

Estimating traffic

A case study of the Chester sub-region in 1827–28

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The present bridge over the River Dee at Chester is the principal thoroughfare between the great manufacturing districts of the North of England [and] Wales; and Shropshire, Herefordshire, the Western Counties and also Holyhead and Ireland.

All the Coals for the supply of Chester and the districts to the North and East of it are brought over this bridge, as also the Iron of [Denbighshire], both in the pig and when manufactured into Boilers, Cylinders etc.; the Lead of Flintshire, the timber from Wales and Shropshire, and the Cheese of a very large extent of the Country. There are sixteen Stage-coaches passing it daily, besides all the Chaises, Gigs and Horses of the adjacent Country; it is a very great thoroughfare for Cattle, Sheep etc. and it is crowded with Foot Passengers, for whom there is not a side path.¹

This description of the traffic that teemed over the medieval Dee bridge in the 1820s gives a flavour of the goods and people both coming to, and passing through, Chester in the early nineteenth century. Many contemporary sources describe traffic in terms such as those used in Chester. The problem for the historian is that such sources give little, if any, numerical information on how much traffic in total there actually was and how it was made up. Transport historians still find it difficult to provide a comprehensive and quantified picture of transport as ‘the movement of people and things between places’ for which Robbins called in 1991.² Valuable insights can be gained by studying the traffic generated by specific transport users, an approach used fruitfully in Jones’s study of the transport policies of the brewers Truman Hanbury & Buxton and by Turnbull in the case of John Wilson & Son.³ Evidence on the transport decisions of specific enterprises or individuals is, however, hard to come by and may not be typical. The regional approach does offer a way forward, and the work of Turnbull again, together with Langton, Hallas, Freeman, Unwin, Wilson and Barrow,⁴ among others, has demonstrated the value of regional analysis. None of these studies offers, however, a comprehensively quantified picture of regional traffic at specific points in time. The objective of measuring the work done in terms of tons shifted and passengers carried in specific areas at particular dates continues to remain elusive.

More regional work in pursuit of this objective would be useful because it increases our understanding both of transport itself and of transport's wider significance in a number of ways. Firstly, estimates of the total amount of traffic moving in an area at a particular date are important in their own right to complement and give greater precision to the type of impressionistic evidence quoted at the beginning of this article. Comprehensive traffic figures would also allow comparisons to be made between the amounts of transport activity in different regions and the amounts at different periods in the same region. These could in turn be used as one measure of economic development to progress the type of work pioneered by Wilson.⁵ Secondly, it is necessary to quantify the relative importance of passenger and freight traffic within the total mix in order to be more precise about the work done by different types of operator and the extent to which they complemented each other. The results could also be an indicator of the social significance of transport in a region and its role in the less tangible transmission of information, market knowledge, ideas and money. A more refined knowledge of traffic would also come from estimating the work done by private transport as well as that done by scheduled operators. Our understanding of road transport, a vital sector, is still dominated by studies quarrying accessible data on stagecoach services and scheduled carriers; the traffic of local carters and own-account carriage continues to lurk in the shadows.

A fourth aspect of estimating regional traffic is in terms of the relative importance of different transport modes and routes and the extent to which they complemented as well as competed with each other. Unwin and, more recently, Barrow have produced valuable syntheses of regional transport patterns but their studies lack comprehensive estimates of the total traffic moved at particular dates.⁶ More precise measurement of the importance of different routes and carriers would help exploration of the relationship between economic activity and transport flows and the nature of links between producers, distributors and consumers. Fifthly, more precision on regional traffic could contribute to assessing the significance of the transport sector within the wider economy in terms of numbers employed, capital invested and, above all, the costs and benefits of transport. This in turn leads to a final and fundamental issue, the relationship of transport provision to economic development. There has been considerable division of opinion concerning this relationship in the industrial revolution. At one extreme are those scholars such as McCloskey and Freeman⁷ who suggest that the significance of transport provision for economic development has been overstated. At the other extreme Szostak argues that 'a modern system of transport was necessary for the Industrial Revolution to occur in England'.⁸ Attempts to resolve the relationship between transport and economic development using cliometric methods have rather fallen out of fashion in recent years despite some continuing interest in the significance of the railways.⁹ Though nobody would argue that better traffic estimates would alone be sufficient to resolve the question of transport's role in the industrial revolution, it is nevertheless the case that such estimates are necessary for the debate to be carried forward.

This article is designed to explore the potential for generating estimates of regional and sub-regional traffic flows at a particular point in time by taking the case of the Chester sub-region in 1827–28. It begins by describing the regional traffic generators together with the routes and modes of transport available. It then quantifies the amount of traffic on each mode and route and uses this evidence to arrive at overall estimates of the sub-region's traffic as well as of the relative importance of different transport providers. The study concludes by outlining some of the wider implications of the work. The process inherently entails making many assumptions whose validity could be challenged. Such challenges ought to provoke searches for more robust methods and data rather than dismissal of the basic objective. In particular, the exercise tackles one of the more intractable problems of transport history, that of estimating the amount and character of road traffic. A methodology is suggested to provide a comprehensive picture of road transport and its importance relative to inland waterways and coastal shipping.

The Chester sub-region in 1827–28

The Chester sub-region is shown in Figure 1. Its population in 1821 was 136,101 and rose to 153,102 in 1831.¹⁰ At its heart was the city of Chester. Chester was the major city of north-west England in medieval times as well as being the gateway to north Wales and the main port for Ireland. This ancient importance ensured that Chester remained a regional transport node in subsequent centuries, but relative decline set in from Tudor times, and by the 1820s the city had substantial problems.¹¹ The port had been eclipsed by Liverpool and in the previous 100 years key parts of its manufacturing economy had withered away. Only the founding of a leadworks in 1800 and the emergence of steam corn milling in 1819 counteracted to some extent the decline of the city's manufacturing base. Chester's significance as a national trade centre, particularly for Irish linen, had also dwindled,¹² although this was offset by an enhanced sub-regional role. In the early nineteenth century the city remained the dominant service centre for west Cheshire and adjacent areas of north Wales. Chester's relative torpor was, however, reflected in slow population growth by contemporary standards – only 7 per cent between 1821 and 1831.¹³

The sub-region's roads and waterways mostly converged on Chester and the traffic patterns partly reflected the city's importance for the surrounding areas. Equally significant was through traffic between districts on the sub-region's periphery and beyond, and for this traffic Chester was often merely an obstacle to passage elsewhere. Liverpool, eighteen miles to the north-west, dominated the sub-region whilst industrial south Lancashire lay to the north-east. The more volatile and at this time rather depressed industrial districts of Flintshire and Denbighshire were within a dozen miles of the city to the west and south-west.¹⁴ The equally depressed Cheshire saltfield around Northwich was about seventeen miles to the east. Traffic moved across the sub-region between these poles of activity. Chester's immediate hinterland

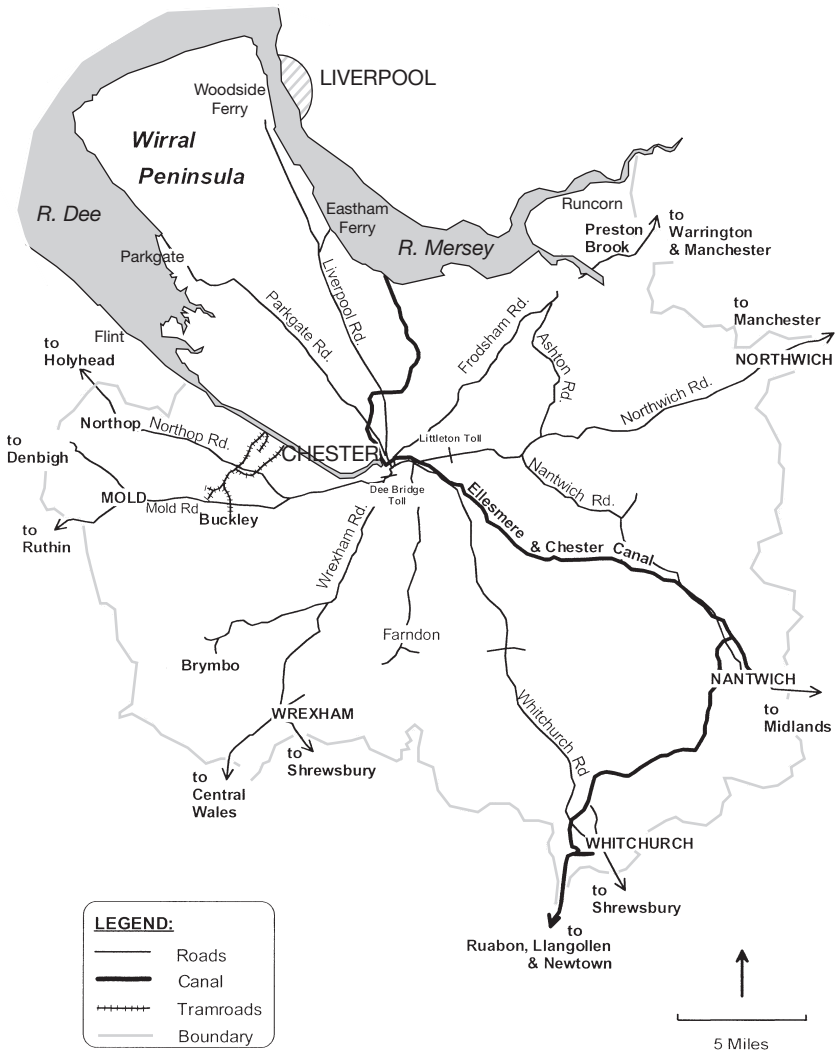


Figure 1 The sub-region of Chester in 1827-28

was rural but the farming economy benefited from demand from the surrounding urban areas.¹⁵ This demand generated important, but complex, movements between country and town of a type which is difficult to document. In summary, the Chester sub-region centred on a largely pre-industrial city that lay close to industrialising areas but had an ambiguous relationship with them. Its traffic flows illustrate those of an economy with the mix of pre-industrial and industrial features that characterised the country as a whole in the early nineteenth century.

Transport facilities in the Chester sub-region

The Grosvenor Bridge over the Dee at Chester, opened in 1833, was the only major addition to the local transport infrastructure promoted in the 1820s.¹⁶ The bridge apart, Chester's sluggish economy did not generate sufficient traffic or, more important, sufficient traffic growth to stimulate new transport facilities. The city had to be content with provision made in earlier, more prosperous times, or as an adjunct to serving more dynamic parts of the sub-region and beyond.

Turnpike roads provided comprehensive coverage of the area, radiating from Chester in eight directions.¹⁷ The turnpikes trusts were all established in the eighteenth-century boom, but in two distinct phases. The earlier group of roads to Northop/Mold, Wrexham, Whitchurch and Nantwich were all turnpiked before 1759 and dated from the period when Chester was still the dominant regional metropolis. The roads to the Wirral peninsula (for the Liverpool ferries) and to Frodsham, Warrington and Preston Brook came later, in the 1780s.¹⁸ By then Chester had been eclipsed by more vigorous areas and the priority had shifted towards improving the city's links with the port of Liverpool and industrial Lancashire. A network of local roads and lanes fed the sub-region's turnpikes.

Coastal shipping was an option for traffic between Chester and Liverpool. At a meeting of the River Dee Commissioners in 1826 Richard Tyrwhitt, the Recorder of Chester, reported 'an expression he had lately heard that "the Port of Chester is gone – its trade had absolutely become insignificant, it had vanished"'.¹⁹ He was lamenting the apparent demise of trade at the city's wharves, though traffic remained extensive downstream. The brick, pottery and coal producers around Buckley in Flintshire could send their products direct to wharves on the Dee by local road or tramroad. These routes bypassed Chester and were particularly important for maritime exports to north Wales, Liverpool and Ireland. The shocking state of the Dee Navigation was a chronic factor undermining shipping at Chester.²⁰ Vessels of 200–300 tons, drawing 13–14 ft, were generally unable to get to Chester from after 1819, and even vessels of 100 tons found it difficult.²¹ Coasting flats smaller than about eighty tons could still get to the city, and they provided an element of flexibility in the transport options to Liverpool that could be exploited if the need arose.

The canal was the third main transport facility in the sub-region. The waterway's development had been a complicated process but by the 1820s the result was the roundabout route of the Ellesmere & Chester Canal from Ellesmere Port (Whitby Locks) to Nantwich and to industrial Denbighshire via Whitchurch and Ellesmere.²² While the canal passed through Chester, the main aim had been to link Shropshire and north-east Wales with the Mersey. There was a connection into the Dee at Chester but the canal company was hostile to its use because it drained both traffic and water from the through route to Ellesmere Port.²³ Traders in Chester did not actively sustain the link, either, something they were to regret in 1827.

A substantial diversion of the Dee–Mersey coasting traffic to the canal took place after 1795.²⁴ Nevertheless, the canal, like the Dee, did not serve the whole sub-region. Even those areas served by water transport had an alternative in the roads. The Wirral line of the canal was paralleled by the Wirral turnpike/Mersey ferry route to Liverpool and by the Frodsham road for traffic to Runcorn, Preston Brook, Warrington and Manchester. The Northwich road was a more direct option for Northwich and Manchester. The Nantwich road more or less paralleled the canal, whilst the Whitchurch and Wrexham roads both offered more direct routes than the circuitous course of the canal (which never got as far as Wrexham, in any case). The roads to Northop and Mold provided direct, if hilly, access to the Flintshire industrial area as an alternative to the routes via the Dee involving transshipment from tramroad or road to coasting vessels.

Coastal and canal traffic in the sub-region

It is now possible to turn to the task of estimating the traffic flows of the Chester sub-region in 1827–28. In an environment of acute data deficiency, the best evidence available is that relating to coasting traffic between Chester and Liverpool. Its amount and nature were documented in the Liverpool Customs Bills of Entry, a vital but still underused source for maritime traffic.²⁵ The Customs Bills recorded cargo details of every loaded coastal vessel entering Liverpool from the Dee, clearances of vessels going from Liverpool to the Dee, as well as dated lists of exports in that direction. The traffic carried by regular coastal vessels in the year 1827 is summarised in Tables 1 and 2. Firebricks from Buckley were the biggest single commodity carried coastwise from Chester to Liverpool (Table 1), but they were shipped from downstream wharves, not from Chester city itself. Some of this traffic did use the canal route to the Mersey²⁶ but the proportion seems to have been small. Lead ore, pig lead, timber and chert stones from Flintshire were the other significant cargoes. These coastal exports from Chester to Liverpool amounted to over 6,400 tons in 1827. A much wider variety of goods was imported in the opposite direction (Table 2), but the overall tonnage was small – about 1,250 tons.

Table 1 Coasting traffic, Chester to Liverpool, by regular coastal vessels, 1827

<i>Goods</i>	<i>Tons</i>
Firebricks	5,664·6
Fireclay	147·5
Wheat	34·0
Hay	0·6
Timber	106·0
Lead ore	97·8
Pig lead	165·1
Chert stones	214·0
Total	6,429·6

Table 2 Coasting traffic, Liverpool to Chester, by regular coastal vessels, 1827

<i>Goods</i>	<i>Tons</i>
Oats	101.7
Barley	23.8
Wheat	252.6
Indian corn	1.0
Beans	4.2
Pease	1.0
Oatmeal	0.8
Malt	109.1
Flour	0.5
Sugar	1.0
Molasses	0.3
Rum	0.1
Spirits	0.6
Brandy	0.3
Wine	2.9
Cotton	6.0
Flax	10.0
Hemp	0.3
Skins	2.8
Hides	3.0
Palm oil	4.5
Oil	1.1
Tallow	2.0
Salt	185.8
Pine timber	332.5
Deals	12.0
Fir timber	25.0
Oak timber	70.0
Hardwood	65.0
Coal	30.0
Total	1,252.1

Source Merseyside Maritime Museum: Customs Bills of Entry, Liverpool.

Imported foodstuffs, wine and spirits, raw materials and grain predominated. In total, therefore, only 7,682 tons went by coaster on the Chester–Liverpool route in 1827, and it is unfortunate that the best-documented traffic flow within the Chester sub-region was also the least significant.

Quantifying traffic on the Ellesmere & Chester Canal is a more difficult task. Although extensive company records survive, none contains usable traffic statistics for the period in question. A more indirect approach has had to be used. It is possible to get some idea of the goods carried on the canal route between Chester and Liverpool because in 1827 a dispute occurred between the canal company and the traders of Chester. On 26 July 1827 the canal company announced that from 1 August there would be substantial increases in the tonnage rates charged.²⁷ Chester traders reacted with uproar and argued, rightly, that the changes were designed to favour long-distance traffic from Denbighshire and to penalise short-distance traffic around Chester, particularly that entering or leaving the Dee. A trade committee was immediately

established, with representatives from most of Chester's key trades,²⁸ and it set out to defeat the canal company by diverting traffic back to the Dee. Additional sailing flats were brought on to the river, wharfage was leased, and during the remaining months of 1827 some traffic that normally went by canal was sent coastwise. This means it is visible in the Liverpool customs bills, and Tables 3 and 4 itemise this diverted traffic.²⁹ The main goods rerouted from Chester to Liverpool were lead products from the Walkers Parker lead works in Chester, pig iron deriving from the Wrexham area, as well as some foodstuffs and timber. Grain, imported raw materials and foodstuffs predominated in the reverse direction from Liverpool. As grain formed, however, a high proportion of the goods, special or seasonal factors have to be considered. This is done by comparing grain traffic on the coastal route in two other years, 1826 and 1837, with that in 1827. This evidence shows that grain traffic in the autumn of 1827 was abnormally high. In both 1826 and 1837 only eight cargoes of grain moved between Liverpool and Chester during these months, whereas fifty-nine did so in 1827. Although the absolute flow of grain in 1827 was larger than that in other years, the important question is whether this was because a lot of grain was imported to the Chester mills in 1827 or because such grain flows were normal and would usually have been sent by canal. The evidence appears to confirm the second interpretation. Most of the craft carrying grain to Chester between August and December 1827 were canal flats specially registered for use on the Dee in pursuit of the traders' campaign.³⁰ It seems likely that the majority of the grain traffic normally used the canal route.

Table 3 Coasting traffic diverted from the canal, Chester to Liverpool, August–December 1827

<i>Goods</i>	<i>Tons</i>
Wheat	5.0
Flour	10.0
Potatoes	21.8
Barley	30.0
Wool	0.3
Cheese	2.0
Beans	0.8
Timber	100.0
Pig lead	100.0
Sheet lead	170.0
White lead	2.5
Red lead	0.8
Lead pipe	34.0
Lead shot	547.0
Paint	9.6
Painter's colours	12.0
Blacking	0.4
Pig iron	545.5
Sheet iron	9.0
Total	1,600.5

Table 4 Coasting traffic diverted from the canal, Liverpool to Chester, August–December 1827

<i>Goods</i>	<i>Tons</i>
Oats	156.8
Barley	63.5
Wheat	946.3
Beans	20.9
Pease	1.0
Oatmeal	0.8
Flour	0.5
Rum	0.4
Spirits	0.6
Brandy	0.3
Wine	2.9
Cotton	1.5
Flax	10.0
Skins	5.3
Hides	3.0
Palm oil	4.5
Oil	1.1
Tallow	2.0
Salt	162.1
Deals	12.0
Fir timber	24.0
Hardwood	65.0
Total	1,484.4

Source Merseyside Mari-time Museum: Customs Bills of Entry, Liverpool.

The evidence indicates, therefore, that nearly 3,100 tons of goods were diverted from the canal to the coastal route during the 1827 dispute. It was originally hoped that this high-quality Customs Bill data could be linked with statements made by key actors in the drama to quantify the proportion of traffic removed from the canal and hence to produce overall figures on the canal's traffic. Although the canal company was clearly rattled by the switch of traffic to the Dee, the evidence did not prove robust enough to do so.³¹ Other sources have had to be used, and the results are summarised in Table 5. In October 1836 Robert Kerr, a Liverpool forwarding agent, carried out a census of canal traffic passing Whitby Locks for the promoters of the Chester & Birkenhead Railway. He reported his findings to the Commons committee looking into the Bill, circumstances that might have led him to produce an overoptimistic picture of the traffic. The evidence he provided is, however, detailed and convincing. Kerr used it to estimate that traffic totalling 49,660 tons a year was conveyed by canal flat between Liverpool and Chester via Whitby locks. This, in other words, was the local canal traffic between Chester and Liverpool,³² and the issue here is whether the total in 1827–28 would have been close to the 1836 figure. The answer is probably that it was. The Ellesmere & Chester Canal had ended up with an isolated, expensive and roundabout waterway running through a largely rural area. Only at its Denbighshire extremity was there significant local industrial traffic. The

Table 5 Estimates of waterway traffic, Chester sub-region, 1827–28

<i>Mode</i>	<i>Tons</i>	<i>%</i>
<i>Coastal traffic</i>		
Evidence from Customs Bills 1827:		
Coasting traffic, Chester–Liverpool, coasting vessels 1827 (Table 1)	6,430	
Coasting traffic, Liverpool–Chester, coasting vessels 1827 (Table 2)	1,252	
Total	7,682	
Canal traffic switched to coasting during 1827 dispute (August–December) (Tables 3–4)	3,085	
Total	10,767	
<i>Canal traffic</i>		
Chester–Liverpool traffic (Kerr’s estimate, 1836)	49,660	
Chester–Manchester traffic (Frost’s estimate, 1836)	13,000	
Chester–Shropshire traffic (using Wilson’s 1808–09 data)	30,862	
Total	93,522	
<i>Modal split of Chester–Liverpool waterway traffic</i>		
‘Normal’ coastal traffic	7,682	13.40
‘Normal’ canal traffic	49,660	86.60
Total	57,342	
Coasting traffic during the 1827 dispute (August–December) (from Customs Bills)	6,800	27.86
Canal traffic during 1827 dispute: five-twelfths of 49,660 less 3,085 tons	17,607	72.14
Total	24,407	

For further explanation see text.

company’s gross income was more or less stagnant between 1820 and 1832 and it began to rise only after the canal was connected to the national network in 1833.³³ This resulted in the development of narrow-boat traffic from the Midlands, and Kerr’s survey carefully distinguishes these ‘boats’ from the purely local flat-borne traffic between Liverpool and Chester.³⁴ Although there may have been some increase in the latter, reflecting economic growth between 1827–28 and 1836, it is nevertheless reasonable to conclude that this traffic continued at roughly the same level from the 1820s to 1836 and that Kerr’s figure for the latter year is a good approximation to that eight years earlier.

Kerr was interested only in traffic between Chester and Liverpool. There was another significant flow between Chester and Ellesmere Port, that to Runcorn and Manchester. This was estimated at 250 tons a week in 1836, or 13,000 tons a year, and consisted of ‘flour, malt, cheese, agricultural produce generally and Manchester goods to Chester and North Wales’.³⁵ Again, if it were assumed that the 1827–28 figure was similar, the total Wirral Line traffic would have been about 62,660 tons (Table 5). The growth of the inland narrow-boat traffic means that Kerr’s figures for traffic beyond Chester cannot be used for 1827–28. Wilson has, however, published a breakdown of the canal’s income by traffics and areas in 1808–09, when it was still an isolated system.³⁶ Analysis of his figures reveals that three-quarters of its income

came from industrial traffic in its Welsh upper reaches. Only one-quarter came from the Wirral line and from goods passing between Chester and the 'Shropshire Line' above the city. The split of the Chester-based income was two-thirds to the Wirral Line traffic (i.e. Chester–Ellesmere Port) and one-third to that above Chester. There is no reason to think these proportions would have altered much by the 1820s, so if they are applied *pro rata* they suggest the traffic on the canal above Chester came to 30,862 tons. It is estimated, therefore, that in total the canal was transporting over 93,000 tons of traffic to, through and from Chester in 1827–28 (Table 5).

As for the coastal route, Kerr gave a figure of 9,568 tons, a figure that relates plausibly to the 7,682 tons of 1827, particularly since the lead traffic remained on the river after the traders' dispute. He reported that 'a very small proportion [of traffic] goes by the R. Dee', though he did confirm that 'the lead works have five flats [which] generally go down the Dee'.³⁷ Around 1827–28 it would appear that the coastal route normally carried about 13 per cent of the Chester–Liverpool waterway traffic, the bulk of which consisted of bricks from the downstream wharves. During the 1827 dispute Chester's traders possibly increased the coastal route's share to around 28 per cent (Table 5). Any permanent revival of the coastal route clearly posed some threat to the canal, but the prospect faded in 1828.

It is possible to estimate the ton mileage of waterway traffic in the Chester sub-region as well as its crude tonnage, and the results are shown in Table 6. Contrary to conventional wisdom, ton mileage figures within a sub-region may be of more questionable value than simple tonnages, since they are distorted by accidents of geography and history. In the Chester sub-region coastal shipping had to take the long way round the top of the Wirral peninsula, whilst long-distance canal boats took a wandering route through south Cheshire to get to Whitchurch and beyond. In Table 6 an attempt is made to discount the effect of circuitous routes by taking the 'direct' distance

Table 6 Estimated ton-mileage of waterway traffic, Chester sub-region, 1827–28

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>
<i>Route</i>	<i>Tons</i>	<i>Miles</i>	<i>Ton miles</i>	<i>Direct miles</i>	<i>Direct ton miles</i>	<i>%</i>
	<i>Canal</i>					
Chester–Liverpool	49,660	18	893,880	18	893,880	49.16
Chester–Manchester	13,000	16	208,000	13	169,000	9.29
Chester–Shropshire	30,862	31	956,722	20	617,240	33.94
Total canal	93,522		2,058,602		1,680,120	92.40
	<i>Coastal</i>					
Chester–Liverpool	7,682	36	276,552	18	138,276	7.60
	<i>Total water</i>					
All routes	101,204		2,335,154		1,818,396	

Notes *a* Chester–Manchester: sub-regional section between Chester and Runcorn. Chester–Shropshire: sub-regional section between Chester and Whitchurch. *e* 'Direct miles': shortest direct route distance between points. *f* Ton miles by direct route distance. *g* Percentage of ton miles by direct route distance. For further explanation see text.

between relevant points. The estimates generated by this approach suggest that canal traffic above Chester generated about one-third of water transport's ton miles, whilst that between Chester and Liverpool contributed about one-half.

The Buckley tramroads

Coasting traffic to Liverpool was only part of that on the river in the 1820s. Bricks, pottery and coal were also exported along the North Wales coast and, importantly, to Ireland, traffics which in their maritime stage are not considered in this study. These products did, nevertheless, depend on land transport over the three miles from Buckley to the river, and they formed a distinct, self-contained, flow of traffic within the sub-region. The Aston, Mancot and Sandycroft horse tramroads carried much of this traffic³⁸ but evidence on the amount is scanty. The quality of the permanent way was poor and pottery, in particular, still tended to use the roads, giving 'employment to a large number of independent carters or jaggars, most of them from the local farms'.³⁹ In 1839 the Aston tramroad, by far the most important of the three, carried 47,709 tons down to the Dee, of which bricks formed 58 per cent and coal 37½ per cent.⁴⁰ If it were assumed that the Aston tramroad carried 80 per cent of the traffic, the total amount transported to the Dee wharves by tramroad in that year would have been about 60,000 tons. In 1837 Customs Bill evidence shows that 12,190 tons of bricks and clay were exported to Liverpool from the wharves served by the Flintshire tramroads. This forms 20 per cent of the estimated total of tramroad traffic in 1839, two years close enough to be comparable. In 1827 5,812 tons of bricks and clay were exported to Liverpool. This was 48 per cent of the 1837 total,⁴¹ so if it is assumed that the proportions of Liverpool and non-Liverpool traffic were the same in 1827 a *pro rata* calculation suggests that 29,060 tons came down the Flintshire tramroads in that year, covering 87,180 ton miles. No reference to any uphill traffic has been found, though return loads may have been consumables for the brickfields, potteries and coal mines.

Estimating road traffic: methodological problems

In addition to reviving coastal traffic to Liverpool during the 1827 dispute, the Chester traders had another option, that of combined road and water transport. Goods could be sent on the Wirral turnpike to Eastham Ferry or to Woodside, opposite Liverpool, and shipped thence by Mersey flat. At the outset of the dispute this option was indeed considered and it was reported that 'arrangements are in progress for bringing general merchandise [to] Eastham which it is calculated can be done at a lesser cost than even the old rates of tonnage charged by the Canal Co.'⁴² The statement was clearly hyperbole, and no further evidence has come to light on the diversion of canal traffic to the roads during the dispute. This is not, however, to dismiss the importance of road transport in the Chester area.

The difficulty of estimating road traffic is well known, and predictable problems arise in the Chester context. The only surviving traffic censuses date from 1836 and 1844 and were carried out for railway promoters.⁴³ These provide some valuable evidence on the structure of traffic in the sub-region but they are neither comprehensive nor contemporary with the period being examined.⁴⁴ For freight traffic the approach has, therefore, to be indirect, and it uses gate rental income data from turnpike trusts.⁴⁵ The validity of doing this has been the subject of some debate. Freeman used income data in his important study of south Hampshire turnpikes.⁴⁶ Spencer, Griffin, Wilson and Hallas, together with Phillips and Turton, have also used toll income in various ways to analyse traffic trends and the relative importance of different roads.⁴⁷ Williams asserted, however, that gate rents are not an accurate reflection of the volume of traffic on a road, although he later used such data as evidence of increasing traffic in the Workington and Whitehaven districts of Cumbria.⁴⁸ Gerhold has perhaps been most sceptical of turnpike income data. His objections relate mainly to their value in identifying trends over time and over a wide area with variable road maintenance costs and gate spacing characteristics, as is the case in the Philips and Turton study.⁴⁹ Work on the Chester sub-region certainly confirms that turnpike trust income returns from 1817 onwards can be misleading, since they often include non-toll income, especially loans, in the figures.⁵⁰ It is therefore important to use evidence relating directly to tollgates rather than trust income overall. Even then the gate rental income cannot be used to estimate the amount of traffic unless the actual tolls paid by road users are factored into the equation as well as evidence on exemptions, special rates and the freedom of traffic to pass and repass gates on any one day. This study attempts to apply such evidence to produce estimates of the total tonnage and ton mileage of traffic using the main roads and hence of their importance relative to the canal and coastal routes. The process is inevitably somewhat complicated, and the detailed figures produced must be regarded as extremely tentative, but they do suggest a plausible picture.

All the tollgates around Chester were normally leased to toll farmers by the 1820s. The rental income to the turnpike trusts did not, therefore, equate with the total tolls paid at the gates, since by definition the rent was pitched at less than the toll income in order to provide the farmer with his profit. The rent figure, in other words, normally understates the actual tolls paid and hence the traffic. Contemporary evidence of rent arrears and the termination of farmers' contracts suggests, nevertheless, that the margin between rent payable and toll received was often slim.⁵¹ Whatever the profit margins, the rental values appear to have directly reflected the income potential of the different roads, and evidence from the study area reinforces the view that gate rents can be a sound indicator of relative traffic volumes.

Passenger traffic on the roads

Passenger traffic on the roads will be examined first. Although many studies have used directory evidence to estimate traffic on scheduled stage coaches,

the amount of private passenger traffic in carriages, on horseback and on foot is usually left vague or is ignored altogether. Table 7 attempts to estimate both types in the Chester area. The pattern of stagecoach services in 1828 is known from local directories, and if assumptions are made about the average loading of coaches an estimate of their traffic volume on the eight roads radiating from Chester can be produced.⁵² A census on the Liverpool road in 1836 revealed an average loading of 9.29 passengers per coach, so, to allow for some inflation in the 1830s, a round figure of nine persons per coach is assumed for 1828.⁵³ Applying this figure to all the services suggests that Chester's coach services carried about 180,000 passengers a year, or 3,500 passengers a week, to, through and from the city. There were direct long-distance services to London, Birmingham and Holyhead but the number of travellers to such exotic destinations was relatively small. The volume traffic was to closer destinations. That to Liverpool was paramount, and here there was competition from the canal. The Wirral canal packets were well publicised and have been of considerable interest to historians,⁵⁴ but by the 1820s the service seems to have been in decline.⁵⁵ Sir George Head found 'not more than twenty or thirty passengers' on it in the summer of 1835, so if we assume an average daily loading of twenty-five per trip in 1827–28 the packet would have carried 18,200 passengers in that year.⁵⁶ It accounted, therefore, for about one-quarter of the Liverpool traffic, probably mainly poorer people, with the stage coaches carrying at least 75 per cent. The Liverpool road carried around one-third of the road passengers and passenger miles of the sub-region.⁵⁷ The Wrexham road was the second busiest route. The strength of Chester's connections with Liverpool and with Wales and the Marches contrasts with the relative weakness of those to the east and south-east.

Between 23 September and 6 October 1836 an employee of Robert Kerr stood at Sutton on the Liverpool road and took details of everything going past.⁵⁸ This evidence, together with a rather cruder count done on the Wrexham road in 1844,⁵⁹ is a valuable indication of the amount of private traffic on the sub-region's roads at the time. The aim of the exercise was to produce estimates of likely rail traffic between the main towns, and it is possible, even likely, that the census takers tried to weed out local travellers, particularly those on foot. Figures for private traffic based on the 1836 and 1844 proportions almost certainly underestimate the true amounts for these reasons but they are the best we have. There is also the definitional problem of what constitutes a significant 'journey' in historical terms. Before the availability of cheap passenger transport poorer people commonly walked several miles to work or for social purposes, and it is certainly the case that transport historians need a better understanding of the significance of local movement on foot in past periods. With all these qualifications in mind, the Liverpool and Wrexham road counts suggest that about 20 per cent of travellers were in private carriages of various types and another 11 per cent were on foot or horseback. These proportions have been applied in Table 7 and they indicate that private carriages may have carried nearly 55,000 people a year on the main roads, whilst at least 30,000 travelled significant distances on foot or

horseback. In regions with widely varying population densities it may be necessary to estimate the differential traffic generation characteristics of sub-districts, but this is not thought necessary in the relatively homogeneous Chester sub-region. Journeys by private conveyance were likely to have been shorter than those by stage coach. To arrive at a figure for private passenger miles it has been assumed, therefore, that such trips averaged only half the distance of scheduled services. This produces an estimate of about 660,000 passenger miles per annum, 186 per cent of all road passenger miles.

A word of caution has to be entered here. In estimating 'passenger' journeys it should not be assumed there is in practice a clear distinction between passenger and freight traffic. A grey area exists between the two that reflects the complex purposes of travel. This can be illustrated by the case of James Higginson, a farmer from Great Barrow, near Chester. He kept a diary from October 1817 to January 1819 that reveals much about his family's trips in the sub-region and it is clear that many of the journeys were multi-purpose. A trip to Chester by farm cart, for example, would typically involve his wife taking butter and poultry to market, deals to buy livestock or sell grain, attempts to extract payment from business associates as well as finding out the latest market prices. The day would commonly be topped off by a drinking session in the pub.⁶⁰ This evidence emphasises how 'transport' facilitates a complex range of activities involving the movement of people, commodities, money, information and ideas. Quantitative estimates of traffic should be a means to recognise the scale of these functions, not to obscure them.

Freight traffic on the roads

On 19 July 1823 a cart clattered on to the Bridgegate weighing machine in Chester and the ticket that survives reveals it was carrying 23 cwt 3 qtr of coal, almost certainly from a pit in Flintshire.⁶¹ In January 1829 William Rutter, a scheduled carrier based at the Hop Pole inn in Chester, was paid £2 10s for transporting an iron weighing machine all the way from Warrington to the Aston Hall estate, near Hawarden.⁶² These evidential fragments are examples of the traffic in coal and general merchandise travelling the sub-region's roads in the 1820s. The account of traffic on the old Dee bridge with which this article began provides a similar but more comprehensive picture. None of this evidence tells us, however, how much freight there was in measurable terms, and it is to this problem that we now turn.

Estimating the freight traffic on the Chester sub-region's roads has to rely on indirect methods, and the results are shown in Table 8. The approach starts with known data on the rental income of tollgates on the sub-region's turnpikes, and column b specifies this for each of the sub-region's turnpikes in the year 1827–28. The gates were put up for bids each year, normally around May/June, and the official notices to tender specified the rents in the previous year. The rents for the year 1827–28 were culled mostly from notices in the *Chester Chronicle*. In many cases values were specified for individual gates, but for present purposes the rents shown for each road are an

Table 8 Estimated road freight traffic in the Chester sub-region, 1827-28

<i>a</i>	<i>b</i> Turnpike passenger traffic				<i>e</i> Scheduled carriers				<i>i</i> Private carriers				<i>n</i> All freight carriage			
	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>	<i>l</i>	<i>m</i>	<i>n</i>	<i>o</i>	<i>p</i>	<i>q</i>
Liverpool	1,560	6	327-60	109-20	0	0	4	0-00	436-80	1,123-20	2,592	26,957	26,957	15-01	100-00	0-00
Frodsham	604	6	109-20	36-40	58	9,048	5	188-50	334-10	269-90	498	5,182	14,230	7-92	36-42	63-58
Ashton	93	6	0-00	7-76	0	0	5	0-00	7-76	85-24	157	1,637	1,637	0-91	100-00	0-00
Northwich	383	6	88-40	29-47	30	4,680	5	97-50	215-37	167-63	309	3,219	7,899	4-40	40-75	59-25
Nantwich	375	6	67-60	22-53	4	624	5	13-00	103-13	271-87	502	5,220	5,844	3-25	89-32	10-68
Littleton	246	6	0-00	0-00	0	0	5	0-00	0-00	246-00	454	4,723	4,723	2-63	100-00	0-00
Whitchurch	830	6	109-20	36-40	6	936	4	15-60	161-20	668-80	1,543	16,051	16,987	9-46	94-49	5-51
Wrexham	1,635	9	327-60	109-20	110	17,160	8	572-00	1,008-80	626-20	361	13,150	30,310	16-88	43-39	56-61
Mold/Northop	1,612	9	109-20	36-40	42	6,552	5	136-50	282-10	1,329-90	1,637	59,580	66,132	36-82	90-09	9-91
Dee Bridge	153	9	0-00	0-00	0	0	6	0-00	0-00	153-00	235	2,448	2,448	1-36	100-00	0-00
Parkgate	106	6	15-60	5-20	4	624	4	10-40	31-20	74-80	173	1,795	2,419	1-35	74-21	25-79
Total	7,597		1,154-40	392-56	254	39,624		1,033-50	2,580-46	5,016-54	8,463	139,961	179,585		77-94	22-06

Notes *a* Littleton, Dee Bridge: locally generated traffic estimated from residual toll income of combined roads (see map). *c* Toll on the road per horse drawing a passenger vehicle in 1828. *d* Annual tolls paid by scheduled coaches (Table 7), assuming four-horse coaches. *e* Annual tolls paid by private traffic at 2.5% of total toll income from passenger traffic; Ashton road estimated from average of Frodsham and Northwich roads. *f* Weekly trips by scheduled carriers from Pigot's Directory, 1828 (total trips both directions). *g* Total annual tonnage carried by scheduled carriers at three tons per trip. *h* Toll on road per horse drawing goods vehicle with 6 in. + wheels, 1828; on Northop-Mold road it is assumed that half the traffic was coal at the special rate of 3d per horse. *i* Annual tolls paid by scheduled carriers, assuming six-horse waggons at the published toll rate per horse, one toll per return trip ($(f/2) \times \text{toll} \times 6 \times 52$). *j* Total toll income paid by all passenger traffic and scheduled carriers. *k* Residual toll income paid by local private freight carriers ($(b-i)$). *m* Tonnage p.a. carried by local private carriers at 4 cwt per trip on Cheshire roads and 24 cwt per inward and 4 cwt per outward trip on Welsh roads. For further explanation see text. Small discrepancies in some totals are due to cumulative rounding error.

aggregate of all gates within the sub-region controlling that road. This does not result in double counting of income, for reasons explained below. Wide variation in the value of roads can be seen, with the Liverpool and Welsh roads standing out clearly as the most prosperous. Part of the income was paid by passenger traffic, and it is necessary to weed this out of the calculation. In column c of Table 8 the toll per passenger horse on each road is shown. In 1827–28 tolls were levied once a day on each vehicle, so the toll paid at the first gate ‘freed’ other gates and covered a return trip within the day on the road. This is the reason why the use of total gate rental income on a road does not result in double counting of the same trips.⁶³ This principle has been applied in calculating the number of passenger and freight trips made. Stage coaches were generally pulled by four horses, and so their toll payments can be estimated by multiplying the known data on services by the tolls charged (Table 7 and column d of Table 8). The Liverpool road traffic census of 1836⁶⁴ suggests that about 25 per cent of toll-paying horses were engaged in private passenger traffic, so the income from these has been added in column e. It is then necessary to estimate the income from known scheduled carrier services.⁶⁵ There was an extensive network of carriers’ services on the sub-region’s roads in the 1820s but the directories revealed one surprise. There was not one scheduled carrier on the Liverpool road, despite its primacy for passenger traffic. It is clear that the all-water routes between Chester and Liverpool rendered the road/ferry alternative uncompetitive for scheduled carriers. Carrier services were, however, extensive on the Frodsham road and especially on the Welsh roads. It is assumed that typically the carriers used six-horse waggons,⁶⁶ and, again, the number of toll-paying trips can be multiplied by the tolls charged on each road to produce estimates of the tolls paid by stage waggon traffic. It is important to stress here that the actual tolls charged on each road were not necessarily the maximum allowed by the relevant Act and that there were normally more punitive rates for waggons with wheels under 6 in. wide. The rates shown are those actually in force in 1827–28 from the best local evidence, and it is assumed that stage waggon operators were prudent enough to avoid higher tolls by running vehicles with 6 in. wheels. The resultant toll incomes are shown in column i of Table 8. The total amount paid by scheduled passenger and freight traffic and by private passengers can now be totalled for each road (column j) and the result subtracted from the known income of each road. In each case a residue of income remains. This residue must be the amount of toll income paid by the local carriers, farmers and drovers (column k). It will be seen that on all but three roads the income from this traffic exceeded that of all the other operators, and in the sub-region as a whole it produced nearly twice the income of the other traffic. This is only what one would expect. The majority of road freight in the early nineteenth century, as now, must have been moved in unadvertised journeys by largely unknown operators either working on their own account or for payment, and much of it would have been moved relatively short distances. The actual amount of this freight therefore needs to be estimated, but the surviving evidence is paltry as regards

who carried it, how often, how much they carried and how far they went. Some assumptions can be made, nevertheless, from the shreds of evidence that do exist.

Between 1806 and 1820 a local carrier plied the roads and lanes between Warrington and Northwich just outside the study area. Both his name and the village from which he operated are unknown⁶⁷ but he has left evidence of his loads and in some precious cases their weight and their origin and destination. They were mainly from Northwich and Warrington to consumers in the country, which suggests he was a farmer seeking profitable return loads. He conformed in most ways with Everitt's description of the country carrier.⁶⁸ His vehicle was small, his average load was only 4 cwt and his known trips averaged 6.6 miles.⁶⁹ His low-intensity operation is in sharp contrast with the work of scheduled interurban carriers, but there is every reason to believe the evidence is sound. Most local traffic then, as now, was moved because it was immediately necessary for business, and in such circumstances it was not possible, or even economic, to ensure large or full loads. Four hundredweight in a one-horse cart was low in comparison with the weights carried by scheduled carriers but it is a plausible average to use for traffic on the rural roads of Cheshire. The coal traffic from Flintshire is another matter. Here it can be assumed that the trips were regular and that full loads were carried from the pits into Chester. We have an indication from the Bridgegate weighing machine of what a full load of coal may have been – nearly 24 cwt. It would have needed a two-horse cart. This weight was carried only from the coal-field, however, and for the purpose of estimating the average load of private waggons on the Welsh roads it is assumed that loads on the return trip were 4 cwt, making an average of 14 cwt overall.

These assumptions on the average load and motive power of private local waggons are applied to Table 8 in columns l and m to estimate the number of trips and the tonnage moved by such operators. In doing this the question of concessionary toll rates, punitive rates and exemptions has to be considered. On the one hand, coal traffic from Flintshire on the Northop road was afforded a concessionary toll, namely $2d$ per horse for carts with wheels of 6 in. or more and $3d$ for those under 6 in.⁷⁰ This was the only concessionary toll in the sub-region. Evidence suggests that narrow-wheel coal carts were commonplace,⁷¹ so the $3d$ toll rate has been applied. Coal's proportion of the combined traffic on the Mold/Northop roads is unknown, so it has been assumed, admittedly arbitrarily, that it formed half the traffic. Timber traffic on the Northwich, Nantwich, Whitchurch and Mold roads was, on the other hand, subject to higher tolls of $9d$ or $10d$ per horse,⁷² and all trusts imposed higher tolls on narrow-wheel vehicles and punitive ones on those whose wheels had projecting nails. In the absence of any run of detailed gate receipts there is no way of knowing the proportion of traffic affected by these special and punitive charges, but their overall impact may well have been offset by exemptions for traffic passing along roads only a short distance as well as by the compounding of tolls by regular operators.⁷³ Taking all the evidence together, the conclusion drawn here is that, apart from the special case of

Flintshire coal, the welter of special rates, exemptions and compounding probably cancelled each other out and that reasonable estimates of private traffic travelling the sub-region's main roads can be produced using the basic tolls charged for broad-wheel waggons. What this exercise will not produce, however, is an estimate of the short-distance farm and construction traffic subject to standard exemptions in the turnpike Acts. This shadowy but considerable movement must be borne in mind when the figures for the traffic that can be estimated are considered. There is also one type of toll-paying traffic on the turnpikes that has proved impossible to estimate – the droving of animals. The movement of animals to market on foot was clearly one of the significant traffics of the pre-railway age, but local evidence of it on Chester's turnpikes roads is sketchy. It suggests, however, that the amounts were sufficiently small to be discounted in these calculations.⁷⁴ Further work is undoubtedly necessary here, however.

With these caveats in mind, the calculations behind Table 8 indicate that the amount of private freight traffic on the sub-region's main roads in 1827–28 was nearly 140,000 tons. To this figure must be added the amount of freight moved by scheduled carriers. It is assumed that the carriers used six-horse waggons and that their load factor was higher than the local private carts'. Three tons is therefore taken to be their average load,⁷⁵ and this results in the figures of traffic moved by scheduled carriers shown in column g of Table 8. Adding the tonnage moved by scheduled carriers to that by private operators finally produces an estimate of the overall total tonnage of freight on the roads (column n). The description of Dee bridge traffic in 1825 stated that 'the coals for the supply of Chester ... the iron of Denbighshire ... the lead of Flintshire ... the timber from Wales and Shropshire and the cheese of a very large extent of the country' crossed the old Dee bridge into Chester. This graphic description can now be supported by specific figures. Over 96,000 tons of freight went to and from Chester on the Welsh roads in 1828, just over half the sub-regional total (column n). Private local carriers moved the majority of this freight but the scheduled carriers carried a substantial amount nevertheless, particularly on the Wrexham road. The failure of the Ellesmere Canal to build its line up Gresford Bank to Wrexham had left road carriers, both scheduled and private, with a monopoly of direct traffic from the Wrexham area.

The large volume of traffic generated by the industrial parts of the sub-region can be contrasted with that on the roads serving the rural areas. The Ashton, Nantwich, Whitchurch and Parkgate roads subsisted mainly on freight generated by the local farming economy. Even here the existence of a direct canal alternative seems to have reduced the traffic potential of the Nantwich road in comparison with that to Whitchurch. Long-distance carriers' waggons rumbled along both the Whitchurch and the Nantwich roads a few times a week but they were insignificant in the total traffic. The scheduled carriers played a bigger role on the Northwich and Frodsham roads, particularly the latter, on which forty-four waggons a week connected Chester with the Trent & Mersey Canal at Preston Brook.⁷⁶ The rather limited service on

the Northwich road is probably evidence of how the mid-Cheshire saltfield was oriented to Merseyside rather than to Chester. Carriers played no role on the Liverpool road for reasons already discussed but this does not mean the Liverpool road was bereft of freight. Agricultural traffic was in fact described as 'considerable' in 1837, being 'generally carried by the farmers themselves in their own carts'.⁷⁷ Much of it was destined for Liverpool and included market garden produce from the Chester area and the Wirral peninsula.⁷⁸ The evidence suggests that this and other freight on the Liverpool road amounted to around 27,000 tons a year.

The computations suggest, therefore, that nearly 180,000 tons of freight were moved by road in the Chester sub-region in 1827–28, or rather under 3,500 tons per week. Over three-quarters of this traffic was in the hands of private unscheduled carriers (column p). The process has, therefore, generated measurable indicators of the work done by freight transport operators, but how sound are the figures produced? The overall picture is plausible in terms of the relative traffic volumes on the different roads and the split between scheduled and local carriers. It does not follow that the actual tonnages are reasonable. The problem is, of course, that there are almost no contemporary figures against which to test the modern estimates. Nevertheless, some evidence from the 1830s and 1840s does suggest they are in the right target area. William Jenkins, a Chester weights and measures inspector, reckoned in 1837 that a total of 17,378 tons of freight a year was carried to and from Chester on the Frodsham, Northwich, Nantwich and Whitchurch roads.⁷⁹ The estimate here for 1827–28 indicates that 44,960 tons were carried on these roads, not at first glance a very promising result. The method appears to have overestimated the traffic. This may not be the case, however. For a start, witnesses to railway Bill committees almost certainly underestimated or even discounted local traffic in their calculations. Secondly, three changes in the transport infrastructure between 1828 and 1837 probably produced a real fall in road traffic on these routes in the intervening years. The Liverpool & Manchester Railway was opened in 1830, and it quickly led to the rerouting via Liverpool of much high-value freight and passenger traffic between Chester and Manchester. In 1836 it was stated that 'the Carriers have abandoned the Carriage of [goods] by Land' between Chester and Manchester.⁸⁰ New canals connected Chester directly with the national canal network in 1831 and 1835. These changes decimated the carrier traffic to Preston Brook and probably undermined long-distance road freight on the Nantwich and Whitchurch roads. If the underestimation of local traffic and these developments of the 1830s are factored out of the equation, the figure of 44,960 tons for 1827–28 is more plausible. In 1844 William Jenkins was back on the witness stand for the North Wales Mineral Railway Bill. He stated then that 21,840 tons of coal were carried from the Flintshire pits to Chester by carrier, but he went on to add, 'I do not know how much is carried by private cart,' with the implication that it was an additional amount.⁸¹ He estimated Chester's coal consumption at that time as 57,933 tons a year, most of which came from Flintshire by road or up the Dee.⁸² The 1827–28

estimate of freight on the Northop/Mold roads serving Flintshire is 66,132 tons. This figure includes not just the coal traffic about which Jenkins spoke but the wide range of other goods passing to and through the Chester sub-region from the Flintshire industrial area and rural north Wales. The present figures and some more or less contemporary estimates can thus be credibly related to each other and Table 8 seems to paint a plausible picture of traffic volumes in the Chester sub-region's roads in 1827–28 produced by methods that might be applicable elsewhere.

A full picture of the work done by road transport needs to include ton-mile statistics as well as crude tonnages carried. Calculations for the Chester sub-region are shown in Table 9. The problem here is that estimates have to be made of the average length of haul of different types of traffic. For the scheduled hauliers it is assumed, with two minor exceptions, that this was the distance between Chester and the settlement at the sub-region boundary (column c).⁸³ Local private traffic had, by definition, a shorter length of haul, and on rural Cheshire roads 6.6 miles has been adopted on the basis of evidence from the Northwich area carrier.⁸⁴ On the Welsh roads the distances to the Flintshire pits and the Wrexham industrial area have been used.

These calculations suggest that over 1.53 million ton miles of freight haulage took place on the Chester sub-region's roads in 1827–28. The ton-mile statistics are naturally more flattering to the work done by scheduled carriers. They accounted for one-third of the ton miles in the area, despite the fact that they carried only just over one-fifth of the crude tonnage. Their waggons dominated traffic on the Frodsham, Northwich and Wrexham roads. The overall evidence documents yet again, however, the major role in freight transport played by local private carriage in the Chester sub-region. It is the work of this

Table 9 Estimated road freight ton miles in the Chester sub-region, 1827–28

<i>a</i> Road	<i>b</i> <i>Scheduled carriers</i>		<i>c</i> <i>Private local carriers</i>				<i>g</i> Total ton miles	<i>h</i> Total ton miles	<i>i</i> Scheduled (%)	<i>j</i> Private (%)	<i>k</i> Total (%)
	<i>Tons p.a.</i>	<i>Miles</i>	<i>d</i> <i>Tons p.a.</i>	<i>e</i> <i>Ton miles</i>		<i>f</i> <i>Miles</i>					
				<i>p.a.</i>	<i>p.a.</i>						
Liverpool	0	12	0	26,957	6.6	177,916	177,916	11.56	0.00	100.00	
Frodsham	9,048	14	126,672	5,182	6.6	34,201	160,873	10.45	78.74	21.26	
Ashton	0	6	0	1,637	6.6	10,804	10,804	0.70	0.00	100.00	
Northwich	4,680	17	79,560	3,219	6.6	21,245	100,805	6.55	78.92	21.08	
Nantwich	624	20	12,480	5,220	6.6	34,452	46,932	3.05	26.59	73.41	
Littleton	0	2	0	4,723	2	9,446	9,446	0.61	0.00	100.00	
Whitchurch	936	20	18,720	16,051	6.6	105,937	124,657	8.10	15.02	84.98	
Wrexham	17,160	12	205,920	13,150	10	131,500	337,420	21.93	61.03	38.97	
Mold/Northop	6,552	11	72,072	59,580	8	476,640	548,712	35.66	13.13	86.87	
Dee Bridge	0	1	0	2,448	1	2,448	2,448	0.16	0.00	100.00	
Parkgate	624	11	6,864	1,795	6.6	11,847	18,711	1.22	36.68	63.32	
Total	39,624		522,288	139,962		1,016,437	1,538,725		33.94	66.06	

Notes *b*, *e* Tonnages from Table 8. *c* Distance to named settlement, except Liverpool road (to Bebington), Frodsham road (to Preston Brook) and Ashton road (actual length of road). *f* Cheshire roads 6.6 miles average, from D5245/3 carrier data; Wrexham road: to Wrexham industrial area; Mold/Northop Road: to Buckley collieries. For further explanation see text.

sector that needs more investigation to understand fully the significance of road transport in the economy of the industrial revolution period.

Traffic in the Chester sub-region

Having estimated separately the traffic carried by road, canal, coastal shipping and tramroad it is now possible to review the total picture and produce a 'modal split' of transport in the sub-region in the late 1820s. In doing so it is important to be aware of the fragmented perspective on transport that emphasising modes and routes can suggest. The sub-regional transport system was an interconnected entity, and many of the goods and people being moved used more than one mode or route in the course of a single journey. Bricks from Buckley, for example, used tramroad or cart and then coaster or canal flat and Mersey flat in the course of their trip to Liverpool. Farm produce from Great Barrow was sent by cart to Chester or driven to Preston Brook and then transferred to the canal. Passengers from Liverpool to Whitchurch began their journey by Mersey ferry to Eastham or Ellesmere Port and changed to stage or canal packet for Chester and usually then to another stage for the final leg of their journey. A private carriage or a long walk might well complete the trip. Machinery sent from Warrington to the Aston Hall estate went all the way by road but would appear in the tonnage statistics for both the Frodsham and Northop roads.⁸⁵ The overall estimates of traffic carried on the different modes and routes are, therefore, measures of the total transport work done in the sub-region. Much of this work will have been done to the same goods or people in the course of their journeys.

These factors must be borne in mind in considering Table 10. This summarises the total traffic carried in the Chester sub-region in 1827–28 and the modal split of the traffic. In terms of crude tonnage the estimates suggest that nearly 310,000 tons of freight were moved in the sub-region in 1827–28 and that road transport was the largest single element in this movement (column c). Humble carts and waggons carried approaching 60 per cent of the freight, and at the sub-regional level this measure of transport activity has much to recommend it. It emphasises the importance of short-distance movement to the functioning of a local economy. The canal carried rather under one-third of the traffic and was, therefore, of lesser, though by no means negligible, importance. The tramroads carried about one-tenth of the tonnage, but coastal shipping to Liverpool played only a minor role. The road estimates do not include, furthermore, local traffic which avoided the turnpike system altogether, such as that within the towns or deep in the countryside, so the full significance of road transport is still understated.

A rather different picture emerges if ton-mile statistics are considered. The sub-region's transport carried over 3.4 million ton miles of freight in 1827–28, but by this criterion the relative importance of road is reduced. The canal's significance for longer-distance haulage is more apparent. The waterway's main role was to link the sub-region with areas beyond its boundaries and as a conduit for through traffic.

Table 10 Traffic in the Chester sub-region, 1827–28

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>
<i>Freight</i>							
<i>Route</i>	<i>Tons</i>	<i>%</i>	<i>'Direct' ton miles</i>	<i>%</i>	<i>Rate per ton mile (d)</i>	<i>Cost (£p)</i>	<i>%</i>
<i>Canal</i>							
Chester–Liverpool	49,660		893,880		5	18,622.50	
Chester–Manchester	13,000		169,000		5	3,520.83	
Chester–Shropshire	30,862		617,240		5	12,859.17	
Total	93,522	30.18	1,680,120	48.78		35,002.50	33.72
<i>Coasting</i>							
Chester–Liverpool	7,682	2.48	138,276	4.01	3.10	1,786.07	1.72
<i>Tramroads</i>							
Buckley–river Dee	29,060	9.38	87,180	2.53	6	2,179.50	2.10
<i>Roads</i>							
Liverpool	26,957		177,916		13	9,637.12	
Frodsham	14,230		160,873		13	8,713.95	
Ashton	1,637		10,804		13	585.22	
Northwich	7,899		100,805		13	5,460.27	
Nantwich	5,844		46,932		13	2,542.15	
Littleton	4,723		9,446		13	511.66	
Whitchurch	16,987		124,657		13	6,752.25	
Wrexham	30,310		337,420		8	11,247.33	
Mold/Northop	66,132		548,712		8	18,290.40	
Dee Bridge	2,448		2,448		8	81.60	
Parkgate	2,419		18,711		13	1,013.51	
Total	179,586	57.96	1,538,724	44.67		64,835.47	62.46
<i>All modes</i>							
Total	309,850		3,444,300			103,803.53	
<i>Passenger</i>							
	<i>Total</i>	<i>%</i>	<i>Passenger miles</i>	<i>%</i>	<i>Rate per mile (d)</i>	<i>Cost</i>	<i>%</i>
<i>Canal</i>							
Wirral packet	18,200	6.40	327,600	8.45	1.33	1,815.45	5.78
<i>Roads</i>							
All roads	266,261	93.60	3,548,942	91.55	2	29,574.51	94.22
Total	284,461		3,876,542			31,389.96	
<i>All traffic</i>							
						<i>Cost</i>	<i>%</i>
Freight						103,803.53	76.78
Passenger						31,389.96	23.22
Total						135,193.49	

Notes *b* Passenger from Table 7; freight from Tables 5 and 8. *d* Passenger from Table 7; freight from Tables 6 and 9, using 'direct' ton miles. For further explanation see text.

A third measure of the relative significance of transport is how much people paid for it. Although evidence is available of the tolls charged by turnpikes and the canal company it is unsatisfactory in itself, since such charges were only part of the cost of transport to the final consumer. Carriers' costs

and profit have to be included as well as the costs of using own-account vehicles and horses.⁸⁶ There are details of carriers' rates set by the local justices but they say little about what was actually happening out on the roads.⁸⁷ The only answer is to use fragments of (often conflicting) information on the actual charges levied by carriers for the transport of goods and passengers. In the case of road transport some assumptions have to be made on the cost of private transport to those with the means to afford it. In most cases the evidence which survives is in terms of a specific charge per ton for goods or passengers transported between particular places, and these figures need to be converted into per-mile figures. An estimate then has to be made of the 'typical' rate per mile that will fairly encompass the diversity of circumstances in the sub-region.

On the canal the available evidence in the 1820s and 1830s ranges between 3·33*d* per ton mile for bricks between Chester and Liverpool and 6·67*d* per ton mile for general cargoes on the same route, with figures in between for cargoes to Manchester.⁸⁸ Fivepence per ton mile is taken as the average.⁸⁹ A rate for coastal shipping is superficially easier to specify, since a carrier advertised rates in 1828, but the resultant figure of 1·56*d* per ton mile based on the roundabout route of thirty-six miles actually travelled is misleadingly low.⁹⁰ Using the direct distance between Chester and Liverpool produces a better comparison with the canal. By this criterion coastal shipping was still significantly cheaper, at 3·1*d* per ton mile. Road carriers' charges were doubtless very varied, but only limited information survives. The Northwich carrier seems, on average, to have charged around 13*d* per ton mile, and this has been used here as the rate for Cheshire roads. The rates for the more intense industrial traffic on the Welsh roads were lower. An average of 8*d* has been used for these roads.⁹¹ Robert Kerr helpfully gave figures for the cost of both stage and private travel on the Liverpool road in 1836, and his evidence is the basis of the figure of 2*d* per mile for passenger traffic, although higher stage charges on other roads are taken into account in this figure.⁹²

Application of these ton or passenger-mile rates to the traffic data produces the cost estimates shown in column g of Table 10. They suggest that over £135,000 was spent directly on transport in the Chester sub-region in 1827–28, 23 per cent of it on passenger travel and 77 per cent on freight. The distribution of this money broadly reflects the balance of work done in terms of goods moved (column d) but the greater distance travelled by canal traffic is reflected in the fact that the average load by canal cost 9*s* a ton for its transport, as compared with 7*s* 3*d* a ton by road.⁹³ Transporting goods by canal may have been cheaper in ton-mile terms but longer hauls still meant that more was spent on canal transport ton for ton. This conclusion emphasises that an assessment of the full economic costs and benefits of more 'efficient' transport is not straightforward.

Estimates of the expenditure on different modes of transport and on different routes offer, nevertheless, the potential for a more fundamental examination of the costs and benefits to a local economy of the actual mix of transport facilities. A full analysis is beyond the scope of this article but two

examples can be given. The evidence suggests that nearly £104,000 was spent in 1827–28 on freight transport in the Chester sub-region, over 60 per cent of it on road transport. The canal nevertheless played a significant role, and we can assess in crude financial terms its benefit to the area. If all the freight on the canal in 1827–28 had had to use road transport it would have added over £17,000 to transport costs in the sub-region, nearly 17 per cent more than the actual expenditure.⁹⁴ Such a counterfactual speculation is clearly open to the objection that traffic totals, patterns and facilities would have been different had the canal not been built. It is perhaps more legitimate to speculate on the results of not building a canal in the area. The Ellesmere company's inability to complete a direct route between Wrexham and Chester meant that traders were forced to rely on road haulage, and this imposed extra costs of over £2,700, nearly 2.6 per cent of freight transport expenditure in the sub-region.⁹⁵

Conclusion

One of transport history's objects is to identify the work done by transport within the wider economy. This object has in practice proved difficult to attain but an increasing number of enterprise-based and regional studies have demonstrated a fruitful way forward in recent years. The present work on the Chester sub-region in 1827–28 has rested on the premise that such regional studies need to find ways of quantifying the total amount of traffic flowing in and through an area at a particular date. This ideally should lead to a full investigation of the wider relationship between transport and the local economy and between the different transport facilities available. The aim here has been more modest. It has been to arrive at some plausible estimates of traffic as a necessary part of this wider process and to tackle some of the methodological problems that arise in doing so. The findings do, nevertheless, suggest some issues needing further investigation in other regions and in other time periods.

The first issue clearly concerns the methodology. It has been argued that it is possible to arrive at estimates of traffic in an area even when data from traffic censuses and returns are largely lacking. Limited evidence from the early Railway Age has been used to corroborate the estimates made here, but the basic methods used, particularly those relating to the roads, need to be tested elsewhere to help confirm or reject their validity. In doing so consideration has to be given to how the evidence is actually presented, since the conclusions drawn will reflect the performance criteria adopted. Depending on the measures used – tons, cost or ton miles – the canal in the Chester sub-region was, for example, responsible for either 30 per cent or 34 per cent or 49 per cent of freight transport (Table 10). To say this is not to obfuscate the issue but to render more precise the basis on which such judgements are made.

The second issue relates to the pattern of traffic revealed in this study. The Chester sub-region in 1827–28 could be viewed as a microcosm of England and Wales in the industrial revolution. Its economy was clearly influenced by

the dynamic industrial and commercial areas near by, yet the majority of its population still worked in agriculture and at its heart was an essentially pre-industrial city.⁹⁶ Although the area's geography imposed distinct characteristics on its transport pattern, Chester's traffic may illustrate, nevertheless, a region in the middle of the development spectrum, neither dynamic heartland nor isolated backwater. A number of features are apparent. Both the transport network and the services provided seem to have been sub-optimal in relation to the demands placed on them. Coasting was undermined by the poor state of the Dee, the tramroads were rudimentary, whilst the canal route was circuitous and the company discriminated against local traffic. Even the road system suffered a major bottleneck at the old Dee bridge. The Chester sub-region seems to exemplify Freeman's preference for 'development by shortage' in the relation between economic growth and transport investment.⁹⁷ Marked improvements were to come in the 1830s. Within this situation the roads are revealed as the most important transport medium. The road network was clearly both comprehensive and competitive for many transport needs, whereas the other transport modes performed more specialist or local functions. The Chester area amply confirms, therefore, the importance now attached to road transport in this period.⁹⁸ Within road transport local private freight traffic seems to have been vastly greater than scheduled carrier services. This suggests that the emphasis given to the latter in the literature is somewhat misplaced; more work has to go into the study of local carters and private carriage. The scheduled stage coaches were dominant in the passenger travel that can be estimated, and their role in facilitating market knowledge, business contacts and finance was doubtless significant. Passenger traffic formed, however, under one-quarter of the total transport work done in the sub-region. This figure suggests the lack of opportunity for mass passenger travel before the arrival of the railways.⁹⁹

Although the heart of the Chester sub-region was primarily rural and pre-industrial, its traffic flows nevertheless reflected industrialisation and growing international trade. The heaviest traffic in the area was generated by economic interchanges connecting north-east Wales, south Lancashire and Liverpool. Although simple historical geography would predict these linkages, the evidence presented here has permitted an assessment of their volume. The large volume of traffic in the sub-region from these areas is a measure of the dramatic transport impact of the industrial revolution even on areas outside the industrial heartlands. A study of the Chester sub-region sixty years before would doubtless reveal a markedly different pattern and volume of traffic.

A more important question is whether traffic estimates for the 1820s in regions similar to Chester would tend to reflect the patterns suggested by this study. Equally important is the need for work on regions both more and less developed than Chester. It will always be the case that the figures produced by such work will rest on challengeable assumptions and will be wrong, even if they are in the right target area. These problems will confirm some people in their belief that such attempts to quantify are of questionable value. The

counter-argument is, however, that comprehensive traffic estimates must have a part to play if transport history is to come up with a more rigorous, comprehensive and explanatory view of transport, especially in the key period of the industrial revolution.

Notes

- 1 Cheshire and Chester Archives (hereafter CCA), TRB/49, Chester Dee Bridge Bill, Statement of fact in favour of the Bill, c. May 1825. The original says 'Derbyshire' rather than Denbighshire, clearly a transcription error.
- 2 M. Robbins, 'The progress of transport history', *Journal of Transport History*, third series, 12, 1 (1991), p. 85.
- 3 E. Jones, 'A transport private saving calculation for the brewers Truman, Hanbury and Buxton, 1815–63', *Journal of Transport History*, third series, 7, 1 (1986), pp. 1–17; G. Turnbull, 'Scotch linen, storms, wars and privateers: John Wilson and Son, Leeds linen merchants, 1754–1800', *Journal of Transport History*, third series, 3, 1 (1982), pp. 47–69.
- 4 J. Langton, *Geographical Change and the Industrial Revolution* (Cambridge, 1979); G. Turnbull, 'Canals, coal and regional growth during the industrial revolution', *Economic History Review* 40, 4 (1987), pp. 539–40; C. S. Hallas, 'On the hoof: road transport in the Yorkshire dales, 1750–1900', *Journal of Transport History*, third series, 17, 1 (1996), pp. 20–42; M. J. Freeman, 'The stage coach system of south Hampshire, 1775–1851', *Journal of Historical Geography*, 1, 3 (1975), pp. 259–81; 'The carrier system of south Hampshire, 1775–1851', *Journal of Transport History*, new series, 4, 2 (1977), pp. 61–84; 'Turnpikes and their traffic: the example of southern Hampshire', *Transactions of the Institute of British Geographers*, new series, 4 (1979), pp. 411–34; R. Unwin, 'The transport systems of the Vale of York, 1660–1775', *Journal of Transport History*, third series, 2, 2 (1981), pp. 17–36; R. G. Wilson, 'Transport dues as indices of economic growth, 1775–1820', *Economic History Review*, second series, 19, 1 (1966), pp. 110–23; T. Barrow, 'Corn, carriers and coastal shipping: the shipping and trade of Berwick and the borders', *Journal of Transport History*, third series, 21, 1 (2000), pp. 6–27.
- 5 Wilson, 'Transport dues'.
- 6 Unwin, 'The transport systems'; Barrow, 'Corn, carriers and coastal shipping'.
- 7 D. McCloskey, '1760–1860: a survey' in R. Floud and D. McCloskey (eds), *The Economic History of Britain since 1700 I, 1700–1860* (second edition, 1994), p. 259; M. J. Freeman, 'Introduction' in D. H. Aldcroft and M. J. Freeman (eds), *Transport in the Industrial Revolution* (Manchester, 1983), pp. 18–21.
- 8 R. Szostak, *The Role of Transportation in the Industrial Revolution: a comparison of England and France* (Montreal, 1991), p. 1.
- 9 J. Foreman-Peck, 'Railways and late Victorian economic growth', in J. Foreman-Peck (ed.), *New Perspectives on the Late Victorian Economy: essays in quantitative economic history, 1860–1914* (Cambridge, 1991), chapter 3.
- 10 The defined sub-region is centred on Chester and extends to the nearest significant towns which were originating and destination points for traffic passing into, and through, the region. These towns are Liverpool, Frodsham, Northwich, Nantwich, Whitchurch, Wrexham and Mold. Each of these places could, in turn, be the centre of a sub-region subject to similar study. The sub-regional population figures exclude Liverpool.
- 11 For Chester's history in the nineteenth century see J. Herson, 'Victorian Chester: a city of change and ambiguity', in R. Swift (ed.), *Victorian Chester: essays in social history, 1830–1900* (Liverpool, 1996), pp. 16–19, and C. P. Lewis and J. D. Herson, 'Late Georgian and Victorian Chester, 1762–1914', in C. P. Lewis and A. T. Thacker (eds), *A History of the County of Cheshire V, The City of Chester*, Victoria County History of England series (Oxford, 2002), pp. 228–77; for the role of the port see J. D. Herson, 'Canals, railways and the demise of the port of Chester', in P. Carrington (ed.), *Where Deva spreads her wizard stream: trade and the port of Chester*, Chester Archaeology Occasional Paper 3 (Chester, 1996), pp. 75–89.
- 12 D. O'Hearn, 'Irish linen: a peripheral industry', in M. Cohen (ed.), *The Warp of Ulster's Past: ... the Irish Linen Industry, 1700–1920* (1997), pp. 163–90.
- 13 This was less than half the England and Wales average of 15.8 per cent.

- 14 The literature on the Lancashire industrial area is voluminous. For north-east Wales see A. H. Dodd, *The Industrial Revolution in North Wales* (Cardiff, third edition, 1971), especially chapters v–viii; K. Davies, ‘The growth and development of settlement and population in Flintshire, 1801–1851’, *Journal of the Flintshire Historical Society*, 22 (1972/73), pp. 63–97; G. C. Lerry, ‘The industries of Denbighshire’ I, *Transactions of the Denbighshire Historical Society*, 6 (1957), pp. 74–8.
- 15 R. E. Porter, ‘Agricultural Change in Cheshire during the Nineteenth Century’, unpublished Ph.D. thesis, University of Liverpool (1974); R. Porter, ‘The marketing of agricultural produce in Cheshire in the nineteenth century’, *Transactions of the Historic Society of Lancashire and Cheshire*, 126 (1977), p. 149.
- 16 J. W. Clarke, ‘The building of the Grosvenor bridge’, *Journal of the Chester Archaeological Society*, 45 (1958), pp. 45–55.
- 17 Two other turnpikes, the Whitchurch–Warrington and the Wrexham–Nantwich, passed through the fringes of the region. Both carried significant traffic unrelated to Chester and provide a reminder that regions should never be seen as closed centripetal economies. Their traffic has not, however, been assessed as part of this research. Only the minor road to Farndon and Holt was not turnpiked in the 1820s, though a trust was set up at the surprisingly late date of 1854. W. Harrison, ‘The development of the turnpike system in Lancashire and Cheshire’, *Transactions of the Lancashire and Cheshire Antiquarian Society*, IV (1886), 80–92; ‘Appendix II’, X (1892), 237–48.
- 18 The road to Tarvin and Northwich was turnpiked in 1769. Its intermediate date could reflect the Cheshire saltfield’s ambiguous relation to the county town.
- 19 *Chester Chronicle*, 11 August 1826.
- 20 For a fuller discussion of the politics of the river Dee in this period see Herson, ‘Canals, railways’, pp. 75–7 and 81–4.
- 21 CCA CCF/6/18, Admiralty inquiry into Dee navigation improvement, Chester, 1849: minutes of evidence. Evidence of John Myers, partner in Dixon & Myers, Chester timber merchants, and evidence of Capt. John Jones.
- 22 C. Hadfield, *The Canals of the West Midlands* (third edition, 1985), pp. 42–4. The canal provided an outlet for the Montgomeryshire system at Frankton.
- 23 Herson, ‘Canals, railways’, pp. 79–83.
- 24 The company also manipulated tolls to favour long-distance carriage from north-east Wales and Shropshire to Ellesmere Port at the expense of Chester and the Dee link. PRO RAIL 826/7, Ellesmere Canal, Sub-committee and Finance Committee Minutes, 5 February 1805; PRO RAIL 826/8, Ellesmere and Chester Canal Order Book, 29 August 1816. In 1814 and again in 1817 tolls were altered to ensure that coal and other traffic from Denbighshire would be nowhere more expensive than rival traffic from Flintshire via the Dee. PRO RAIL 826/4, Ellesmere and Chester Canal General Committee Minutes, 20 July 1814, 25 July 1816 and 31 July 1817.
- 25 The Customs Bills of Entry are held by the Merseyside Maritime Museum Archive. Data were collected for all imports, exports and clearances on the Dee–Mersey route for the complete years 1827 and 1837. Similar data were sampled for October in the years 1826, 1832 and 1834. These data are held on an Access database at Liverpool John Moores University. The traffic was almost always recorded by reference to the customs office rather than the wharf of origin or destination on the Dee and near by – Chester, Flint, Mostyn or Rhydland (Rhuddlan). The term ‘Chester’ covered the river down to Connah’s Quay as well as the city itself, but it is possible to distinguish most of the city-based traffic from the more distinctive cargoes handled at the downstream wharves.
- 26 Between 1 April 1822 and 31 March 1823 58,000 bricks were sent in five separate loads to Liverpool from Catherall’s brickworks at Buckley, using the canal route. A similar amount in 1827 would have been about 5 per cent of the brick exports to Liverpool in that year. Flintshire Record Office (hereafter FRO) D/HC/C/83, Account for freight from Chester by the Ellesmere Canal, P. Coffield & Co. to Messrs J. & W. Catherall, April 1822–July 1823.
- 27 The company had gained powers to do this by 7–8 Geo. IV, cap. 102, which received the royal assent on 21 June 1827. The burghers of Chester had been caught napping during the committee stages of the Bill. J. Priestley, *Historical Account of the Navigable Rivers, Canals and Railways throughout Great Britain* (1831), pp. 252 and 260–2. All rates were roughly doubled, but even more obnoxious to Chester traders was a new clause which stipulated that goods travelling less than twelve miles on the canal, and passing through a lock, would be subject to a surcharge of 2s per ton. Another clause allowed any boat carrying

- less than thirty tons, and passing through a lock, to be charged for thirty tons 'at the highest rates unless water be running over the Waste Weirs of the Locks'.
- 28 The trades represented included milling, corn dealing, lead production, brewing, chemicals, ironfounding, timber merchants and the food, drink and tobacco trades.
 - 29 Only some goods in the original Customs Bills are shown in tons; the rest are listed in a multiplicity of measures. Conversion factors have therefore to be applied, the most important of which are: oats, one bushel = 42 lb; barley, one bushel = 56 lb; wheat, one bushel = 63 lb; bricks, 193 to the ton; lead shot, one bag = 56 lb. The grain measures are the same as those used by Barrow, 'Corn, carriers and coastal shipping', table 8, and approximate to those quoted in B. R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), agriculture, table 5, p. 86. The other conversion factors used can be obtained from the author. The conversion factor for bricks was obtained from FRO D/HC/C/83, Account for freight.
 - 30 'The canal carriers were therefore informed that it was expected that they would immediately get registered a sufficient number of flats to carry all the goods which might be ordered by the river.' Report of the Traders' Committee, *Chester Courant*, 1 January 1828. Eight flats used, the *Acton Grange*, *Orford*, *John Shanklin*, *Supply*, *Lord Hill*, *Liverpool*, *Hannah* and *Brother and Sister*, were never included in the Dee or Liverpool shipping registers and six of them were noted on the canal route in 1836. FRO S/1 Ships Register, 19 April 1836 to 17 June 1848; Merseyside Maritime Museum Archive, C/EX/L/4/42-4, Register Books, Liverpool, 17 December 1825 to 14 November 1827; House of Lords Record Office (HLRO), Evidence, HC, Vol. 7, Chester & Birkenhead Railway Bill, 14 April 1827.
 - 31 In October 1827 the company offered to reduce some of the new tonnage charges on condition that the traders and canal carriers abandoned the river. The canal carriers had caved in by the middle of December and despite blustering from the Trade Committee most traffic seems to have reverted to the canal after January 1828, though Walkers Parker lead boats continued to use the Dee thereafter. PRO RAIL, 826/7, Ellesmere Canal Sub-committee and Finance Committee Minutes, 1805-46, 14 December 1827.
 - 32 HLRO, Evidence, HC, Vol. 7, Chester & Birkenhead Railway Bill, evidence of Robert Kerr, 14 April 1837, pp. 7-19 and 26-9. Broad-beamed flats did not normally trade beyond Christleton, three miles above Chester, so traffic carried in them can be assumed either to be local or to have been transhipped from narrow boats at Chester. Such traffic could have been transhipped to Dee flats in 1827.
 - 33 Herson, 'Canals, railways', table 10.1 and pp. 80-1; PRO, RAIL 826/4 and 826/5, Ellesmere & Chester Canal General Committee Minutes, 1813-27 and 1827-45.
 - 34 HLRO, Evidence, HC, Vol. 7, Chester & Birkenhead Railway, 17 April 1837, p. 29
 - 35 HLRO, Evidence, HL, 1836, Vol. 6, Manchester & Cheshire Junction Railway, 13 July 1836, evidence of James Garrett Frost, corn miller and merchant, Manchester. Frost was a well informed witness and a partner in Frost's Steam Mill in Chester. The firm used the canal extensively.
 - 36 E. Wilson, *The Ellesmere and Llangollen Canal: an Historical Background* (1975), appendix iii.
 - 37 HLRO, Evidence, HC, Vol. 7, Chester & Birkenhead Railway, 14 April 1837, pp. 3 and 30.
 - 38 J. I. C. Boyd, *The Wrexham Mold and Connah's Quay Railway* (Oxford, 1991), pp. 18-42.
 - 39 J. E. Messham, 'The Buckley Potteries', *Flintshire Miscellany No. 1*, Flintshire Historical Society Publications (1956), p. 49. The firm of Catherall's also had twenty-eight of its own carts in 1817.
 - 40 FRO, D/DG/48, Miscellaneous notes by Denis Griffiths re. Flints. Clay Industries, entry 'notes on Flintshire industries'. The other products were iron, 4.4 per cent, and pottery, 0.5 per cent. Coastal coal exports were restricted by the imposition of coal duty until its final abolition in 1831. In 1806 it was estimated that 16,000 26 cwt chalders of coal, or 20,800 tons, were exported from the Flintshire coalfield, and this amount probably stayed much the same until 1831. 'The slump of 1826 was the beginning of a long spell of lean years' in the coalfield. Dodd, *Industrial Revolution in North Wales*, pp. 201-2.
 - 41 Liverpool Customs Bills of Entry database, 1837 and 1827.
 - 42 *Chester Courant*, leader, 7 August 1827.
 - 43 HLRO, Evidence, HC, Vol. 7, 1837, Chester & Birkenhead Railway Bill; HLRO, Evidence, HC, 1844, Vol. 29, North Wales Mineral Railway Bill; Appendix C, Committee of Inquiry into Chester & Crewe Railway Bill, 1837, in Teachers' Centre, Tarporeley, *From Nantwich to Chester Town* (Chester, 1973), copy in Chester Library.

- 44 Quite apart from the substantial economic growth which occurred between the 1820s and the 1836–44 period, the opening of the Liverpool & Manchester Railway in 1830 and the Birmingham & Liverpool Junction Canal in 1835 had significant effects on sub-regional traffic flows.
- 45 Eileen Willshaw has provided a general review of Chester's carrying trade and coach services, but she was unable to provide details of specific services, the traffic volumes involved or the goods carried. E. Willshaw, 'The Inns of Chester', unpublished M.A. thesis, University of Leicester, 1979, pp. 77–80.
- 46 Freeman, 'Turnpikes and their traffic', pp. 411–34.
- 47 K. H. Spencer, 'Railways and turnpikes in Preston, 1830–50', *Transport History*, 6, 3–7, 1 (spring 1977), p. 49; C. P. Griffin, 'Transport change and the development of the Leicestershire coalfield in the Canal Age: a reinterpretation', *Journal of Transport History*, new series 4, 4 (1978), pp. 232–4; Wilson, 'Transport dues', pp. 110–23; Hallas, 'On the hoof', p. 31; A. D. M. Phillips and B. J. Turton, 'Staffordshire turnpike trusts and traffic in the early nineteenth century', *Journal of Transport History*, third series, 8, 2 (1987), 126–46.
- 48 L. A. Williams, *Road Transport in Cumbria in the Nineteenth Century* (1975), pp. 62 and 100.
- 49 D. Gerhold, 'Introduction: carriers, coaches and road traffic in the horse-drawn era' in D. Gerhold (ed.), *Road Transport in the Horse-drawn Era* (Aldershot, 1996), p. xvi.
- 50 CCA QDT3/4, Chester–Frodsham Turnpike Income and Expenditure Returns, 1823–58; QDT3/5 Chester, Neston and Woodside Turnpike, 1822–59; QDT3/6 Chester and Northop Turnpike, 1825–81; QDT3/7 Chester and Tarvin Turnpike, 1823–58; QDT3/8 Chester and Whitchurch Turnpike, 1822–71; QDT3/9 Chester and Wrexham Turnpike, 1822–77; QDT3/29 Nantwich and Woore Turnpike, 1822–75; QDT3/31 Northwich and Kelsall Turnpike, 1822–33.
- 51 See CCA LTB/1/2 Chester and Frodsham Turnpike Trust, Minute Book, 1821–37 (gate rental receipts at the rear of the book); CCA LTD1/1, Chester and Northop Turnpike Trust, Minute Book, 1828–38. In 1806–07 the Chester and Wrexham Turnpike Trust failed to let its gates and collected its tolls directly. In that year the trust succeeded in collecting in tolls only 77 per cent of the rental income it was able to get from leasing the gates the following year. This indicates the attractiveness of toll farming to trust administrators. CCA LTE/2, Chester and Wrexham Turnpike Trust, Treasurer's Journal of Accounts, 1795–1808.
- 52 Data on stagecoach services taken from Pigot & Co's. *Directories of Cheshire and North Wales, 1828/29*. These sources in fact contain detail anomalies but the overall pattern of services is clear.
- 53 HLRO, Chester & Birkenhead Railway, 17 April 1837, evidence of Robert Kerr, forwarding agent, Liverpool, table 1. Freeman found an average of 8.45 passengers per coach in Hampshire. 'The stage coach system', p. 276.
- 54 For example, Hadfield, *The Canals of the West Midlands*, pp. 169 and 179.
- 55 Only one boat operated during the 1820s, and there were a number of changes of lessee together with numerous arrears of rent to the canal company. PRO RAIL 826/8, Ellesmere & Chester Canal Order Book (Chester Sub-committee), 1813–34.
- 56 Sir George Head, *Home Tour through the Manufacturing Districts of England in the Summer of 1835* (reprinted 1968), p. 61.
- 57 Although passenger miles are shown in Table 7, the number of passengers may, contrary to conventional wisdom, be a better indicator of the work done by stage coaches, since the passenger-mile figure merely reflects the location of the sub-regional border town. Nantwich and Whitchurch happen to be farther from Chester than Liverpool and Wrexham, and this inflates the apparent importance of their services in passenger miles.
- 58 HLRO, Evidence, HC, Vol. 7, Chester & Birkenhead Railway Bill, 14–17 April 1837, evidence of Robert Kerr; the parliamentary writer has written 'Southall' but this is probably a mistake for Sutton (Hall) at the half-way point of the Liverpool road.
- 59 HLRO, Evidence, HC, 1844, Vol. 29, North Wales Mineral Railway, 7 June 1844, evidence of William Jenkins.
- 60 CCA, DDX106, Diary of James Higginson, farmer, probably of Great Barrow, 1817–19. On 21 November 1818 he solemnly resolved to 'drink no more wiskey' but four days later he 'got drunk again' on another trip to Chester.
- 61 FRO, D/BC/911, Miscellaneous papers of Dr William Currie, Boughton Hall, Chester.
- 62 FRO, D/BC/620, Aston Hall Estate Rentals and Accounts, 1821–29.

- 63 It is noteworthy, however, that a number of local turnpike Acts were renewed in 1828–29 and the trusts involved sought to restrict the right of free passing and repassing, particularly for stage coaches. These trusts had the same clerk, Henry Potts of Chester, and the provisions were identical. See 9 Geo. IV, cap. 71, Chester and Frodsham Road Act, 1828; 10 Geo. IV, Chester and Tarvin Road Act, 1829; 9 Geo. IV, cap. 74, Chester and Northop Road Act, 1828.
- 64 HLRO, Chester–Birkenhead Railway Bill, evidence of Robert Kerr
- 65 From Pigot & Co's *Directories* for Cheshire and North Wales, 1828.
- 66 No local descriptions of local stage waggon teams have been found, so a compromise of six horses per waggon has been adopted on the basis of evidence for feeder services to Russell's waggons investigated by D. Gerhold, *Road Transport before the Railways: Russell's London Flying Waggons* (Cambridge, 1993), pp. 64–5.
- 67 CCA, D5245/3, Carrier's Ledger, 1806–19. The geographical distribution of the carrier's known trips suggest a base in the Stretton–Budworth area. Only data covering 1818–19 have been used, since this was closest to the study period.
- 68 A. Everitt, 'Country carriers in the nineteenth century', *Journal of Transport History*, second series, iii (1976), especially pp. 184–7.
- 69 The carrier evidence is not totally straightforward, since the full set of necessary variables – distance, weight and cost – is never present together. The average distance of known trips was 6.6 miles. The average price of all trip loads was 17d and the average price per hundredweight was 4.27d. If we assume that 4.27d per hundredweight was paid for the average 6.6 mile journey, it follows that if the average price of loads was 17d for that distance the average weight of loads was $17d \div 4.27d = 398 \text{ cwt} - 4 \text{ cwt}$ in round figures.
- 70 For every horse drawing a waggon or cart with wheels less than 6 in., 3d; for carts with wheels 6 in. or more, 2d. Report of the Select Committee on the Roads from London to Holyhead and from Chester to Holyhead, 3 May 1822, *Parliamentary Papers* vi, 35 (Return of Henry Potts on tolls on the Chester–Northop road).
- 71 CCA LTD1/1, Chester and Northop Turnpike Trust, Minute Book, 1828–38, 20 June 1828.
- 72 10d on the Mold road, 9d on the other three.
- 73 On 18 September 1828 Sarah Rutter, a Chester stage waggon operator on the Frodsham road, was allowed to compound for her tolls at the Trafford and Netherton gates for one year for a sum of £45. This sum was about the same as the maximum charge under the existing toll regime that allowed free passing/repassing on the same day, but the new tolls introduced in August 1828 would have doubled her payments. CCA LTB/1/2 Chester and Frodsham Turnpike Trust, Minute Book, 1821–37. Hemingway provides a valuable table showing the 'amazing increase' in turnpike tolls brought in by the 1828–29 Acts on the various roads, increases he was 'at a loss to account for'. J. Hemingway, *History of the City of Chester* (Chester, 1831), ii, p. 236.
- 74 Jenkins estimated that calves on the Wrexham road from Wales to Chester and Liverpool in 1844 numbered 2,600. These would have contributed about 0.8 per cent of the road's toll income. On the Liverpool road Kerr's 1836 census showed animals contributing about 0.5 per cent of the income. The diary of James Higginson indicates that only about 1 per cent of his family's trips involved droving. These journeys were to deliver livestock for the Manchester market to the canal wharf at Preston Brook, a distance of eleven miles. The evidence from these three sources is therefore consistent but the amounts still seem suspiciously small. Both Williams and Hallas have, however, emphasised that drovers tended to travel cross-country and to avoid metalled roads. HLRO, Evidence, HC 1844, Vol. 29, North Wales Mineral Railway Bill, 7 June 1844, William Jenkins, appendix C; HLRO, Evidence, 1837, Commons Vol. 7, Birkenhead & Chester Railway Bill, 14 April 1837, Robert Kerr; CCA, DDX106, Diary of James Higginson; Williams, *Road Transport in Cumbria*, p. 24; Hallas, 'On the hoof', p. 25.
- 75 D. Gerhold quotes load estimates of between 13 cwt and 15 cwt per horse for the period between 1816 and the 1830s, or between 39 and 45 tons per six-horse waggon. The average of three tons per waggon is assumed here to take account of Welsh and Cheshire hills and a proportion of under-capacity operation. D. Gerhold, 'Productivity change in road transport, 1690–1840', *Economic History Review* 49, 3 (1996), p. 50.
- 76 The Trent & Mersey provided access to the rest of the canal system and, in particular, to water carriage from Manchester, the Potteries and the Midlands as well as London. The Ellesmere Canal system provided no such access in 1828, although the pattern was to change in the 1830s. The limited amount of local traffic on the Northwich road was probably because it passed through Delamere, a wooded area of sandy soil and poor agriculture.

- 77 HLRO, Chester & Birkenhead Railway, evidence of Robert Kerr, 14 April 1837, p. 112.
- 78 Porter, 'Agricultural change in Cheshire', pp. 226–7. Hemingway provided evidence to corroborate this when he reported that in 1784 'one flat only was then sufficient for the carrying trade from [Eastham] to Liverpool; whereas the number now employed [1831] for that purpose amounts to from twenty to thirty'. Hemingway, *History of Chester*, ii, p. 335.
- 79 Teachers' Centre, Tarporley, *Nantwich to Chester*, Document 24. He did not, unfortunately, apportion it to the different roads.
- 80 HLRO, Evidence, HL, 1836, Vol. 6, Manchester & Cheshire Junction Railway Bill, 13 July 1836, evidence of James Garret Frost, corn miller and merchant, Manchester. He gave evidence of the transfer of passenger and mail traffic to the railway route through Liverpool. Another witness, Joseph Janion, a wool draper, of Chester, gave evidence that woollen goods from Yorkshire to Chester went by rail to Liverpool, from there to Birkenhead or Eastham by ferry and thence by road to Chester.
- 81 HLRO, North Wales Mineral Railway, evidence of William Jenkins, 7 June 1844, p. 35 and appendix C.
- 82 The water route involved carriage by tramroad from the pits to the Dee and transshipment into boats for Chester. This was expensive for such a short journey, and in 1831 it was stated that the price of Flintshire coal sent to Chester by road was the same as that by water. Hemingway, *History of Chester* ii, p. 337.
- 83 Some of their traffic was undoubtedly shorter-distance but that travelling beyond the sub-regional boundary more than counterbalanced it.
- 84 CCA D5245/3, Carrier's Ledger.
- 85 FRO, D/BC/620, Aston Hall Estate Rentals and Accounts, 1821–29, account of William Rutter, haulier, Chester.
- 86 James Higginson spent £9 17s 5d maintaining his 'long cart' in 1818. A detailed breakdown of costs is given. CCA DDX106, Diary of James Higginson.
- 87 Denbighshire Record Office (DRO) QSD/AA/1/1, Carriers' Rates, Denbighshire Quarter Sessions, 1806–24 (includes evidence on the Cheshire roads); DRO BD/A/190, Easter Quarter Sessions, 1827, Rates of Carriage for the Borough of Denbigh.
- 88 FRO, D/HC/C/83, Account for freight from Chester; HLRO, Evidence, HC, 1837, Vol. 7, Chester & Birkenhead Railway, 14 April 1837, pp. 31–4; HLRO, Evidence, HL, 1836, Vol. 6, Manchester & Cheshire Junction Railway, 13 July 1836, p. 30.
- 89 The evidence behind this rather high figure suggests there was indeed a strong element of monopoly pricing in canal transport in the Chester area at the time. This was, of course, precisely the grievance of the Chester traders during the 1827 dispute.
- 90 *Chester Courant*, 15 July 1828. 'Joseph F. Moss, New Crane, Chester and Nova Scotia, Liverpool, ... has commenced an establishment of sailing vessels, coastways, between this port and Liverpool, four days a week.' He charged 4s a ton for minerals and 5s 4d a ton for grain.
- 91 The average of the Northwich carrier's known trips is actually 12·93d per ton mile. The evidence for transport from Flintshire and the Wrexham Road ranges from 6·5d per ton mile for iron but 9d for general traffic and between 6·75d and 12d per ton mile between 1831 and 1844 for Flintshire coal. Hemingway stated in 1831 that the price of Flintshire coal delivered in Chester was 12s 6d a ton. The pithead price at that time was about 8s per ton, so 4s 6d represented transport cost over eight miles, or 6·75d per ton mile. CCA D5245/3, Carrier's Ledger; Hemingway, *History of Chester* ii, p. 337; HLRO, Evidence, HC, 1844, Vol. 29, North Wales Mineral Railway, appendix C.
- 92 The average for traffic on the Liverpool road was 19d per mile. Stages on the Wrexham road were 3d a mile in 1844. HLRO, Chester & Birkenhead Railway, 14 April 1837, pp. 88–99; HLRO, Evidence, HC, 1844, Vol. 29, North Wales Mineral Railway, appendix C.
- 93 I.e. column (h) divided by column (c).
- 94 It is assumed that if the canal had not existed road carriage for long-distance traffic would have been more competitive, so that the rate would have been 8d per ton mile, 3d more than the canal. Using this figure, the 1,680,120 ton miles carried by canal would have cost £21,001.50 more than the actual cost of £35,002.50. Existing traffic on the Liverpool road might have benefited from the saving, costing £3,706.58 less, and the net increase in cost would therefore have been £17,294.92, 16·66 per cent of the estimated 1827–28 amount. Total sub-regional transport freight costs would have risen to £121,098.45.
- 95 On the Chester–Liverpool route, with a direct canal alternative, roughly 65 per cent of freight traffic went by canal and 35 per cent used the road. It could be assumed, therefore,

- that a canal on the Wrexham route would have taken 65 per cent of the freight, i.e. 219,323 out of 337,420 ton miles. This would have travelled at 3d per ton mile less than by road, a saving of £2,741.54, or 2.64 per cent of freight transport costs in the region.
- 96 Herson, 'Victorian Chester', pp. 13–51.
- 97 Freeman, 'Introduction', pp. 21–3.
- 98 T. Barker and D. Gerhold, *The Rise and Rise of Road Transport, 1700–1990* (Basingstoke, 1993), pp. 11–14.
- 99 James Higginson, who seems to have been a reasonably prosperous farmer, used stage-coach services only twice in the sixteen months covered by his diary. He visited his brother and later went to his brother's funeral in Newport, Shropshire.

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