understandings of urbanization prompted or supported by the reconstructed chains, the present concern is simply with the extent to which it is possible to complete them. This proves very satisfactory; Table 5 provides some summary statistics. There are

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Table 5. Completion of chains; number of bundles in chains by status.

		Termination		Total	
		Known	Unknown		
Origin	Known	number	4461	15	4476
		pct	97.2	0.3	97.5
	Unknown	number	77	36	113
		pct	1.7	0.8	2.5
	Total	number	4538	51	4589
		pct	98.9	1.1	100.0

Table 6. Chains ending unexpectedly.

Origin Year	Term (years)	Occupier	Property	NAV0	Chain	Comment	Unknown Origin?	Bundles
1790	14	John Richardson	[]	£2	412	Wealth?	■	15
1790	99	Joseph Dewsnap	[]	£2	391	lost	..	4
1791	1	Samuel Richardson	cottage	£1	534	Wealth?	■	18
1795	99	James Shaw	Silent fill	£2	4843	lost	..	11
1813	99	Joseph Band	[]	£2	2398	Wealth?	■	3
All								51

4589 bundles in total, each representing a property object at a point in time, which using the methods outlined can be arranged into 186 chains, defining the Land Tax graph in Figure 3a(a,b,c). In contrast to the fixed property objects case, only five chains simply continue with a constant notional value from 1784 through to 1829 (implying both unchanging boundaries and the absence of material development affecting Land Tax assessment).

Overall, 4461 bundles (97.2%) occupy a place in a chain for which the circumstances of origin and termination are both known. Thirty six bundles (0.8%) form part of a chain where neither the circumstances of origin or of termination are clear. In 1784, the township was assessed as sixty bundles (excluding tithes and official salaries), fifty three of which define chains which can be traced directly through to 1829. Seven of the remaining ten were merged into others and two incurred some radical rupture. None of the chains beginning in 1784 become untraceable.

Chains begin or end unexpectedly when the logic set out above fails to capture the practices of the assessors. They may also begin unexpectedly when new property is built. Problems of continuity are thus more easily understood by focussing on chains that end unexpectedly (which are listed in Table 6).

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Though the inconsistencies seem modest, most of the broken chains appear to arise from changes in the untaxed residuum. Sometimes such changes seem to result from the personal circumstances of an occupier, consistent with the interpretation of statute in Table 1. Thus while let to Samuel Richardson, a Tollemache cottage with an unusually low NAV (£1) was assessed for Land Tax, but ceased to be traceable after his death. More convincingly, a Tollemache 14-year let with an unusually low rent was not assessed for Land Tax while occupied by Jacob Jackson but became so once it was occupied by the wealthy attorney, Robert Bennett⁷⁴. Other broken chains seem to reflect possibly systematic changes in the margin of the untaxed residuum. Thus in 1813 when the assessment seems especially assiduous, two additional holdings were assessed for the first time although they had been built some years earlier, though given the values of the property their previous exclusion might have been a matter of policy.⁷⁵ Moreover, with the local revaluation of 1822, the Earl of Stamford and Warrington's plantation appears for the first time, which might be more likely to be oversight. Nevertheless, it seems clear both that these inconsistencies are modest, and that the method adopted goes quite a way towards unravelling them.

audit: can the chains be placed - and with what degree of precision?

Each of the 4705 individual bundles was assigned to a patch, thereby defining 324 distinct patches. Some 268 (82.7%) of them can be located. For the remaining 56 (17.3%), different solutions are possible.⁷⁶ Figure 4 illustrates the extent to which it proves possible to locate the patches by mapping (where possible) the footprint of the chains in a single year- 1799. Each number shown on Figure 4 corresponds to a chain shown on Figure 3a(a, b or c) at that particular stage.

The ease or difficulty of locating a particular patch depends fundamentally upon the richness of the cluster of descriptions associated with the chain on the one hand and the cartographic resource on the other. There are, however, two mediating considerations: the geographic configuration of the patch itself, and the extent of changes in occupancy between 1830, and the time at which cartographic survey was undertaken. These are considered in turn.

As the amount of **descriptive matter** brought together within a chain increases, the chance of locating the patch improves, even though many individual bundle descriptions may be either entirely uninformative (eg 'cottage', or 'house and land') or now untraceable ('Badgers Hall', 'Bolton Hill', 'Baron (or Barren) Alley'). Cottages traceable only by their occupier are thus hard to place and hence only 73.9% of patches with a NAV0 of £2 or less can be located as opposed to 86.0% of other patches as Table 7 shows. Locating such

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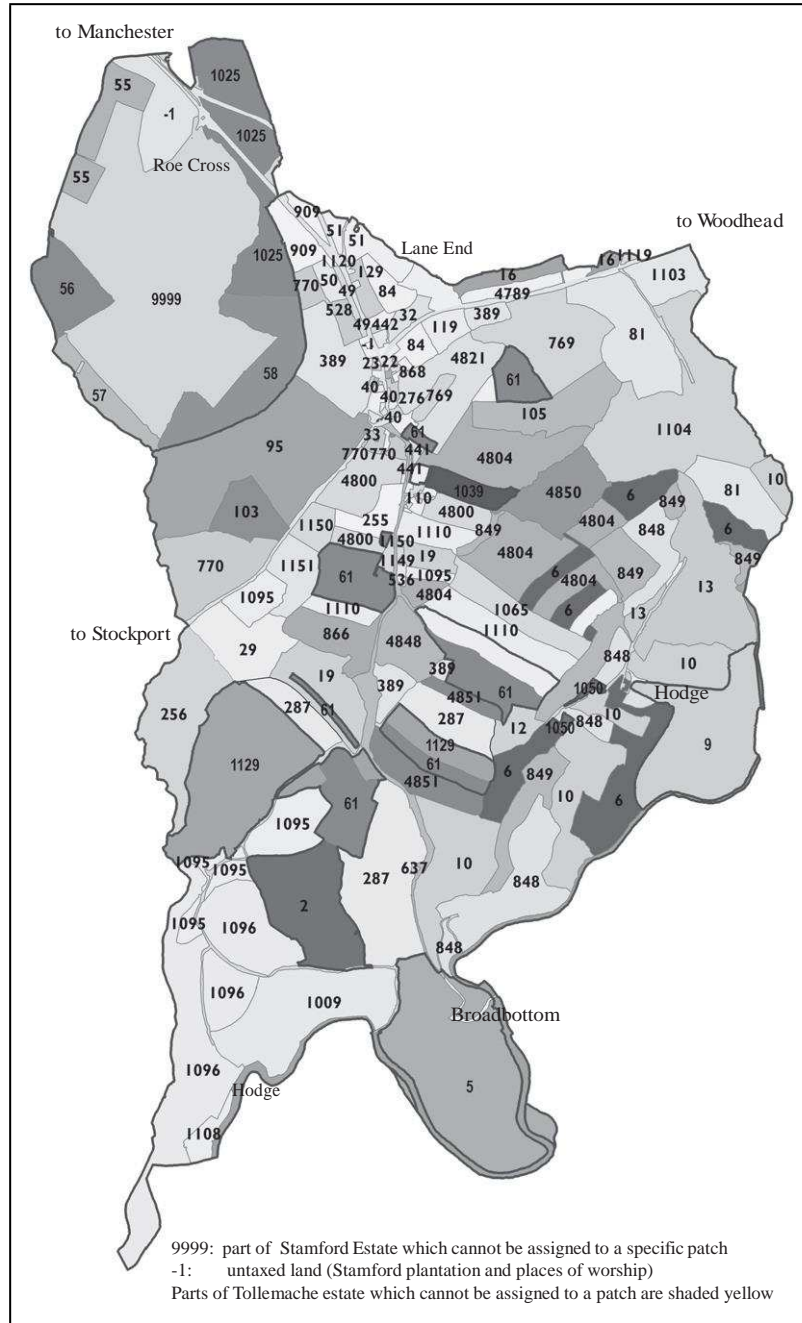


Figure 4. Land Tax Patches: Mottram-in-Longdendale 1799.

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Table 7. Percentage of all patches traceable 1784–1829; by circumstance.

	Stamford Estate		Other Freeholds All	
Traced	19.4		90.6	82.7
Untraced	80.6		9.4	17.3
All	100.0		100.0	100.0
	Entire Township		Larger Holdings All	
	Cottage Holdings			
Traced	73.9		86.0	82.7
Untraced	26.1		14.0	17.3
All	100.0		100.0	100.0
	Township Excluding Stamford Estate		Larger Holdings All	
	Cottage Holdings			
Traced	74.7		96.6	90.3
Untraced	25.3		3.4	9.7
All	100.0		100.0	100.0

patches depends largely on continuity of occupancy between 1830 and the time of the Tithe Commutation survey.

The range of **cartographic resources** is obviously critical. For patches within the Tollemache estate, the availability of a digital plan reconstructed on the basis of the Tithe map, surviving books of reference and other textual and graphical sources proves very valuable. Chains are linked directly to parcels on 14-year lease as reconstructed. For patches within the Stamford and Warrington estate, no special cartographic sources are currently available and this proves a problem. In the case of the other minor freeholds, the chains derived are not complex and hence the Tithe map suffices.

Configuration of holdings has less obvious effects. Where a freeholding (for which no estate map is available) comprised several contiguous patches with different occupiers, the possibility of defining their limits depends entirely on the extent of changes in occupancy between 1830 and the tithe commutation survey of 1846. The configuration of patches corresponding to 14-year Tollemache leases also cause difficulties. Although the location of the agricultural parcels included in such leases is known from the reconstruction (however scattered they may be), the location of disjoint cottages is not known. Once again, the feasibility of locating such cottages depends on the extent of changes in occupancy between 1830 and 1846.

Ultimately, therefore, where the Tithe Map is the only cartographic resource, the most critical consideration is the **extent of changes in occupancy** between 1830 and 1846. Turnover of tenants on the Stamford and Warrington estate was

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such that it proves possible to locate only seven of its 36 patches (19.4%). The specific pattern of turnover on the Tollemache estate in that period allows that 75% of cottage holdings can be located (but this should be compared with 97% of larger holdings).

reconstructing urbanization: the pattern of land allocation and development

The chains derived from surviving Land Tax records expose a period of substantial change, revealing the chronology and pattern of development in remarkable detail. They establish the succession of occupiers of a changing mosaic of holdings, and of an expanding stock of building, providing a framework for organizing and making sense of further materials.

Overall, they reveal three phases:

Phase 1: 1784–1804; A ‘considerable increase:’ development of village by petty capitalists guided by the landed interest, with active subdivision of small farms, creation of new cottage farms and the establishment of first generation machine spinning factories;

Phase 2: 1805–1825; The ‘finished town:’ establishment of second generation spinning and calico printing factories, with intensification of housing, and the transfer of control of cottage property to larger capitals;

Phase 3: 1826–1830; Minor Dispersed Development; resumption of small-scale development on the Tollemache estate.

Phase 1: 1784–1804; A ‘considerable increase’:

Unlike neighbouring townships, Mottram had experienced little of the rapid demographic growth typical of proto-industrialization. Aiken in 1795 observed that ‘it is only of late years that the town has had any considerable increase, which has been chiefly at the bottom of the hill, but some latterly on the top⁷⁷. The chains allow that period of increase to be reconstructed and more surprisingly point towards some of the processes underlying his observation.

Chaining indicates that this growth was almost entirely within the Tollemache estate. Chains begin as the 14-year leases of 1771 come to an end, making way for the 1785 ‘tack.’ It was also in 1785 that Wilbraham Tollemache secured the Parliamentary Act allowing him to grant long leases on his Mottram estate (overcoming limitations of tenure shared with other major landowners).⁷⁸ The new ‘tack’ provided an opportunity for change, and the power provided by the Act was critical to the program of subdivision and physical development shown by the Land Tax chains (see Figures 3a and 3b respectively).

Neither a record of the 1785 ‘tack’ nor a contemporary survey survive, but the chains reveal its effects. Opportunity was taken to break up the two tenant

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farms to the east of the Manchester turnpike (Chains 41 and 52), releasing plots immediately adjoining the road for development, the remaining parcels either being packaged into smaller bundles (Chains 116, 117 or 118) or assigned to other very small scale holdings (augmenting Chains 24, 25, 27 and 59). Single parcels of land adjoining the Woodhead and Stockport turnpikes were separated from former holdings and assigned to publicans (Chains 15 (Bennett) and 39 (Goddard)). Elsewhere, cottages were severed from the small farms with which they had been previously let (reducing Chain 7). The overall effect of the 1785 changes across the Tollemache Mottram estate was to re-configure holdings in a form more attuned to the pattern of demand, reducing their typical size and presumably contributing to the increase in rents per acre discussed below. Moreover, the apparent rigidity of 14-year leases did not prevent further subdivision after 1785. Between 1786 and 1787, Thomas Cardwell's farm (Chain 47) was divided so as to create four 'cottage farms,' (Chains 197, 255, 253, 256), at minimal expense to the landowner as existing buildings provided the dwellings⁷⁹.

Developers of the 'middling sort,' representing a specific 'combination of work and property' (in the spirit of Lubow⁸⁰) re-centred the village. New housing built on the roadside plots by the surgeon James Stead (Chain 197) and by Thomas Chadwick, a woollen clothier (Chain 129) became subject to Land Tax by 1786. By the same year, William Garside, a shopkeeper, had built his 'Baron Alley' (Chain 198) in what was becoming the core of the village near the junction of the three turnpikes. Alongside, the tailor Robert Hamilton completed the property subsequently styled 'Grocers' Hall' (Chain 199), and Wagstaffe's mill (Chain 771) was built adjoining a farm house built a century before, a remnant of a holding evidently divided before the period examined. All these had the benefit of 99-year leases; the market was unmuzzled, but regulated by the aspirations of the Tollemache estate.

Chaining shows how the release of further parcels by the principal landowner allowed for thickening and extension of this core (see Figure 3b). Housebuilding by the publican-farmer Samuel Cook on the Pit Croft by 1791 (Chain 528), drew it southwards on the Stockport turnpike, while development by the weaver Joseph Bardsley (Chain 442) extended it northwards on the Stalybridge road. By 1790, Thomas Cardwell, the farmer whose holding had been divided into cottage farms, had completed the first housing on 'Brick Croft' (Chain 390), the remainder being incrementally built-out and subdivided, changing hands repeatedly before development was ultimately completed in 1813.

While most of this activity contributed to the formation of a minor commercial centre - 'a sort of market' as Aiken put it, at its peak in 1791, building started at the hamlet of Mudd - the top of the hill which he described. Thomas Shaw's houses (Chain 536) and Jonathan Hadfield's Badgers Hall (Chain 535) of 1791 were followed by Joshua Binns' Bolton Hill (Chain 636) from 1792. Again the

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developers were of the middling sort, but rather than the craftsmen-shopkeepers of the new village core, two of the three (Binns and Shaw) were cotton spinners and aspirant industrial capitalists who in 1796 together secured a lease for an ambitious scheme to create a water-powered cotton mill at Hodge never in fact built.⁸¹

Chaining also indicates the attenuated period of incremental development on individual plots. Setting the evidence of the chains alongside documentary and photographic material, it becomes clear that the basic development units of the period were usually single houses or pairs, frequently abutting existing buildings (see Figures 5 and 6). Within any particular Land Tax chain, incremental development appears as increases in NAVO of between 10 shillings (£0.50) and £2 not attributable to transfer of property from others. Figure 7 shows the aggregate value of these incremental changes year by year, highlighting their significance in the late 1780s and into 1791/2. Much of the property built in this way at the village core was evidently poor, and was demolished in the early years of the twentieth century. At Mudd too, incremental accretion once again produced 'a number of irregular tumble-down houses'.⁸²

Closely spaced parallel terraces played no part in this form of urbanization (although they typified the later Broadbottom colony). Indeed, the building plots released on 99-year lease were too narrow to permit this. Instead, the discontinuous ribbon of development meant occupiers of the new property might still occupy garden land and grazing land rented separately. In the absence of property it was not possible - in Malcomson's terms - to provide 'for one's own needs by one's own efforts, without the mediation of wage-employment'⁸³, but access to means of subsistence was possible. The development forms of the township in the 1780s and 1790s thus had no necessary direct connection with proletarianization. They were consistent with the extension of a mixed marketized cottage economy, and the small-scale developers frequently occupied (adjoining) land for fourteen-year terms, allowing them or their tenants the possibility of cow keeping. Moreover, the particular pressure of demand for small areas of pasture and grazing abutting the village is strongly suggested by the pattern of Tollemache rents and increases in those rents.

Alongside those changes in the closing years of the late eighteenth century that appear to reflect the late flowering of a proto-industrial economy - or rather one based on pluriactivity - the Land Tax chains also track the onset of industrialization proper. On the Tollemache estate, chaining shows both minor textile development intercalated in the village and larger-scale machine spinning on riverside sites at the southern limit of the township. Chaining shows the severance of an old fulling mill - Hodge Mill (Chain 68) - from a small farm (Chain 4) subdivided in the 1785 'tack' (also forming Chain 66). It shows the succession of its occupiers and following realignment of business interests, the construction of an adjacent factory - Wharf Mill (Chain 1108) - by 1799.⁸⁴

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Figure 5. Incremental Development. Building A with three steps predates the rebuilding, appearing on a lease plan of 1789 as a saddler's shop and is part of Chain 276. The property which extends it, B, is accounted for within Chain 38, its construction presumably corresponding to an increase in its annual value of £1 in 1792, or a further increase of £1 in 1793. Property C occupies a site accounted for within Chain 40. A notional value of £1.50 in 1784 increased to £3 by 1792, and £3.50 by 1806. The site was granted a 99-year lease in 1796, including an area where development had taken already taken place (Source: Tameside Image Archive; Copyright Tameside MBC).

Beyond the limits of the principal landlord's estate, the Land Tax chains track the construction of Thomas Lowe's mill (Chain 740) on his family's freehold by 1794, and its absorption once again into Chain 1 on the death of his father.

Chaining shows, however, that even the reconfiguration of land uses and the pattern of development accompanying machine spinning did not begin to constitute urban forms typified by 'confined streets'. Alongside a demand for workers' housing, machine spinning induced a demand for land for grazing

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Figure 6. Incremental Development. Samuel Cook's development first appears as Chain 528 in 1791 with a notional annual value of £2, being subject to a 99-year lease from Wilbraham Tollemache dated January 1789. With incremental development, the value rose to £3 in 1793, and to £3.50 in 1806. In 1815, the property was split forming two further chains- 2778 and 2831 (Copyright: Author).

horses, pasturing cattle and growing fodder crops, leading to displacement of households engaged in more traditional activity. In the case of Hodge Mill, a single terrace was built unrelated to a street system, in nearby pastureland, accommodating workers and collective loomshops (Chain 835). Chaining tracks the block's initial construction on land taken from the holding of farmer-clothier John Lees (Chain 3), its later extension and the subsequent increase in notional value as adjoining land was transferred from Lees (presumably a cow ground for the benefit of the occupiers)⁸⁵. Chaining shows that through the 1790s the demand of incipient cotton capitals for 'agricultural land' prompted the displacement of long-settled families - Bowers (Chains 4 and 66) and Lees (Chain 3) - who perhaps epitomised the traditional dual economy, culminating in the subdivision of Lees' Hurst Clough farm in the tack of 1799, and

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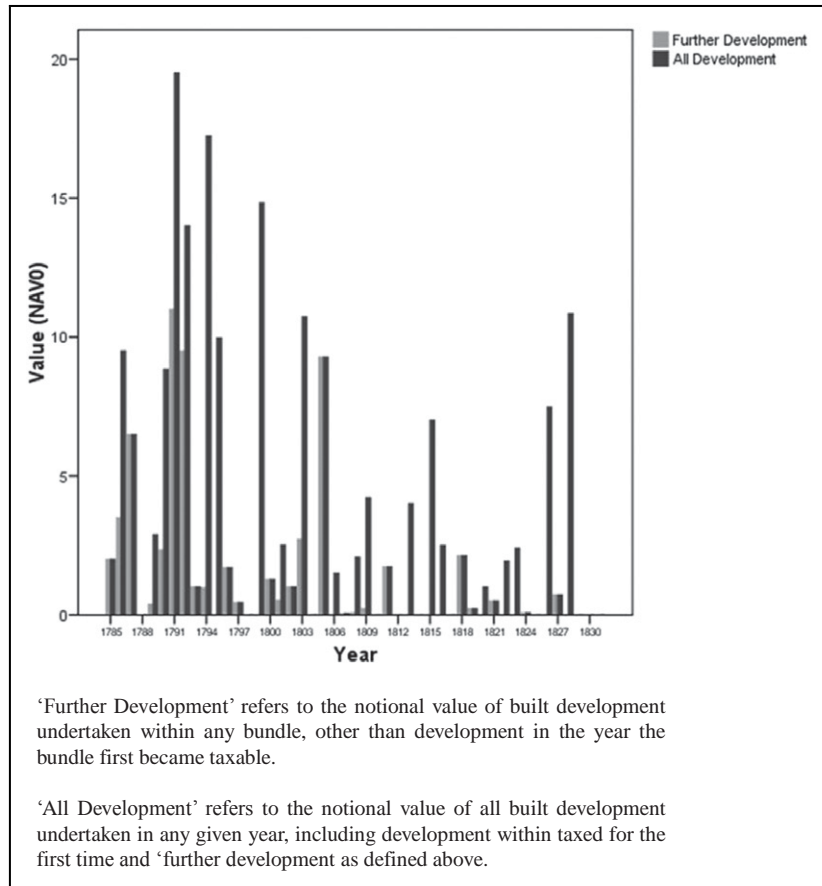


Figure 7. Notional annual value of new built development: Mottram-in-Longdendale 1784-1829.

assignment of a further portion to Moss (Chain 835,1108), the cotton spinner who controlled Wharf Mill. Thus although in this locality land ownership was highly concentrated, the demand of both craftsmen and of machine spinners had continued to stimulate fragmentation of holdings in contrast to pervading trends and the conventional wisdom of estate management.

Phase 2: 1805–1825; The *'finished town'*:

Analysis of the chains suggests a marked change in the pattern of development and the organization of housing with the opening of the nineteenth century.

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Apart from change at Hodge discussed, the ‘tack’ of 1799 involved little further subdivision of holdings. For whatever reason, possibly an active policy of restraint, new housebuilding ceased on the Tollemache estate, and Mottram became a ‘finished town’.⁸⁶ The remaining plots on Brick Croft (Chains 875 and 876) transferred between petty capitalists without development until construction on of Chain 876 in 1813 by the publican William Warhurst. With restraint came intensification and escalation of rents, with rents of cottages securing twice their rateable value by 1818, and yields on cottages double expectation by 1826.⁸⁷

The balance of forces driving change in the new century, and the physical character of development, seem quite different. Factory-based industry came to the fore, while some of the first generation machine spinning businesses disappeared. Most significantly, the Sidebottom brothers - locally rooted major capitals - established Broad Mills and the adjoining Broadbottom colony outwith the Tollemache estate at the southern limit of the township (Chain 1627). Although chaining cannot trace subsequent development because of exoneration, other evidence highlights the stark difference between the physical configuration of housing in the colony and that elsewhere in the township. These parallel terraces in their tightly confined complex, emblematic of proletarianization, were the principal addition to the housing stock in the period.⁸⁸

While physical development was restricted, the township’s economy grew, becoming dominated by large-scale textile manufacture.⁸⁹ Development by the Sidebottoms apart, the Land Tax chains show that opportunities offered by the early mechanization of calico printing were realized by Samuel Matley and Co who took over Tollemache property at Hodge following the collapse of the earlier spinning partnership (Chain 68). Despite the scale of the physical investment by this second major capital which the chains suggest (an increase of £22.25 NAV0 in 1805–6), the Matleys built no further workers’ housing. Rather they intervened in the supply of housing space by buying up property built on long lease in the preceeding period. Besides the block controlled by their predecessors at Hodge (Chain 835), its second floor loomshops divided to provide further accommodation, they acquired housing constructed at the height of the boom by Jonathan Hadfield at Mudd (Chain 633).⁹⁰

Although chaining shows that building had virtually stopped on Tollemache land, successive Censuses (1801, 1811, 1821) demonstrate that the number of households in the township continued to grow at levels outstripping building by the Sidebottoms.⁹¹ Property use thus intensified. Much of the building developed by the boom which Tollemache had promoted was bought up to provide workers’ housing. The chains show that the interests involved were not limited to industrialists such as Matley, who might be motivated at least in part by their own need to secure labour power. Centrally, chaining exposes the hitherto unrecognized market-making role of the local attorney and rentier,

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Robert Bennett. Evidently a man of substantial means holding Bank of England debt, by the close of the eighteenth century he had become actively involved in its growth. He had played a transitory role in Silent Mill (Chain 4843), an enterprise of John Sidebottom, two of whose sons controlled the Broad Mills complex. By 1795, Bennett had both himself built new property on 99-year lease (Chain 4842), and engaged in a series of transfers allowing further subdivision of Harrop's holding and creation of housing out of its stable (Chain 4789). Chaining shows Bennett's transitory direct involvement before the property passed to the Manchester liquour merchant, Henry Cardwell, while Bennett's account book shows that he retained an interest as Cardwell's mortgagee.

After 1800, Bennett's role grew as he acquired properties demised by Tollemache for 99 years, including housing developed in the preceeding spurt of growth by the woollen clothier Thomas Chadwick (Chain 129) and the cotton spinner Thomas Shaw (Chain 536). He took older cottage property demised to John Sykes (Chain 21), and that property demised to the publican Edmund Hill, creating further housing out of his barn (Chain 2145). Bennett, moreover, played an important role in providing mortgage finance for the final developments on building leases granted in the period of expansion (eg Chain 876).⁹² Renting out land that he held from Tollemache on 14-year lease (including Chains 36 and 1875) - not merely parcels of meadow but gardens and pigcotes gave Bennett further income streams, and influence over what remained of the 'cow and cottage' system in its continuing form, and the provision of housing space with no land at all.⁹³

The Land Tax chains show, moreover, that the major cotton spinning and calico printing capitals also came to control substantial areas of pasture land and grazing. The Sidebottom brothers succeeded to freehold land formerly held by two lesser freeholders - Lowe (through Chain 1) and Kershaw (Chain 2), but leased nothing from the principal landlord. Subsequent development on those freehold bundles (limited in fact to substantial mansions for their own occupation) cannot be traced through the Land Tax returns, because they purchased exoneration once they came into possession of the property. Matley secured Tollemache land including not only that leased to the spinners that preceeded them (Chain 68), but took the adjoining Hurst Clough holding (Chain 3) from 1810 and the farm previously occupied by the publican Samuel Cook (Chain 31) from 1824.

Phase 3: After 1825: '*Minor Dispersed Development*':

The final years of the surviving Land Tax record form a codicil to this account, indicating a new period of construction on the principal landlord's estate (Chains 4196?, 4223, 4225, 4269), following a flurry of building leases. An estate survey of 1826, preparatory to a new tack, perhaps signalled this change, noting that

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Matley's houses at Hodge (Chain 835) made a return of 12% per annum, roughly double that expected.

The pattern of land release was similar to that of the period before 1805, with the blocks longer, but still widely dispersed. The Land Tax chains show development in 1828 on Tollemache land near, but distinctly separate from, the Broadbottom colony. John Clayton, a publican-shopkeeper, developed Haven House 350m to the west. William Loughridge's terrace was built 250 metres to the north, surrounded by pasture land which the chains show was taken from Brown Road Farm (Chain 4270). Any suspicion that this continues a pattern of thirty years before seems confirmed by roughly contemporary comment that 'Loughridge wants a cow-keeping out of I6' in an estate notebook.⁹⁴

urbanization: summary

In summary, therefore, chaining allows the construction of a history of changing land-use and development at the simple, phenomenal, level. It reveals a period of subdivision, and rapid village development, whose character and sudden ending remain unrecognized.⁹⁵ At this level there are significant gaps - most obviously problems arising from exoneration, rendering the account offered of the Sidebottom cotton enterprise seriously deficient.⁹⁶ Understanding the nature and extent of the untaxed residuum also remains a problem, despite the possibility of noting changes under the longitudinal approach.

Moreover, these changes at the phenomenal level can be seen to have contributed to attenuation of a proto-industrial configuration, creating cottage farms, stimulating pluriactivity, accommodating crafts and trades, and satisfying pent-up housing demand. Their significance within the constitution of an urban-industrial ensemble can also be appreciated; there is direct evidence of construction and expansion of mills, printworks, and (though occluded) of a factory colony. While other sources show more clearly the nature of the Sidebottoms' starkly class-divided locale, chaining reveals some of the less obvious aspects of this urbanization, including the manner in which the substantial capitals secured control of undeveloped land, and the control and intensification of previously developed housing. Chaining exposes the role of Robert Bennett which seems totally unknown.⁹⁷ The capacity of the Land Tax chains to track the building stock (subject to exoneration) assists obliquely in appreciating facets of proletarianization, provided one recalls that it does not track numbers of households.

The present study qualifies the nature of this urban-industrial ensemble. It stands as a warning against simplistic imagining of this form of urbanization as a force 'that covered the hills and valleys of Lancashire and the West Riding with the factory towns that were to introduce a new social type for the world to follow'.⁹⁸ In the township examined, physical urbanization after

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1804 did not engage forces strong enough to increase the flow of housing output substantially. The present study shows the modest scale of the particular physical developments that contributed to urban growth and their configuration relative to each other. It points to the persistence of the cottage farms and the demand of industrial capitalists for grazing and pasture, which partly underpins this intermingling of agriculture and industry. Mottram became part of the vast scattered city that Bamford described in 1844, a place where people, although deeply engaged in urban social movements did not spend their 'lives in the confined streets of large towns, shaded alike from the winter's wind and the summer's sun' as in the imaginings of John Revans, scourge of the Chartist Land Plan.⁹⁹ Although portrayed by a Royal Commission in that same year as part of the third largest town in the country outside London, its households were as deeply rooted in small scale agriculture as in textiles, and the large town merely a geostatistical artifact¹⁰⁰.

The evidence of the Land Tax chains allows for reflection on the strategies open to specific actors, and shows before 1805, Tollemache and his steward apparently pursuing a form of planning barely discussed.¹⁰¹ Favouring subdivision of holdings, and turning their backs on conventional wisdom they pursued an approach to promoting cottage farming far removed from any sort of paternalism, and avoiding all capital expenditure, but employing regulation in a period of local economic expansion. Moreover, they seem to have recognized that while issuing ninety-nine year building leases would generate only modest income, it unlocked development potential, in turn stimulating increased economic output, a portion of which would accrue to the estate in the form of rack rent on the adjoining land. Whatever the ideological position, the material benefits to the landlord of extending the 'cow and cottage' system outweighed those offered by industrial urbanism.

conclusions

Finally, some broader conclusions are offered about aspects of the Land Tax returns and the nature of social relationships implied which are thrown into high relief when the methods developed here are adopted. Although the chain perspective deploys an interpretative strategy which emphasizes the relation between line entries in successive returns rather than the individual line entries alone, its insights carry implications for more familiar approaches to the Land Tax. It demonstrates, for example, that without an understanding of the pattern of assessments across a township it is not possible to interpret change at individual properties.¹⁰² Chaining reveals, moreover, the variety of linguistic descriptions which may be applied to the same enduring referent, and thus stands as a warning against overly nice interpretation of particular terms. It shows in the context considered that terms such as 'house' and 'cottage' do not clearly pick

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out different property types. Neither can ‘a cottage’ be distinguished from ‘a cottage and croft’ or a ‘house’ from a ‘house and land’. (In the circumstances, both should be understood to include small areas of land). Such variant terms are variously applied in different years without any change in the proprietor, occupier or most critically the notional annual value of the property described. No more can a ‘cottage’ be distinguished from ‘cottages’, though the plural is rarely used. In fact, comparison with estate documentation shows that reference to ‘a cottage’ in a line entry may include a number of dwellings, and typically denotes more than one.¹⁰³

Chaining also indicates that assessors were varyingly assiduous in carrying out their duties, and more significantly points to limited systematic local change in the use of language over time. In some years, sharper (although not necessarily definite) descriptions are provided (eg ‘a croft, late Woolleys;’ or ‘Barber’s cottage; Bretnor’s field’). For other years, particularly in the 1820s when development was locally very limited and holdings static, bundle descriptions (though present) are very bland. In the Mottram returns, the manner in which the use of the term ‘farm’ shifted as the mixed economy developed, however, is of more significance. As subdivision continued, the term ‘farm’ came to be subordinated to ‘house’ within the returns (as in the entry ‘house and farm’), and to refer to smaller and smaller holdings, denoting perhaps a single close. It seems no accident that the description ‘Barber’s Cottage; Bretnor’s field’ later became ‘Barber’s Cottage; Bretnor’s farm’, and that the field in question had been divided into two. Despite the fact that only four of the 356 households in the township in 1821 were primarily dependent upon agriculture¹⁰⁴, by 1828, the Land Tax returns describe 61 units within the township as ‘X Farm . . .’ or ‘house and farm . . .’ and a further ten as ‘part of farm . . .’

Crucially, however, the sustained investigation demanded suggests that at least in this case the returns have more integrity than either Mingay’s¹⁰⁵ entirely dismissive view or even Noble’s¹⁰⁶ more detailed examination might incline us to believe. The prime purpose of the returns was to communicate liability as economically as possible, and if our intentions are different, it seems reasonable that we should pay the price. The present approach makes great demands of the returns and of related sources. In its pursuit, mismatches between the Land Tax returns and estate documentation have repeatedly been found to be explicable, and the sources to have different but complementary strengths. Difficulties stem from the extended pyramidal nature of property-holding and occupancy which eludes the simple distinction between ‘proprietor’ and ‘occupier’ of the Land Tax returns, and occasional legal uncertainties. As local practice in Mottram treated the Earl of Stamford and Warrington’s lifeholders as proprietors for Land Tax purposes, the freeholder went almost unrecorded in the returns. The local assessor’s unexpected identification of the Earl as proprietor in a line entry for 1822 in Chain 60 proves consistent with the agent’s supposition that the property

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was likely to be forfeit following the death of the tenant in 1819. Line entries for the years until 1829 reflect actual occupation and shifting assumptions of ownership, until it became clear that another of the three lives had survived.¹⁰⁷ Those holding from the Tollemache estate ninety-nine year leases determined by lives were not, however, consistently treated as proprietors. These anomalies are, however, a characteristic of the complexity of land ownership not the inadequacy of the returns.

Difficulties in matching 'occupiers' from the Land Tax returns with 'tenants', from estate documentation are thus to be expected. Occasional notes in estate records serve as a reminder of the depth of the landholding pyramid. Given a reference to property let by Tollemache 'occupied by Joshua Wagstaff and Benjamin Holdgate under James Shaw under John Reddish', it is not clear which 'occupier' should be expected in the Land Tax returns. The repeated instances where leases are granted in the name of one partner while another is recorded as occupier should not occasion surprise. Alternating occupiers may also be expected to appear in the Land Tax returns in such circumstances, and the inter-temporal adjustments noted provide a further reason for alternating occupancy. Divergences between tenancy and occupation may be expected to carry meaning even if it cannot always be recreated. The Mottram Land Tax returns record John Harrison as the occupier of Tollemache's Titterton Farm (Chain 36) in 1813, but Robert Bennett is recorded as lessee in the 1813 'tack.' In this case, Bennett's own account book survives showing the terms on which it was indeed sub-let to Harrison. Neither is John Hadfield found in estate documentation through the 1820s, despite appearing as the occupier of Tollemache land in the Land Tax returns. In this case, however, a later note in an estate document claims that 'John Hadfield, joiner, has held W1, W2 and W3 for all the present lease' - again showing the distinction between the lessee and the occupier¹⁰⁸.

There seems a very real possibility, at least in the township considered, that the Land Tax returns provide a more accurate record of actual occupation than the evidence of leases. It is presumably easier for the modern-day analyst observing mismatch to conclude that the returns are deficient than for the assessor or collector of the Land Tax to justify a baseless demand. Ultimately, this investigation begs the question of what must be true of the organization of society at the time in question for this manner of reconstruction to be possible, and what aspects of that social organization underlie the difficulties and limitations. Obviously, despite the contemporary belief that many went untaxed, in the locality considered regular partial updating of valuations allowed for inclusion of newly built property, local changes in poundage were applied and local comprehensive 'revaluation' in 1822 systematically shifted the relative value of agricultural, domestic and industrial property. The possibility of forming the chains, however, demands much more - requiring (and hence providing evidence of) a high degree of consistency in practice at local level in a time of

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change. Where chains are broken, sustained investigation has usually resolved the problem, demonstrating that this is more usually the result of complexity rather than oversight. This implied order and stability, rests on the mentality of part-time assessors of a ‘middling sort’, whose common sense also provided for the local administration of the Elizabethan Poor Law.

It was this mentality which compensated for the deficiency of the Land Tax returns as a ‘technology of power’.¹⁰⁹ The mechanisms of government were crucially undeveloped. Government’s lack of awareness of or concern for the operation of the Land Tax at local level as late as the 1830s is amply demonstrated in the evidence provided to a Royal Commission by the officials responsible at national level.¹¹⁰ Governing at a distance was hardly possible.¹¹¹ The Pennine fringe at the end of the eighteenth century was barely a ‘geocoded landscape’: the ‘spatial regime of inscriptions’ in Rose-Redwood’s terms was poorly developed¹¹². The underdeterminacy (and occasional inaccuracy) of the line entries, however, would only have prejudiced the original purpose of a return in the absence of collectors and occupiers whose local knowledge allowed them to appreciate its assumptions and draw necessary inferences, resolving the problems of reference both personal and geographical. In the terminology of relevance theory, the message of each line entry is linguistically communicated, but not (fully) linguistically encoded.¹¹³ The core challenge of the current paper has lain in the attempt to compensate for that tacit knowledge, and to reconstruct it to a degree. This, however, is only possible because of an original order.

end notes

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- ¹⁵ See Marshall, W.H., *On The Management Of Landed Estates: A General Work For The Use Of Professional Men*. 1806: Printed for Longman, Hurst, Rees, and Orme.
- ¹⁶ Ginter, D.E., *A Measure of Wealth: The English Land Tax in Historical Analysis*. 1992, London: Hambledon Press.
- ¹⁷ Turner, M., Mills, D (eds.), *Land and Property: The English Land Tax 1692–1832*. 1986, Gloucester: Alan Sutton
- ¹⁸ Examples for this locality are found in Nevell, M. and J. Walker, *Tameside in Transition*. 1999, Ashton-under-Lyne: Tameside Metropolitan Borough Council; and Haynes, I., *The Cotton Industry in Hollingworth and Mottram-in-Longendale*. 2008, Ashton-under-Lyne.
- ¹⁹ Hunt, H.G., 'Land Ownership and Enclosure 1750–1830', *Economic History Review*, 1959. **24**: p. 497–505
- ²⁰ Henstock, A., 'House Repopulation from the Land Tax Assessments in a Derbyshire Market Town, 1780–1825', in *Land and Property: The English Land Tax 1692–1832*, Turner, M., D. Mills, Editors. 1986, Alan Sutton: Gloucester. p. 118–135.
- ²¹ This was a particular concern of writers such as Gray, H.L., 'Yeoman Farming in Oxfordshire from the Sixteenth Century to the Nineteenth'. *Quarterly Journal of Economics*, 1910. **24**: p. 293–326 and Davies, E., 'The Small Landowner, 1780–1832, in the Light of the Land Tax Assessments'. *Economic History Review*, 1927. **1**: p. 88–9.
- ²² Noy, W., *The principal grounds and maxims: with an analysis of the laws of England*. 1821, London: Sweet, p292
- ²³ Harrop, J., P. Booth, and S. A. Harrop, *Extent of the lordship of Longendale 1360, 2005*, Record Society of Lancashire and Cheshire, p xxxiii.
- ²⁴ On statutory provisions and practice see evidence of Wood and Garnett included within Second report from the Select Committee appointed to inquire into the state of agriculture; with the minutes of evidence, and appendix, 1836, (189), p 259. Mottram was included within and subject to quotas for the Stockport Division of Cheshire.
- ²⁵ See Ginter, D., 'The Incidence of Revaluation' in *Land and Property: The English Land Tax 1692–1832*, Turner, M., D. Mills, Editors. 1986, Alan Sutton: Gloucester. p. 180–188.
- ²⁶ Despite frequent claims that the Land Tax poundage was fixed at 4s in the pound (20%) from 1798, this appears to be a statutory maximum. See Miller, S., *The Laws Relating To The Land Tax Its Assessment Collection Redemption And Sale*. 1849, London: Sweet, p3. Latitude

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- at township level to alter both poundage and valuation is discussed in Ginter, *A Measure of Wealth*.
- ²⁷ Between 1780 and 1832 Land Tax fell almost entirely on real property. Tithes, in principle analogous to rent, remained subject to Land Tax and have been variously treated by previous analysts. Gray 'Yeoman Farming' ignored them; Hunt 'Land Ownership and Enclosure' attempted to exclude tithes in situations where before enclosure they were received in kind. Ginter, *A Measure of Wealth* systematically included tithes. Tithes would be pertinent to this study only if commuted into land, which does not appear to be the case. A small range of specific income streams remained liable to Land Tax including official salaries (at a nationally constant poundage of 20s in £100 (ie 1%)). See evidence of Wood and Garnett in *Second Report* p268). Some line-entries in the Mottram return refer to the salaries of excise officers.
- ²⁸ Despite claims (by authorities including Miller *The Laws Relating To The Land Tax*, p11) that property with an annual value of less than £1 ceased to be liable from 1798, the stipulation of s80 of the 1797 Act refers to the exemption of persons whose entire real property is worth less than £1, and merely extends previous provision. See for example Burn, R., *The Justice of the Peace, and Parish Officer*. 1772, London: Cadell, p45). There appear to be no consequent changes in line entries in Mottram in the years immediately after 1798, and it is clear that locally property bundles with lower annual values were taxed although the aggregate values of property held by those liable exceeded £1.
- ²⁹ From 1798, when Land Tax became perpetual, proprietors or occupiers (other than tenants at rack rent) were allowed to redeem their liability by payment of a lump sum (equivalent to fifteen year's purchase). See p284 of Hunt, H.G., 'Land Tax Assessments'. *Economic History Review*, 1966. NS 11: p. 283–286. They were thereafter 'exonerated', and although still listed in the returns, subsequent assessments of the annual value of their property remained constant, and so further development cannot be traced.
- ³⁰ From 1798, further provisions allowed that if an owner did not redeem their Land Tax, another private person or group of people ('the redemptioner'), could redeem but not exonerate that tax. Under this arrangement the Government received the lump sum as if the land tax had been exonerated, but continued collecting the tax for the redemptioner. (These arrangements were repealed in 1802). Property subject to these arrangements were still liable to reassessment. See Wood and Garnett's evidence in *Second Report*, p256). At least locally, such property was not separately identified in the returns.
- ³¹ An Act of 1817 confirmed and amended by further statutes allowed ecclesiastical and other bodies to sell property in order to redeem Land Tax liability. See Miller *The Laws Relating To The Land Tax*, p242). From 1818, the Church's liability with respect to both the Glebe Land and the Tithes in Mottram township were exonerated.
- ³² Provision for appeal is found in the statutory timetable for administering the Tax as discussed by Beckett, J.V., 'Land Tax Administration at the Local Level, 1692–1832', in *Land and Property: The English Land Tax 1692–1832*, M.T.D. Mills, Editor. 1986, Alan Sutton: Gloucester. p. 161–179. In some cases the returns themselves indicate provision for appeal.
- ³³ Although Catholics who had not sworn an oath of allegiance and supremacy and who refused to do so were liable to double tax, Beckett, 'Land Tax Administration at the Local Level', p166, suggests that this did not usually occur in practice.
- ³⁴ National administrators doubted that liability was revised as development occurred, and assessors might have avoided reassessment 'in the interests of local harmony' (Beckett 'Land Tax Administration at the Local Level', p170). Ginter, 'The Incidence of Revaluation' and Ginter *A Measure of Wealth* points to the frequency of reassessment of individual property.
- ³⁵ This possibility is raised in Beckett, 'Land Tax Administration at the Local Level', p163. Note also that case law established that while the tenant might deduct the land Tax from his rent, the amount deducted could only be the sum for which the property would be liable had it remained

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- in the form it was when the tenancy began, with liability for any improvements falls upon the tenant.
- ³⁶ Eg Sayer, B., *An Attempt To Shew The Justice And Expediency Of Substituting An Income Or Property Tax For The Present Taxes ..* 1833, London: Hatchard and Miller, *The Laws Relating To The Land Tax*
- ³⁷ Lord Fitzwilliam, Letter to Laurence French 1798, 10th or 17th Dec 1798, Box X51 5/138, Milton Manuscripts, Northamptonshire Record Office quoted in Ginter, *A Measure of Wealth* p110.
- ³⁸ Beckett 'Land Tax Administration at the Local Level', p171.
- ³⁹ The validity of this procedure can be tested by considering the frequency with which the standardized assessment remains constant from one year to the next in circumstances where the owner, occupier and description of the 'property bundle' remain the same. In 1,542 such cases the hypothesis of constancy holds; in 34 it does not. Those 34 cases appear to reflect substantive change of the types of concern, allowing the conclusion that the fundamental stability of the (standardized) assessments provides a basis for identifying material change.
- ⁴⁰ Miller, *The Laws Relating To The Land Tax*
- ⁴¹ Highway Rate book for the township of Mottram, 1818–19, DD8/8A, Records of the Heginbottom family, Tameside Local Studies and Archives, Ashton-under-Lyne.
- ⁴² Most Land Tax payers' liability fell slightly, but the assessment of Samuel Matley's printworks almost doubled, and that of Beckett's Hodge Mill increased by over 40%. Land Tax due on the larger of the township's small farms in 1822 typically fell to two-thirds of the 1821 assessment, while the sum due on blocks of cottages with little associated land either remained almost constant or increased slightly. Given the large number of distinct property values recorded, and the very low likelihood that a new survey had been undertaken, it seems possible that the 'valuations' underlying the Land Tax assessments for 1822 onward rests on a combination of more than one source. .
- ⁴³ Limiting consideration to cases where the sum assessed was less than 10s (implying £1 NAV0) regressions was used to estimate NAV1 on the basis of NAV0 for chains starting in different circumstances (censored, expected built, split), with estimated values of NAV1 ranging from 90% to 96% of NAV0 (95.2% for expected built property). On this basis, NAV0 for new property has been treated as being 1.052632 of the value of NAV1.
- ⁴⁴ Ginter, *A Measure of Wealth* p14.
- ⁴⁵ Tithes were leased from 1768 to 1808 to William Ulithorn Wray, Rector of Darley, Derbs, and afterwards to his widow. See *Lease for 3 lives* (copy 21 Nov 1818), 1768, P 25/8/13, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester.
- ⁴⁶ From time to time, excisemen were resident in the township, and in principle there is a possibility that as their contribution to meeting the quota rose and fell, the contributions of other taxpayers might alter correspondingly. It is clear, however, from Figure 1 that no such adjustments were made.
- ⁴⁷ Ginter, 'The Incidence of Revaluation' p182.
- ⁴⁸ See Ginter, 'The Incidence of Revaluation'; Ginter, *A Measure of Wealth*.
- ⁴⁹ References to numbers of cottages, undertenants etc are found in Tollemache (Wilbraham of Woodhey) Collection, DTW series, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester.
- ⁵⁰ Local assessors were not consistent in their treatment of holdings of this last type- lessees being considered as proprietors in some years and in some cases, but not all.
- ⁵¹ This notional value is very much less than the actual rental value, though this was not material to the local operation of the Land Tax in the period in question (or of consequence for estimation of area equivalents).

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- ⁵² Unfortunately, although there are good descriptions of the buildings in holdings leased from Tollemache for 14 years from 1799, the range of descriptors seems too variable to provide useful measures of influences on the assessed value of built property. In some cases the number of houses or cottages is included, in others the numbers of bays of building together with their age and quality.
- ⁵³ These are shown in Hilditch, R., *Aristocratic Taxation: Its Present State Origin And Progress With Proposals For Reform*. 1843, London: Simpkin and Marshal, p30
- ⁵⁴ Any principle that bundles with an annual value less than £1 was exempt from Land Tax either from 1798 or throughout - supposedly grounded in statute - is disputed (see Endnote 29).
- ⁵⁵ It is also possible that local assessors might seek to avoid taxing the least valuable cottages, even though this was not a legal requirement as the steward of a major landowner (treating aggregate tax liability of tenants as a deduction of total rent) might seek to determine the share of an estate's Land Tax liability to be placed on each tenant. This practice is advised in Mordant, J., *The Complete Steward*. 1761, London: Sandby. Mordant's exemplar estate accounts place no Land Tax responsibility on cottage tenants (vol 2, p16–18). Although he recommends this on the basis that the manor includes all the property within the township, he adds that 'where the Lord owns only part of the land .. the tax is to be proportioned to each tenant exactly (if he pays it) or if not to the value of the whole estate compared with others &c by the rule of proportion' *ibid* p17. If very small potential liabilities are spread across the entire estate, an untaxed residuum will exist, but the distinction between clumping and omission becomes a fine one.
- ⁵⁶ See Bratko, *PROLOG Programming for Artificial Intelligence*. 2011, Boston: Addison-Wesley.
- ⁵⁷ See Pereira, F.C.N. and S.M. Shieber, *Prolog and natural-language analysis*. 2002, Brookline MA: Microtome Publishing.
- ⁵⁸ See Siler, W. and J.J. Buckley, *Fuzzy expert systems and fuzzy reasoning*. 2005, New York: Wiley
- ⁵⁹ Key sources amongst these are Miller, *The Laws Relating To The Land Tax and Ginter, A Measure of Wealth*.
- ⁶⁰ Peirce, C., S., '*Harvard Lectures on Pragmatism*', in *Collected Papers of Charles Sanders Peirce*, in Hartshorne, C. and P. Weiss, Editors. 1903, p171–172)
- ⁶¹ Henstock . 'House Repopulation'
- ⁶² *ibid*. p124.
- ⁶³ Various Land Tax statutes specify that sums less than a halfpenny should be spread between years. See Miller *The Laws Relating To The Land Tax*.
- ⁶⁴ Comparison of line entries for Tollemache property held by John Goddard and Samuel Cook in 1784 and 1785 provides a simple illustration of this. Between 1784 and 1785 Cook's liability for Land Tax fell by precisely the same amount as Goddard's increased, consistent with the possibility that property transferred between them. In this case, there is evidence from estate documentation that in fact Cook's occupation of Marled Field gave way to occupation by Goddard. No bundle, however, corresponds to Marled Field; it passed from being part of one bundle to being part of another. It therefore cannot be sufficient to suggest that bundles in one year can be represented as combinations of bundles in adjacent years or that the Land Tax liability carried by a bundle can be decomposed as in [1]. It is possible to define a set of differences that together with the values for the bundles themselves in contrast to [1] exhaust all the ways in which any specific bundle could be composed. Without any other information, it is possible (though very far from likely) that if any set of bundles in year y (for example [C',G] in 1784) carried the same aggregate liability as another set in year y+1 (eg [C,G']) that they comprised the same property. In some of these cases, however, if for example C' represented Cook's bundle in 1784 (ie with Marled Field), G represented Goddard's holding

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in that same year and C and G' represented their respective holdings in the following year (G' including Marled Field), then the two sums C'-G and C-G' would represent sums useful for present purposes, and the liability carried by the hidden part can of course be found by subtraction.

⁶⁵ Cf Quine, W.v O., *Word and Object*. 1960, Cambridge MA: MIT Press; Heller, M., *The Ontology of Physical Objects: Four-Dimensional Hunks of Matter*. 1990, Cambridge: Cambridge University Press, and Jubien, M., *Ontology, Modality, and the Fallacy of Reference*. 1993, Cambridge: Cambridge University Press.

⁶⁶ Quine, *Word and Object*.

⁶⁷ In principle, it would be appropriate to combine such simple prior probabilities with further subjective probabilities based on the evidence of the strength of similarity of the line entries. In the example above, the prior probability, P(H) might be seen as the degree of belief in the proposition that when tenant T surrendered his lease, S occupied his cottage, without knowing the identity of S or T. Assessment of the similarity of the line entries provides some additional evidence, which might potentially be combined with P(H) allowing the subjective probability to be revised. According to Bayes theorem, the revised probability P(H|E) given the evidence of similarity(E) is

$$P(H|E) = \frac{P(E|H) * P(H)}{P(E)}$$

where P(E|H) is the probability of finding that similarity given the proposition, and P(E) is the overall probability of such evidence of similarity being found. P(E) must be estimated as the sum of two components; the probability of finding the evidence of similarity if the hypothesis of continuity were true P(E|H) and the probability of finding that evidence if it were not P(E|~H).

⁶⁸ The actual pattern of transitions that occurred cannot be known. Moreover as an element of property can only pass to one chain, there are strong interactions between the probabilities.

⁶⁹ It combines seven sub-scores modified by a score for sequence within the line entries, inclusion of continuing parts and a penalty for complexity. In the middle of the range, a likelihood score of 3 is assigned to a possible linkage between two unmatched line entries for successive years sharing the same liability and proprietor but different occupiers.

⁷⁰ Reference to occupier names may be the only way to identify a specific bundle. Indeed contemporary legal opinion held that 'the names of the tenants were only inserted in order to shew for what property the landlords were rated' (Lord Kenyon CJ R v The Inhabitants of Folkestone Michaelmas Term 1789). See Durnford, C, Sir Edward Hyde East, *Term Reports in the Court of King's Bench, Volume 3 1817*, London: Butterworth. It is very important, however, that a circumstance where a tenant relinquishes one tenancy and takes on another is not mistaken for a change in the nature of a holding.

⁷¹ See bequest of 14-year interest in Tollemache land 'with the tenant right and benefit of renewal thereof': will of Samuel Radcliffe of Mottram in Longdendale, 1797, WS 1797, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester. More generally see Mordant, *Complete Steward*, p360-361 or Marshall, *On The Management Of Landed Estates*, who asks 'What superintendent who knows the difficulty of procuring a good tenant would wish to discharge him? And no such tenant will readily leave the farm he is settled upon if he find proper treatment' (p381).

⁷² The term rigid designator was introduced in Kripke, S., *Naming and Necessity*. 1980, Cambridge MA: Harvard University Press to characterize the relation between a name and its referent. The less orthodox approach here, resting on Jubien, *Ontology, Modality, and the Fallacy of Reference* proves helpful in dealing with changing objects of uncertain extent.

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- ⁷³ This might be thought of as analogous to treating perduring objects as a series of stages rather than a 4D space-time worm as in Sider, T., 'The Stage View and Temporary Intrinsic'. *Analysis*, 2000. 60: p. 84–88
- ⁷⁴ Bennett held a wide range of financial assets including Bank of England debt and a mortgage portfolio in addition to substantial real property interests including the freehold of substantial cotton mills. See also Endnote 92.
- ⁷⁵ In 1813 a printed form was used in Mottram for setting out Land Tax liabilities, annual values were recorded for the first and only time, and care was taken to identify Tollemache 99-year leaseholders accurately, consistently treating them as proprietors. Two additional holdings were assessed for the first time (both at £2 NAV0), both of which were subject to 99-year leases granted some years before (to Band(1798) and Marshall (1786), one on an existing cottage with an unusually low rent. Assessment of one of these (Band) ceased after 1815, ending the chain, but resumed in 1822, the year of the local revaluation.
- ⁷⁶ There are three groups of circumstances a patch cannot be located with sufficient precision to identify a land parcel that could be projected on to the national grid. In the first, a series of patches will be known to correspond to an area of land, but the portions of that land belonging to each patch cannot be known. This is typical of patches on the Stamford and Warrington estate, but the bounds of the two patches created by temporary division of Tollemache estate C from 1829, for example, are similarly unknown. The second circumstance involves cottage property (with any associated land) of unknown extent. Such patches might be thought of as occupying unassigned cottage space (the overall distribution of which can be approximated). In principle, the location of property of this second type might be taken further by first representing unassigned cottage space as a grid of probabilities (having taken account of assigned space within the township and various sketch maps and drawings). Having probabilistically represented the entire unassigned cottage space, a particular patch might then be probabilistically located by reference to ordering information from the Land Tax returns and the notional annual value. The third circumstance is where cottage property of this type represents part of a patch.
- ⁷⁷ Aiken, *Description of the country from thirty to forty miles round Manchester*, p458.
- ⁷⁸ See Chalkin, C.W., 'The Provincial Towns of Georgian England: A Study of the Building Process, 1740–1820'. 1974, London: Edward Arnold.
- ⁷⁹ The holding broken up in 1771 included 11 messuages - far more than any other holding within the Mottram estate Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester
- ⁸⁰ Lubow, L., B, 'From Carpenter to Capitalist: The Business of Building in Postrevolutionary Boston'. 1997, Boston: Northeastern University Press p185
- ⁸¹ The lease is amongst counterpart leases and expired and leases, Mottram, 1786–1899, DTW/2477/F/12, Tollemache (Wilbraham of Woodhey) Collection, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester. In 1792, Bretnor's or Brow cottage is also found away from the village.
- ⁸² Chadwick, W., *Reminiscences of Mottram*. 1882, Stalybridge p7.
- ⁸³ Malcolmson, R.W., *Life and Labour in England, 1700–1780*. 1981, London: Hutchinson, p26
- ⁸⁴ Between 1785 and 1801 the tenants of Hodge Mill were Marsland, Holt (bankrupt), Moss and Swindells with a vacant spell between Holt and Moss when Tollemache himself became liable for the Land Tax. John Swindells and his partner John Dale are alternately reported between 1801 and 1804. The partnership between Moss and Swindells was dissolved in 1796, after which Moss with other partners developed Wharf Mill.
- ⁸⁵ Cow keeping had been used to attract skilled labour by Samuel Greg at Styal. See also Redford, A., *Labour Migration in England, 1800–1850*. 1926, Manchester: Manchester University Press, Chapter 2.

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- ⁸⁶ ‘Mottram-in-Longdendale has often been spoken of as a finished town, as few, if any one, could speak of new houses being erected, except in place of other houses or repairs’. The Manchester Times and Gazette (Manchester, England), Saturday, July 16, 1836; Issue 403. ‘Finished town’ seems to have been in fairly frequent use in the nineteenth century.
- ⁸⁷ In 1818 rents on properties shown in ‘Rent accounts for premises, mainly cottages and small houses in Mottram, Hattersley and Glossop co. Derby, 1806–1837, DDX563/1, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester) were typically double the rateable value (notionally a measure of annual value) shown in the Mottram Highway Rate book for that year (see Endnote 41). A comment in a survey of 1826 DTW/29 Tollemache (Wilbraham of Woodhey) Collection, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester confirms the unexpectedly high yield of cottage property.
- ⁸⁸ The Land Tax shows virtually no development on the Tollemache or Stamford and Warrington estates on this period, nor does the Tollemache archive in Chester Record Office (DTW) Tollemache (Wilbraham of Woodhey) Collection, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester. The Sidebottom brothers were recorded as owners of 34 units (all built since 1801) in the Highway Rate book (see Endnote 41).
- ⁸⁹ Expansion of the Sidebottom enterprise between 1802 and 1834, with the operation of a second mill on the site from 1815 and a third from 1827 is summarised in their evidence to the Royal Commission of Employment of Children in Factories of Factories Inquiry Commission. Supplementary report of the Central Board of His Majesty’s commissioners appointed to collect information in the manufacturing districts, as to the employment of children in factories, and as to the propriety and means of curtailing the hours of their labour, 1834 (167). Its scale relative to other local cotton mills can be gauged by the Crompton census of 1811–1812. The expansion of the Matley’s Hodge printworks can be gauged in part from the Land Tax returns, but its employment cannot be estimated before 1843 (Resolution of confidence in Richard Cobden and his work towards the repeal of the Corn Laws, 1843, employees in the calico printing works of Richard Matley of Hodge. 140 signatures, COBDEN/551, West Sussex County Record Office, Chichester).
- ⁹⁰ The block at Hodge (Chain 835) is described in p37–38 of Nevell, M., *The Archaeology of Industrialisation and the Textile Industry: the Example of Manchester and the South-western Pennine Uplands During the 18th Century (Part 1)*. *Industrial Archaeology Review*, 2008. 30(1): p. 33–48.
- ⁹¹ The 312 ‘houses’ of the 1821 Census for Mottram township should be compared with the 220 of the 1801 Census and the 175 separately rated properties in the 1818 Mottram Highway Ratebook (see Endnote 41), of which 34 were owned by the Sidebottom brothers.
- ⁹² See Rent accounts and papers relating to the affairs of John [sic] Bennett of Mottram in Longdendale, solicitor and property owner, 1806–1837, DDX563/1, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester. His role subsumes those discussed by Anderson, B., L, ‘The attorney and the early capital market in Lancashire’, in *Liverpool and Merseyside*, J.R. Harris, Editor. 1969, Cass: London. p. 50–77.
- ⁹³ Apart from Bennett’s control of the Titterton Farm he received rents on the ‘cottages by the Church yard side’ that estate documentation indicates had been let with it. Whatever his relationship with Kershaw’s freehold at Harryfields, his account book shows a stream of rents coming from Bowers its tenant, and this role continued when ownership of the Harryfields freehold shifted to the Sidebottom Brothers.
- ⁹⁴ DTW2406/30, Tollemache (Wilbraham of Woodhey) Collection, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester.
- ⁹⁵ Despite the availability of a recently commissioned series of local studies, and despite the fact that property remaining from the boom of 1785–1795 lends the present day village much of its physical character, a recent conservation area appraisal (Tameside 2011) demonstrates that this decisive episode in its development remains unknown.

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- ⁹⁶ These events are, however, documented in Nevell and Walker, *Tameside in Transition*; Sayer, M., *Broadbottom 1795–1975: A History*. 2007, Broadbottom: Broadbottom Community Association, and Haynes, *The Cotton Industry in Hollingworth and Mottram-in-Longdendale*.
- ⁹⁷ The current narrative could be potentially enriched by sustained analysis of Bennett's account books, DDX563) Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester but this would be difficult without the organizing framework of the Land Tax chains.
- ⁹⁸ Hammond, J. and B. Hammond *The Skilled Labourer*. 1919, London: Longmans, Green & Co, p 4.
- ⁹⁹ The phrase is from Revans' evidence in Fourth report from the Select Committee on the National Land Company; together with the minutes of evidence, 1847–48 (503), p38.
- ¹⁰⁰ Appendix 1 of First Report of the Commission on the State of Large Towns and Populous Districts, 1844–5, (572), provides population and mortality statistics for the Ashton and Oldham Registration District (Appendix p1). This area had a population of almost 174,000—much greater than Birmingham or Leeds, but only 22,700 people (ie 13%) lived in Ashton itself - the 'large town' examined subsequently. The area included both Mottram and Bamford's Middleton 16km's away (see endnote 7); the true character of Bamford's vast scattered city being evident from the Ordnance Survey six-inch maps of Lancashire of c. 1848.
- ¹⁰¹ The specific case is discussed tangentially in Mathews, S., 'The Cheshire estates of John Tollemache of Peckforton, 1861–1872'. *Transactions of the Historic Society of Lancashire and Cheshire*, 2005. 154: p. 117–136. That examination is critical of the consequences of granting 99 year leases, wrongly assuming that they covered agricultural land rather than building plots.
- ¹⁰² One local example of failure to overlooks total local revaluation in 1822 and treats change at the Hodge Printworks as vast investment (Haynes, *The Cotton Industry in Hollingworth and Mottram-in-Longdendale*).
- ¹⁰³ Given concern with the provision of shelter, and the frequent references in Tollemache estate notebooks to the effect that dwellings have been sub-divided ('house in two dwellings') or recombined, the lack of concern with numbers of units is easily understood. The work reported here indicates that at least in this particular circumstance it is possible to track the creation of dwelling space, but not the number of dwelling units.
- ¹⁰⁴ Abstract of the answers and returns made pursuant to an act, passed in the first year of the reign of His Majesty King George IV, intituled, "an act for taking an account of the population of Great Britain, and of the increase or diminution thereof. 1822 (502)
- ¹⁰⁵ Mingay, G.E., 'The Land Tax Assessments and the Small Landowner'. *Economic History Review*, 1964. 17: p. 381–388.
- ¹⁰⁶ Noble, N., 'The Land Tax Returns in the Study of the Physical Development of Country Towns', in *Land and Property the English Land Tax 1692–1832*, M.T.D. Mills, Editor. 1986, Alan Sutton: Gloucester.
- ¹⁰⁷ Stamford property was held by tenants on leases for three lives, rather than for a fixed term (cf Clay, C., 'Lifeleasehold in the Western Counties of England 1650–1750'. *Agricultural History Review*, 1981. 29: p. 83–96). On payment of a fine, on the death of the first or second life tenants might make up their three lives again. This is a form of tenure distinct from that of 'leasehold for lives-determinable-on-years' found after 1786 on the Tollemache estate and which occupied an intermediate position between lifehold and a lease for a fixed term. Divergence between Land Tax and estate documentation in this particular case arises from uncertainty over the whereabouts of an individual who deserting his wife surreptitiously left the district more than 25 years before. See Letter, Joshua Heggibottom to Worthington & Nicholls, 1829, Hattersley Building Grounds, Box 2 No 38 : Hill : 1768–1829, Ashton-Stalybridge from Enville, Tameside Local Studies and Archives, Ashton-under-Lyne.

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- ¹⁰⁸ Valuation (detailed) of the Mottram, Micklehurst and Arnfield Tollemache estate, 1811, DTW2406/30, Tollemache (Wilbraham of Woodhey) Collection, Cheshire Archive and Local Studies Service, Cheshire Record Office, Chester
- ¹⁰⁹ The term is used in the sense of Rose-Redwood, R., and A. Tantner, 'Introduction: Governmentality, House Numbering and the Spatial history of the modern city Urban History, 2012. 39: p. 607613.
- ¹¹⁰ Wood and Garnett 's evidence in Second Report p265–268.
- ¹¹¹ Cf Miller, P. and N. Rose, 'Governing economic life', *Economy and Society* 1990. 19: p. 1–31;. Barry, A., 'Lines of communication and spaces of rule', in Foucault and political reason: liberalism, neo-liberalism and rationalities of government, in Barry, A., T., Osborne and N. Rose Editors. 1996, University of Chicago Press: Chicago. p. 123–141; and Rose, N., *Powers of Freedom: Reframing Political Thought*. 1999, Cambridge: Cambridge University Press.
- ¹¹² Rose-Redwood, R., 'Governmentality, Geography, and the Geo-Coded World'. *Progress in Human Geography*, 2006. 30(4): p. 469–486, esp. p470.
- ¹¹³ Eg Sperber, D., and D. Wilson, *Relevance: Communication and Cognition*. 1986, Oxford: Blackwell.