The decline of chartered markets in 19th century Britain

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Abstract

Between 1827 and 1888, the number of markets in England and Wales dropped from 774 to 421. This paper uses New Economic Geography to analyse how railways caused market decline, focusing on competition between markets and from fixed shops. Using a unique dataset from the Cambridge Population Group we use 'market potential' to analyse the positive effect of railways on markets. By investigating which markets declined, we analyse whether decreased transport costs increased regional inequality in 19th century Britain.

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1 Introduction

125 years later, this dissertation revisits the *1891 Final Report* in light of new evidence. Modern technology has given access to new historical data; GIS (Geographic Information System) software allows precise analysis of transport costs via multimodal network models by simulating least cost routes, given transport parameters. Using GIS data on transport times, I evaluate whether railways caused market decline. In doing so, I address a question behind the railway-markets story: did decreased transport costs increase regional inequality?

To feasibly compile a panel dataset, I focus on the county of Kent. Between 1827 and 1888, markets in Kent declined from 30 to 7, which is more severe than nationally (774 to 421). I also collect alternative data and find that markets declined from 32 to 21, which I detail later. I choose Kent because it provides a larger sample size of candidate-towns and markets than other counties. In addition, my knowledge of the locations and characteristics of the region (because I live there) provides better context for my analysis.

I examine the effect of railways on two sources of market competition: neighbouring markets and fixed shops. I find that railways caused market decline through both sources of competition. Firstly, railways decreased transport costs for consumers, destroying each market's spatial monopoly. Secondly, railways decreased distribution costs, increasing the number of shops. Using New Economic Geography, where increasing returns and imperfect competition play a key role, I analyse *which* markets declined from increased competition. I find that larger markets may have benefited at the expense of smaller markets. I conclude that decreased transport costs increased regional inequality through trade in 19$^{\text{th}}$ century Britain.

My dissertation is organised as follows: literature review, data, theory for markets and shops, econometric method, results and discussion, evaluation, conclusion, and bibliography.

2 Preliminary note on the historical context

Markets were formal places of trade, held regularly at specified times and places. The ancient market system in Britain developed by means of market charters, which were royal grants of monopolies given to individuals. All trade took place strictly through the franchise, for instance the Domesday Tomes (1086) specified 'that no baker shall sell bread before his oven, but [only] in the market of his lordship the King'.[1] Markets depended on charters to sustain the spatial monopoly and it was well known that competition between markets was problematic; Bracton in the Treatise De Legibus (1210-1268) calculated that the minimum distance between markets should be 6.66 miles to prevent competition.[2]

This way of life flourished for centuries. However, between 1827 and 1888, the number of markets in England and Wales fell from 774 to 421. Concurrently in 1887, a British parliamentary enquiry was raised to evaluate the removal of market charters. For four years, the Commissioners investigated markets across Britain, conducting interviews and collecting statistics. The *1891 Final Report* concluded that "*. . . it is obvious that the restriction, the removal of which is now proposed, belongs to a state of society wholly different from that of the present day . . . The existence of railway communication, and generally the changed conditions of modern life, have rendered this limitation arbitrary and inconvenient . . . We have resolved therefore that it is desirable to put an end to the system under which no person is allowed to hold a market within a certain distance of an already existing market . . .*"[3]

Strangely despite years of investigation, this final conclusion was never implemented. But were the contemporaries correct to argue that railways had essentially destroyed the market charter? Did railways therefore cause market decline?

[1] Royal Commission on Market Rights and Tolls (RCMRT:I:p.48)

[2] He divided a days walk of 20 miles into three portions: the morning for travelling to market, the middle of the day for buying and selling, and the evening for returning home. (RCMRT:I:p.21)

[3] (RCMRT:XI:p.118)

3 Literature Review

New Economic Geography (NEG) explains regional inequality using increasing returns to scale that are external to the firm, or 'external economies'. Krugman's (1991b) spatial model shows how external economies, transport costs and monopolistic competition interact to create a core-periphery pattern within regions. Hanson (2005) applies Krugman's model empirically and finds that regional demand linkages caused spatial agglomeration of US employment between 1970 and 1990. Whilst NEG focuses on regional inequality in manufacturing and employment, I extend NEG theory to the retail sector. Following Fujita, Krugman and Venables (1999) I model the economy's spatial structure as the product of two opposing forces. Centripetal forces lead to spatial agglomeration (imperfect competition granted by market charters, and external economies from the concentration of stalls). Centrifugal forces lead to dispersal (high transport costs, which decreased with 19$^{\text{th}}$ century railway expansion).

The retail location literature also models a balance between centripetal and centrifugal forces (decreased consumer search costs vs competition between retailers) (Miller, Reardon and McCorkle 1999). However, empirically the two forces are examined separately through retailer-consumer proximity (Fox, Montgomery and Lodish 2004) and retailer-retailer proximity (Carlson and Gieseke 1983). Only one study decomposes both effects using data on modern US supermarkets (Fox, Postrel and McLaughlin 2007). I extend the literature by examining both forces historically in Victorian Britain. In addition, historical analysis of markets is non-quantitative (Casson and Lee 2011). This study is the first to analyse markets using regressions.

Another concept I use from NEG is '***market*** potential', which captures a location's access to possible ***markets***. Using ***market*** potential in a British study between 1871 and 1931, Crafts (2005) finds that the peripheralisation of the North, Scotland and Wales was caused

by changes in ***market*** potential from changed transport costs. For instance the relative distance between London and Newcastle (the North) increased after road transportation replaced coastal and rail shipping. However, Crafts' analysis of ***market*** potential divided Britain regionally, but not at a GIS micro level. Donaldson and Hornbeck (2016) use GIS data in a '***market*** access' approach to find that US railways increased agricultural land prices and growth between 1870 and 1890. I extend the literature by using GIS micro-data to analyse British ***market*** potential.

The trade and transport literature focuses on prices to analyse railways and regional development. Fogel (1964) uses a 'social savings' approach to examine the impact of US railways in 1890, finding no significant increase in GDP growth from railways. For 20th century China, Banerjee, Duflo and Qian (2012) find that provinces close to railway lines had more firms with higher average firm profits. One variant to prices is population; in 19th century Oxfordshire, Casson (2013) finds that railways increased population growth in larger towns at the expense of smaller towns. As alternative indicators of regional development, I use markets and shops. Furthermore, Donaldson (2015) finds that welfare gains from railways in 19th century colonial India were caused by the gains from increased trade, where decreased trade costs accounted for the majority of real income impacts. I focus on markets and shops as evidence for trade effects from railways.

4 Data

My sample consists of 66 candidate-towns in Kent for the years 1830, 1851, 1881 and 1911. Candidate-towns are places which meet criteria for urban status at any point between 1575 and 1911.[4] They are places which could have had markets.

[4]Criteria in bibliography

4.1 Markets

The binary dependent variable, existence of a market, uses data from the Cambridge Population Group based on 19th century national publications of the Owen's Book of Markets and Fairs. Using data from the 1832, 1856 and 1888 publications, I approximate for the years 1830, 1851 and 1881, corresponding to the transport times and census data.

For extension to 1911, I collect new data on markets using regional trade directories. These are the Melville's (1858) and Kelly's (1882, 1891, 1903, 1913) Kent directories. Trade directories contained detailed characteristics of towns and villages, and were similar to the yellow pages. I find some interesting discrepancies between Owen's and the Kent directories. The Kent directories recorded a smaller decline in markets over the period. Markets declined from 33 to 21 (1834-1882), to 16 (1913), whilst Owen's recorded market decline from 29 to 7 (1834-1888).

This surprising difference can be reconciled by my finding that later versions of the regional Kelly's directory (1903, 1913) included a short front page list of markets which was not comprehensive, since the detailed listings below revealed that markets existed in more candidate-towns. A national publication such as Owen's could similarly list what were viewed as major markets and exclude those that became relatively non-major. Most markets which declined in Owen's also declined in the Kent directories. I suspect that Owen's provides an early indication of decline though market *size*. This suggests that my Owen's analysis should be interpreted as evidence for railways causing *relative* decline, and the Kent directories for *absolute* decline.

4.2 Is the date approximation justified?

I use the closest available publications for markets *after* the years 1830, 1851 and 1881 since railways affecting markets is the direction of causality. However, more railways may have

been built in between times. This leads to market decline being attributed to a lower level of railways. In particular, using 1888 to approximate for 1881 creates the largest error.

4.3 Trade costs

Based on a GIS network database of transportation nodes for the years 1830, 1851, 1881 and 1911, with transportation time parameters, the least cost routes (in hours, which I justify later) are calculated between each candidate-town and parish in Kent. Figure 1 shows the transport network with connections creating the least cost routes.

4.4 Population

I use data from the ICEM census database for the years 1851, 1881 and 1911. I exclude children under 15 since they may have been undercounted. Population data for 1830 are constructed through a linear interpolation between 1817 church register data (collected for men between 1813-1820) and 1851 census data. I use the 1817 male population as a proxy for 1817 female population.

4.5 Ports

Kent had a large coastline where ports had a larger market potential due to access to international trade. Candidate-towns with ports are taken from Killingray's (2004) Historical Atlas of Kent.

4.6 Shops

I count the number of people with the occupation of 'general shop keeper' from the censuses for the years 1851, 1881 and 1911. To create 1830, an interpolation between 1817 (church

register data for men) and 1851 is used, where the proportion of female to male shopkeepers is assumed fixed at the 1851 ratio of 0.6:1.

4.7 Note on data

I construct data for candidate-towns by aggregating parish data. Using a dataset from the Cambridge Population Group based on the 1891 Ordinance Survey mapping of urban footprints, I identify all parishes which overlap each candidate-town's footprint. I group all overlapping parishes into a candidate-town even if the overlap is small. Since populations were concentrated in the candidate-town footprints, grouping data instead according to percentage-overlap of *area* would underestimate candidate-town data. Figure 2 illustrates how candidate-town data was constructed.

Furthermore, in 1889 an area of Kent was redefined as belonging to London. I exclude data from London (area 39) which I later justify. Where parishes overlapped multiple candidate-towns, I attributed parishes with the larger percentage overlap to one candidate-town only; in several cases this was not possible since the parish fully enveloped both candidate-towns, so I excluded the smaller candidate-town and kept the larger one.

5 Theory – Markets

5.1 External economies

'. . . For the advantages of a market to the community very much depend on the concentration of business in one place. . . ' [5]

Markets were characterised by external economies when stalls located together. External economies arise when consumers buy a range of produce in one place, rather than travel

[5] 1891 Final Report (RCMRT:XI:p.118)

around and buy less (Wolinsky 1983). Consumers make purchases that they were not originally shopping for after seeing the item in a nearby stall. In addition, early markets provided witness to the transfer of goods which reduced disputes between consumers and producers (Pease and Chitty 1958). Markets therefore operated under strong external economies.

5.2 Three effects of railways on markets

1. *(Mr Weaver) The principal part of the people who attend this market are strangers who come from a distance, coming for a cheap fare by railways.*[6]

   Firstly, railways increased a candidate-town's accessibility to producers and consumers, which would increase the likelihood of a market existence. I incorporate the concept of '***market*** potential' first used by Harris (1954) who examined the localisation of industry in the US manufacturing belt. ***Market*** potential captures the intensity of contact with possible ***markets*** and is defined as the sum of ***markets*** j accessible from candidate-town i divided by the distance between i and j. I use parish population to measure ***markets***, and time in hours to measure effective distance. I use time for three reasons; firstly, markets supplied perishable time sensitive goods, which suggests that time was the important trading cost for producers. Secondly, markets were held once or twice a week so consumers would make a day-trip to a market. Time was the constraining trading cost since it is unlikely consumers stayed overnight for shopping. Thirdly, Crafts, Leunig and Mulatu (2006) use Fogel's (1964) social savings approach to find that passenger social savings from Victorian British railways were increasingly dominated by time savings instead of fare savings (10% and 4% of GDP respectively in 1912); this also suggests time was the relevant cost.

   θ is the trade elasticity, which I set to 1 following Harris (1954) and Crafts (2005); I later

[6] Melton Mowbray, 1888 (RCMRT:VIII:p.31)

calibrate ***market*** potential for values ofθ between 0.5 and 5 to find the relevant ***market*** size. A higher θ attributes a stronger declining weight to more distant populations, and increases the weighting for local populations.

$$\text{Market Potential}_i = \sum_{j=1}^{n} \frac{\text{Population}}{\text{Time}_{ij}^{\theta}}$$

Economic theory for ***market*** potential is derived ex post by Helpman and Krugman (1985), who show that under certain assumptions of Dixit-Stiglitz monopolistic competition and Samuelson 'iceberg' transport costs, Krugman's wage model approximates to Harris' ***market*** potential equation.

2. *(Mr. Councillor Barron) Wakefield is a very important competing factor with Darlington. Considerable advantages are gained by farmers sending cattle to Wakefield rather than Darlington from a railway point of view.*[7]

   The second effect of railways would cause market decline; this was the decrease in effective distance between competing markets. Railways removed the spatial monopoly as market-goers could travel to other markets. To capture competition, I use 'market count', which is the number of markets accessible from a candidate-town within 4 hours, excluding its own market status. I test the robustness of my results by changing the distance to two hours.

3. The third effect is more indirect:

   (The Mayor of Middlesbrough) The reason why the butchers' market is not so successful as we might wish is because people will not go a mile or three quarters, when they can be supplied near where they reside.[8]

[7] Darlington, 1888 (RCMRT:IV:p.488)
[8] Middlesbrough, 1888 (RCMRT:IV:p.501)

The Mayor refers to fixed shops, which may have contributed to market decline through increased competition. I include shops as an explanatory variable in my regressions. Railways are relevant indirectly because they may have caused the rise of fixed shops, as I detail next.

5.3 Theory – Shops

Jeffreys (1954) argues that demand from the new middle and upper classes supported the expansion of retail trades between 1875 and 1914. During this period, the growth rate of shops surpassed the rate of population growth. In addition, he argues that railways decreased distribution costs which benefitted the retail sector. To investigate whether railways caused shops (and market decline indirectly), I conduct regressions for the number of shops in a candidate-town.

5.3.1 Two effects of railways on shops

1. Railways decreased distribution costs for shops. Goods from large centres of trade could be cheaply transported to local shops. London was the key centre for trading all types of goods, including the new mass manufactured goods and foreign imports. I therefore use 'Time to London' as a proxy for distribution costs.

2. Existence of the second effect of railways depends crucially on the view of a shop's ***market*** size; this depends on the strength of external economies.

View 1 *(Mr Alderman Gray) . . . In London you find shops in a particular trade congregate together, and people who want a particular class of goods know where to go for them, and the same with markets.*[9]

[9]Newcastle, 1888 (RCMRT:IV:p.37)'

If shops were characterised by strong external economies by locating together (like markets), ***market*** potential is also relevant for shops as external economies could be exploited with a greater ***market*** size. Customers from far away would be attracted to a concentration of shops since search costs are reduced (Hanson 1980). I therefore include ***market*** potential in these regressions, which captures the effect of railways.

View 2 *'. . . It must be remembered that a market essentially differs from a shop, the former depending on a concourse of both sellers and buyers. . . '* [10]

Market potential is not as relevant if shops were dispersed, serving highly local populations. Evidence suggests that shops did not necessarily locate together in the same place, unlike market stalls. Furthermore, markets and shops were imperfect substitutes since price differences for identical goods demonstrate that shops provided the additional service of transporting goods to the consumer which could be consumed on non-market days. In this alternative specification, I include a candidate-town's population and exclude ***market*** potential; railways do not have a second beneficial effect through ***market*** potential for shops.

(The Assistant Commissioner to Mr Watson) What about the prices of commodities in the market as compared with the prices in the shops; are they sufficiently low to attract customers? – Yes

Are they lower in the market than in the shops? - Yes.

(The Mayor) Perhaps pears and apples will be 1d a lb less in the market. In those cases there would be great competition. I see plums for 3d. a lb in the market that I would have to give 4d a lb for near my own home.[11]

[10] 1891 Final Report (RCMRT:XI:p.123)
[11] Middlesbrough, 1888 (RCMRT:IV:p.488)

6 Econometric method

Endogeneity of markets and railways

One problem with estimating the causal impact of transport projects is that the placement of transport may be endogenous. Railways may have been placed deliberately to connect markets. Casson (2013) argues that whilst railway placement was not endogenous to population growth, market status (along with soil type and local wealth) did determine railway placement in 19$^{\text{th}}$ century Oxfordshire. Qualitative evidence also suggests endogeneity of markets and railways is a problem; in the late 19th century, almost all country carriers to Oxford only operated on the market days of Wednesday and Saturday (Chance et al. 1979). This shows that transport networks were placed to serve markets.

6.1 Two solutions to endogeneity

Instrumental variables: Casson (2013) uses the set of railways proposed to Parliament during the Railway Mania (some of which were never passed) as an instrumental variable for 'access to local railway'. Similarly, Donaldson (2015) uses planned railway lines as an instrumental variable for the actual placement of railway lines in colonial India. Donaldson finds that endogeneity bias from deliberate placement of railways on regional income is insignificant, and Casson finds this is true for population growth. However for markets, planned railway lines are not valid instruments since railways could have been deliberately planned to connect existing markets. This suggests whilst instrument relevance is satisfied, the exclusion restriction of $Cov(e, z) = \theta$ is not.

***Market* potential**: The transport network setting can be used to obtain exogenous variation from railway expansion. The aggregate impact of railway expansion for each

candidate-town (by increasing access to ***markets***) is captured by each candidate-town's ***market*** potential. This includes both the direct impact of a railway station opening in a candidate-town, and also the indirect impact of extensions to the existing railway network to more distant regions. It is these indirect changes in the distant railway network which provide sources of exogenous variation, as existence of a market in one candidate-town does not cause the extension of railways in distant regions. Donaldson and Hornbeck (2016) find that for US counties, distant extensions to the railway network provided the majority of variation in ***market*** potential, so the endogenous component is small. Similarly, I find that the variation in ***market*** potential is mostly caused by distant extensions to the railway network. I use this approach to address endogeneity of railway placement.

7 Regression specifications

7.1 Markets

I use fixed effects regression to remove time constant omitted variable bias. For instance a candidate-town's river access influenced the likelihood of a market existing and is also correlated with ***market*** potential. Dickinson (1934) finds that soil type was a key determinant of local produce which influenced both population (in ***market*** potential) and markets (market count). As soil type and river access are fixed over time, fixed effects eliminates these sources of omitted variables bias. However, this means that coefficients of constant variables, such as if a candidate-town was a port, cannot be estimated.

$$P(\text{markets}_{it}) = f(\beta_0 + \beta_1 \text{market potential}_{it} + \beta_2 \text{shops}_{it} + \beta_3 \text{shops}_{it}^2 + \beta_4 \text{market count}_{it} + \beta_5 \text{port}_{it} + year \cdot FE_{s_t} + \text{town} \cdot FE_{s_i})$$

One problem using fixed effects probit or logit is that only observations where the dependent variable varies across time are included. Panel probit and logit models drop observations where markets were equal to 1 or 0 for the entire period. The panel linear probability model (LPM) retains all observations for a comparison, though there may be selection bias for the binary models.

Table 1 shows the results for markets using the Owen's national data. Table 2 shows the results for markets using my dataset from directories focused on Kent.

7.2 Shops

I also use fixed effects for shops to control for time invariant variables such as geographical characteristics which may cause omitted variable bias.

View 1: external economies and *market* potential.

$$\text{Shops} = \beta_0 + \beta_1 \text{market potential}_{it} + \beta_2 \text{time to London}_{it} + \text{year} \cdot FE_{s_t} + \text{town} \cdot FE_{s_i}$$

View 2: no external economies and local population.

$$\text{Shops} = \beta_0 + \beta_1 \text{population}_{it} + \beta_2 \text{time to London}_{it} + \text{year} \cdot FE_{s_t} + \text{town} \cdot FE_{s_i}$$

Table 3 shows my results for shops.

8 Discussion

8.1 Markets - Table 1

Regression (1) is a pooled OLS for comparison to the panel regressions (2)-(4).The differences in signs for shops and market count suggest that fixed effects are required. Similarly to Combes and Lafourcade's (2002) study of regional inequality in France, I find that the R^2 increases significantly when including candidate-town fixed effects. Geographical factors such as local soil type and access to waterways are important in explaining the location of markets.

(2) includes all 198 observations in a fixed effects LPM, where the signs are in line with the probit panel regression (3). ***Market*** potential is insignificant in each specification, which stands out from previous ***market*** potential literature; I evaluate this later.

(3) is a probit regression with year and candidate-town dummy variables. Between 1830 and 1881, there were only 27 candidate-towns where market status changed, leading to 81 observations. Market count has a z statistic of -3.25, which is significant at the 1% level. The more markets a candidate-town has access to within a 4 hour distance, the less likely it will have a market itself, so railways led to market decline by increasing competition between markets. Shops are significant at the 5% level, with a z statistic of -1.97; increased competition from shops also led to market decline.

The effect of shops on markets could be non-linear. A few shops (which could be dispersed) may not create external economies and therefore only increase competition for markets (view 2 for shops). However, many shops would create external economies by attracting consumers from long distances and therefore also benefit markets (view 1 for shops). The coefficient on $shops^2$ is insignificant, although positive, which suggests that external economies from congregations of shops did not benefit markets significantly.

(4) is a conditional fixed effects logit regression for comparison to the probit specification

(3). The significance is reduced but the signs are similar and market count remains significant at the 10% level, which suggests that railways contributed to market decline through increased competition.

8.2 Sensitivity checks

I examine whether varying the distance boundary for market count affects my results. Regressions (5) – (6) use market count with a 2 hour distance instead of 4 hours. My results are unchanged, although market count is less significant; the 4 hour boundary is the most relevant, in line with Bracton's (c.1250) minimum distance calculation by splitting the day into three parts.

I also calibrate ***market*** potential for different trade elasticities θ between 0.5 and 5. I find that modest calibrations away from θ=1 do not affect my results. Whilst railways increased ***market*** potential, ***market*** potential does not appear to have had an effect on existence of markets.

In alternative regressions, I remove ***market*** potential and include only a candidate-town's own population, which is also insignificant. Larger populations did not benefit markets. Nearby populations were not a binding constraint possibly because they were highly mobile. It is therefore competition from other markets and shops that affected market existence.

(The Assistant Commissioner) The population question is not quite relevant to the inquiry, but if Wakefield, with a population of 30,000, can have one of the best markets in Yorkshire, there is no reason why Darlington, with a population of 37,000, should have a worse one.

(Councillor Hill-Drury) It would depend on the question whether other cattle markets have become centres.[12]

[12]Darlington, 1888 (RCMRT:IV:p.490)

8.3 Markets alternative data – Table 2

I extend the analysis to 1911 using my dataset on Kent trade directories, which I suspect measures *absolute* decline. I analyse whether railways caused absolut*e* decline in addition to relative decline using Owen's. Since only 11 candidate-towns have variation in market status between 1830 and 1911, probit fixed effects cannot be used. I use LPM.

As with the Owen's data, the differences between the pooled OLS (1) and the fixed effects models (2) – (7) suggest that geographical factors are important in determining market location. Shops have a consistent negative, although insignificant, effect; if shops increase by 1000, the probability a market exists decreases by between 3 and 9%. The non-linear effect through shops^2 is positive but insignificant so there is insufficient evidence that shops benefited markets by generating external economies. Sensitivity tests for market count (2 or 4 hours) (2) (3) and calibrations for ***market*** potential (θ=0.5, θ=1.5) (4) (5) do not alter the significance.

Market potential using the log specification (6) is positive significant at the 10% level. This suggests that railways benefited markets by providing access to populations; larger candidate-towns were likely to have markets in *absolute* terms. With Owen's, the 'existence' of a market was not affected by population. It may have been relative size, or an unobserved characteristic of market quality which led to the market being noted down in a national publication.

Competition was a key determinant of market existence as market count is significant with a t statistic of -1.77. Railways therefore led to both relative and absolute decline of markets through increased competition.

8.4 Shops

The pooled OLS (1) and fixed effects (2) – (7) regressions have similar signs which suggests that time constant omitted variables are less important than for markets.

View 1 – externalities and *market* potential

In (2), ***market*** potential has a significant positive effect on shops, where the partial effect of increasing ***market*** potential by 100,000 leads to shops increasing by 90. In sensitivity tests (3) and (4), I vary the trade elasticity. ***Market*** potential remains significant for $\theta = 0.5$, but not for $\theta = 1.5$. As is often found in the ***market*** potential literature (Martnez-Galarraga 2014), $\theta = 1$ is the most significant. (7) is a log specification which suggests that a 1% increase in ***market*** potential leads to a 2% increase in shops.

In (2) - (4) and (7), Time to London is negative which suggests lower distribution costs had a positive effect on shops. It is insignificant however using the ***market*** potential specification.

View 2 – no externalities and local population

I replace ***market*** potential with population in (5) and (6). In (5) the number of shops increase by 11 per 1000 increase in population. Population explains more of the variation than ***market*** potential since the R^2 increases from 0.62 (2) to 0.91 (5). This suggests that view 2 of shops is more relevant, where shops serve local populations. (7) is a log specification where a 1% increase in population leads to a 1.4% increase in shops.

Time to London is negative significant. In (6), increasing Time to London by 1 hour decreases the number of shops by around 5. The more costly transportation of goods is, the fewer shops in a candidate-town, controlling for population. Similarly, (7) shows

that increasing Time to London by 1 hour leads to a 17.9% decrease in the number of shops. Since I find evidence that shops competed with markets, railways indirectly caused market decline through shops.

8.5 Evaluation

Time as the trade cost

I find that decreasing Time to London significantly increases shops. However, time may underestimate the effect of decreased costs for shops. Firstly, unlike markets, real trade costs are more relevant for fixed shops. Secondly, the distributive sector is (also) characterised by increasing returns to scale; a greater volume decreases average distribution costs. Because the distributive sector boomed in the late 19th century (Jeffreys 1954), average transport costs fell even if time costs were constant. My results should be interpreted as a lower bound for the effect of railways on shops.

Railway use

The public use of railways gradually increased during the 19th century, which suggests that early railways had a limited effect on markets if passengers did not use them for travel. The effect of ***market*** potential and market count may have intensified over time as people adjusted to railway use. In addition, Crafts, Leunig and Mulatu (2011) rank the South Eastern and Chatham Railway (serving Kent) as Britain's slowest railway which suggests time savings in Kent were smaller than nationally. The effect of railways on markets may have been larger elsewhere.

Sample size

For panel probit and logit the sample was reduced to 27 candidate-towns resulting in 81 observations. When running sensitivity analysis, these regressions did not converge for a specification with a 3 hour market count. In addition, my county-level examination assumes that all trade takes place within Kent, which is not accurate. In particular, the exclusion of candidate-towns from the neighbouring counties of London, Surrey and Sussex would underestimate both ***market*** potential and the market count for candidate-towns just within Kentish borders. To avoid this, it is possible to only consider candidate-towns within a 4 hour minimum distance of Kentish land borders, but this leads to most observations being dropped because Kent is too small. A comprehensive national study would resolve both problems.

London

In hindsight, Kent is a difficult county to analyse due to the effect of London, which I choose to exclude from my dataset and calculations. London's large population would affect ***market*** potential, and the markets in London would affect the market count. The key problem is that I cannot distinguish data for separate candidate-towns in London. Whilst I cannot include candidate-towns in London for this reason, I experiment with the inclusion of London in the ***market*** potential calculations of the remaining candidate-towns, with area 39 being counted once for each candidate-town. I find that this does not change my results for markets, and the coefficient for ***market*** potential remains insignificant. For shops, the other coefficients retain similar signs and significance, but ***market*** potential has a reduced positive significance. I suspect that the inclusion of London in ***market*** potential but exclusion of candidate-towns in London by construction results in a negative bias for the coefficient on ***market*** potential - since candidate-towns in London have a large ***market*** potential but they are excluded from my sample (and they tended to have more shops and markets). Excluding

London is more appropriate, as only including part of London's effect introduces bias.

Market Charter and candidate-towns

The market charter imposed the restriction that a new market could not be established within a certain distance of an existing market (which the contemporaries decided to remove, but did not carry out). The inclusion of candidate-towns which never had markets throughout history could reduce significance because some were not able to hold a market by law. This may explain why my panel probit results are more significant than the LPM results; by dropping candidate-towns where market status did not vary over time, probit or logit models exclude candidate-towns which were not eligible for a market by law (markets=0 for every year). Table 4 shows my regressions using an alternative subset of data. I exclude candidate-towns which did not have a market at any point between 1813 and 1911 according to both Owen's and the Kent trade directories.

I compare these to my earlier results; for the Owen's LPM regression (1), market count is now significant at the 5% level. For the Kent focused trade directories (3), market count is negative significant at the 10% level with the sample of 144 observations compared to insignificant previously. The effect of shops remains insignificant in (1), whilst probit (2) remains negative significant. For the shops regression (4), there are no differences in signs which supports my suspicion that the market charter only complicates my analysis for markets. For markets, the desired sample would use all places with market charters instead of all candidate-towns. Nationally, there were over three-thousand market charters granted before 1550. This may increase significance for the LPM results.

8.6 External validity

Killingray (2004) argues that Kent had notable characteristics, for instance its coastline access to the continent was strategic for British defence and naval operations. It also remained

relatively agricultural, supplying fruit and vegetables, whereas industrialisation occurred in the North. In particular, the proximity to London may mean that external validity to 19th century Britain is not satisfied. However, markets were widespread across Britain and railway expansion was also a national phenomenon, which suggest that the theory for market count, ***market*** potential and shops can be generalised. As I used Access for data processing, a national dataset can be treated similarly to assess the external validity of my study on Kent, which would be an interesting result.

8.7 Which markets declined?

My regression is limited to only identifying the probability a market exists in a candidate-town, given certain characteristics. Market count informs whether competition caused market decline, but cannot predict the locations of markets. Similarly, the trade literature is unable to determine which of two locations will become the core or periphery, and highlights the possibility of multiple equilibria. Instead, the interview extract below illustrates the importance of initial size.

(The Assistant Commissioner To Mr Shaw) I suppose everybody goes to Manchester? – Yes, Manchester has established a very good market both for fish and vegetables.

The fact is you are too near Manchester to make it possible to establish a successful market here. – Yes

And the same with corn? - The same with corn.[13]

External economies were larger in larger markets. Smaller markets could not be established despite increased ***market*** potential as consumers and producers chose to trade at the larger market. This led to regional inequality through changing trade patterns.

[13]Salford, 1888 (RCMRT:IX:p.585)

9 Conclusion

In my sample of 66 candidate-towns in Kent, I find that railways caused market decline directly by increasing competition between markets. Markets also declined from increased competition following the rise of fixed shops. Railways benefited shops through decreased distribution costs, indirectly causing market decline. I find that the Owen's national data may measure *relative* decline. I collect 'absolute' data from regional trade directories and find that railways also caused *absolute* decline through increased competition. In addition, I find that the benefit of increased ***market*** potential for markets was small, leading to overall market decline. NEG and external economies explain why historical evidence shows that larger markets survived at the expense of smaller ones. I conclude that decreased transport costs increased regional inequality in 19th century Britain.

Revisiting 1891, the contemporaries were correct: railways did destroy the market charter, and railways did cause market decline.

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Kelly's Directory of Kent, 1913. [Part 2: Private Resident & Trade Directories]

The urban footprint of candidate-towns is from a digitised dataset at the Cambridge Population Group based on the Ordinance Survey mapping of 1880s and 1890s towns.

The sample of candidate-towns is a comprehensive set of possible places for market location (villages and towns). Places are in the database if they meet any of the criteria below:

- They had a market at any date between 1575 and 1911
- They have been considered towns by contemporaries or historians at some point between 1575 and 1911
- They had a population of 2,500 or more at any point between 1801-1911.
- Some places are included because they had a fair at some point between 1700-1911.

Historical extracts and interview quotes 1887-1891:

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- Royal Commission on Market Rights and Tolls: Minutes of Evidence taken before Cecil M. Chapman, Esq., Assistant Commissioner, at Inquiries held by him in England, together with his Reports on the Markets. Vol. IV
- Royal Commission on Market Rights and Tolls Volume VIII. Minutes of Evidence (A.J. Ashton, Assistant Commissioner.)
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time

Table 1 **Markets Results** **(Owen's data)**	(1) Market (Pooled OLS)	(2) Market (Panel LPM)	(3) Market (Panel Probit)	(4) Market (Conditional FE Logit)	(5) Market (Panel LPM)	(6) Market (Panel Probit)
Market	0.0284	0.0322	-0.484	-0.899	0.0395	-0.978
Potential (θ=1)	(0.0622)	(0.144)	(1.283)	(2.130)	(0.146)	(0.971)
Shops	1.086***	-0.399	-10.29*	-6.864	-0.453	-2.266
	(0.263)	(0.430)	(5.211)	(14.29)	(0.439)	(5.914)
Shops^2	-0.495***	0.00388	2.149	1.265	0.0299	-4.625
	(0.107)	(0.159)	(1.772)	(7.517)	(0.161)	(4.838)
Port	-0.0195					
	(0.0819)					
Market Count	0.00780	-0.0127	-0.521**	-0.576		
(within 4 hours)	(0.0108)	(0.0130)	(0.203)	(0.334)		
Market Count					-0.0146	-0.439
(within 2 hours)					(0.0334)	(0.273)
Constant	0.284*	0.600*	6.217*		0.491	1.868*
	(0.135)	(0.296)	(2.415)		(0.269)	(0.794)
N	198	198	81	81	198	81
adj. R^2	0.175	0.443			0.440	
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Candidate-town FE	No	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Markets Results (Kent directories data)	(1) Market (Pooled OLS)	(2) Market (Panel LPM)	(3) Market (Panel LPM)	(4) Market (Panel LPM)	(5) Market (Panel LPM)	(6) Market (Panel LPM)
Market Potential (θ=1)	0.0548	-0.00107	0.00335			
	(0.0556)	(0.0631)	(0.0632)			
Market Potential (θ=0.5)				0.112		
				(0.121)		
Market Potential (θ=1.5)					-0.0113	
					(0.0121)	
Ln(***Market*** Potential)						0.410
						(0.226)
Shops	0.374***	-0.0534	-0.0572	-0.0729	-0.0329	-0.0904
	(0.0878)	(0.0813)	(0.0816)	(0.0805)	(0.0739)	(0.0800)
Shops^2	-0.0440***	0.00257	0.00292	0.00290	0.00134	0.00537
	(0.0122)	(0.00921)	(0.00934)	(0.00937)	(0.00886)	(0.00951)
Port	0.127					
	(0.0719)					
Market Count (within 4 hours)	0.00107	-0.00596		-0.00661	-0.00595	-0.0161
	(0.00765)	(0.00671)		(0.00674)	(0.00670)	(0.00912)
Market Count (within 2 hours)			-0.00977			
			(0.0120)			
Constant	0.365***	0.654*	0.591*	0.572*	0.648*	-3.657
	(0.106)	(0.255)	(0.250)	(0.255)	(0.259)	(2.366)
N	264	264	264	264	264	264
adj. R^2	0.158	0.734	0.734	0.735	0.736	0.742
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Candidate-town FE	No	Yes	Yes	Yes	Yes	Yes

Table 3 **Shops Results**	(1) Shops (Pooled OLS)	(2) Shops (Fixed effects)	(3) Shops (Fixed effects)	(4) Shops (Fixed effects)	(5) Shops (Fixed effects)	(6) Ln(Shops) (Fixed effects)	(7) Ln(Shops) (Fixed effects)
Time to London	-2.723*	-2.870	-1.806	5.290	-4.792*	-0.179*	-0.0320
	(1.198)	(3.093)	(3.234)	(4.336)	(1.916)	(0.0741)	(0.0788)
Port	52.90***						
	(11.91)						
Market Potential (θ=1)	61.77***	90.82***					
	(16.44)	(21.81)					
Market Potential (θ=0.5)			197.9***				
			(58.95)				
Market Potential (θ=1.5)				12.51			
				(7.178)			
Population					11.30***		
					(1.130)		
Ln(Population)						1.430***	
						(0.150)	
Ln(***Market*** Potential)							2.011***
							(0.345)
Constant	-31.81*	5.041	-159.6**	-61.93	50.28*	3.054***	-21.99***
	(15.42)	(30.33)	(52.17)	(43.91)	(19.65)	(0.836)	(3.715)
N	264	264	264	264	264	264	264
adj. R^2	0.484	0.620	0.552	0.455	0.906	0.873	0.820
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Candidate-town FE	No	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses $^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Table 4 **Subset of candidate-towns**	(1) Markets (Owen's Panel LPM)	(2) Markets (Owen's Panel Probit)	(3) Markets (Kent directories Panel LPM)	(4) Shops (Panel Fixed Effects)
Market Potential (θ = 1)	-0.0837 (0.189)	-0.484 (1.283)	-0.0346 (0.0821)	102.4^{***} (26.21)
Shops	0.613 (0.628)	-10.29^{*} (5.211)	0.0696 (0.108)	
Shops^2	-0.286 (0.207)	2.149 (1.772)	-0.00639 (0.0110)	
Market Count (within 4 hours)	-0.0531^{*} (0.0234)	-0.521^{**} (0.203)	-0.0239 (0.0149)	
Time to London				-5.073 (5.307)
Constant	1.223^{***} (0.308)	6.217^{*} (2.415)	0.955^{***} (0.241)	17.85 (51.53)
N	108	81	144	144
adj. R^2	0.375		0.559	0.668
Year FE	Yes	Yes	Yes	Yes
Candidate-town FE	Yes	Yes	Yes	Yes

Standard errors in parentheses $^{*}\ p < 0.05, ^{**}\ p < 0.01, ^{***}\ p < 0.001$

Towns in Kent	Owens markets				Shops				Kent markets				Population			
	1813	1834	1856	1888	1830	1851	1881	1911	1834*	1858	1882	1913	1830	1851	1881	1911
Totals	29	29	16	7	377	742	1420	5849	32	29	21	16	187223	262364	421783	725703
APPLEDORE	1	1	0	0	0	0	2	0	1	1	0	0	343	379	421	379
ASHFORD	1	1	0	1	0	21	33	113	1	1	1	1	1933	3244	6063	10308
BEARSTED	0	0	0	0	6	3	3	2	0	0	0	0	687	706	746	1098
BEXLEY	0	0	0	0	13	12	15	135	0	0	1	0	2657	4390	10423	22813
BIDDENDEN	0	0	0	0	0	0	0	2	0	0	0	0	793	910	800	791
BILSINGTON	0	0	0	0	0	0	5	0	0	0	0	0	167	216	221	202
BRASTED	0	0	0	0	0	2	0	4	0	0	0	0	530	652	804	1027
BROADSTAIRS	0	0	0	0	0	7	9	38	0	0	0	0	1344	1852	2865	6901
BROMLEY	1	1	1	0	3	4	29	314	1	1	1	0	3019	4174	18648	48499
CANTERBURY	1	1	1	0	26	58	76	186	1	1	1	1	10226	13619	15813	19411
CHALLOCK	0	0	0	0	0	0	0	0	0	0	0	0	229	241	228	174
CHARING	0	0	0	0	2	2	3	5	0	0	0	0	657	797	850	876
CHATHAM	1	1	0	0	48	83	220	831	1	1	0	0	20500	27946	40579	79281
CHILHAM	0	0	0	0	0	2	3	1	0	0	0	0	616	733	866	830
CHISLEHURST	0	0	0	0	13	12	15	135	0	0	0	0	2657	4390	10423	22813
CRANBROOK	1	1	0	1	0	3	4	5	1	1	1	1	1724	2538	2634	2918
DARTFORD	1	1	0	0	8	6	21	119	1	1	1	1	2615	3858	6211	16337
DEAL	1	1	0	0	10	10	31	97	1	1	0	0	7853	6542	8958	12203
DOVER	1	1	0	0	0	72	72	242	1	1	1	1	10455	15506	20973	31423
ELHAM	0	1	0	0	0	2	2	6	1	0	0	0	655	756	741	822
ELMSTED	0	0	0	0	0	0	2	1	0	0	0	0	453	490	461	257
ERITH	0	0	0	0	0	0	28	161	0	0	0	0	2256	3223	8844	21477
FARNBOROUGH	0	0	0	0	0	4	3	8	0	0	0	0	385	586	903	2059
FARNINGHAM	0	0	0	1	0	1	1	7	0	0	0	0	919	1224	1568	2100
FAVERSHAM	1	1	1	1	6	9	32	71	1	1	1	1	3629	4650	8024	9280
FOLKESTONE	1	1	1	0	0	14	42	250	1	1	1	0	3315	4800	12871	24842
FORDWICH	0	0	0	0	0	0	0	0	0	0	0	0	254	286	301	475
GOUDHURST	1	1	0	0	0	0	2	7	1	1	0	0	1506	1609	1676	2035
GRAVESEND	1	1	1	1	18	45	82	258	1	1	1	1	8260	13579	21281	29681
HADLOW	0	0	0	0	0	0	4	5	0	0	0	0	1148	1430	1454	1610
HAM	1	0	0	0	2	1	2	3	0	0	0	0	797	1137	954	1076
HERNE BAY	0	0	0	0	9	2	4	46	0	0	0	0	1214	1829	2693	6834
HIGHAM	0	0	0	0	0	1	3	11	0	0	0	0	393	495	845	1042
HYTHE	1	1	1	0	6	8	15	61	1	1	1	0	3704	4130	6608	13450
IGHTHAM	0	0	0	0	0	2	0	3	0	0	0	0	487	678	768	1012
KEMSING	0	0	0	0	0	0	0	3	0	0	0	0	216	226	261	487
LENHAM	1	1	0	0	0	4	4	9	1	1	0	0	1256	1470	1449	1554
LYDD	0	0	1	0	2	3	3	6	0	0	0	0	811	1023	1495	2203
MAIDSTONE	1	1	1	1	34	40	96	367	1	1	1	1	15856	21944	29161	36530
MARGATE	0	0	0	0	12	28	22	186	1	1	1	1	5253	7706	12849	24589
MILTON	1	1	0	0	3	5	13	48	1	0	0	0	1638	1970	3382	5879
NEW ROMNEY	1	1	1	0	0	1	0	7	1	1	0	0	658	678	672	1105
ORPINGTON	0	0	0	0	3	2	8	19	0	0	0	0	919	1320	2405	4724
OTFORD	0	0	0	0	0	2	1	12	0	0	0	0	426	519	829	1482
QUEENBOROUGH	0	0	0	0	0	2	1	6	0	0	0	0	476	459	656	1775
RAMSGATE	0	0	0	0	0	33	56	216	1	1	1	1	5033	9172	15007	21346
RECULVER	0	0	0	0	0	0	0	1	0	0	0	0	154	167	142	326
RICHBOROUGH	0	0	0	0	2	1	2	2	0	0	0	0	1313	1299	1362	1507
ROCHESTER	1	1	1	0	48	83	220	831	1	1	1	1	20500	27946	40579	79281
SANDWICH	1	1	0	0	6	10	8	15	1	1	1	1	1804	2046	1906	2571
SEVENOAKS	1	1	1	0	0	7	10	47	1	1	1	0	2181	3100	5163	7947
SHEERNESS	0	0	0	0	8	15	28	112	0	0	0	0	2987	6149	11040	14897
SIDCUP	0	0	0	0	13	12	15	135	0	0	0	0	2657	4390	10423	22813
SITTINGBOURNE	0	0	0	0	3	13	30	104	1	1	1	1	2921	3999	8749	12844
SMARDEN	1	1	0	0	0	1	1	1	1	1	0	0	500	698	692	741
ST MARY CRAY	0	0	0	0	2	1	3	6	0	0	0	0	786	1267	1707	2277
STONE	0	0	0	0	2	1	6	44	0	0	0	0	1100	1588	4578	8838
STROOD	0	0	0	0	5	22	13	122	0	0	0	0	2617	3375	5853	11290
SUTTON VALENCE	0	0	0	0	0	0	0	2	0	0	0	0	531	685	704	674
TENTERDEN	1	1	1	0	20	9	12	7	1	1	1	1	2053	2726	2549	2598
TONBRIDGE	1	1	1	1	38	45	85	337	1	1	1	1	8362	14917	29889	44951
WEST MALLING	1	1	1	0	0	2	1	7	1	1	0	0	842	1260	1479	1843
WESTERHAM	1	1	1	0	0	4	8	14	1	1	1	1	964	1301	1513	2246
WHITSTABLE	0	0	0	0	0	5	9	40	0	0	0	0	1764	2392	3758	6096
WROTHAM	1	1	1	0	6	5	2	14	1	1	0	0	1427	1936	2060	2813
WYE	1	1	0	0	0	0	0	2	1	0	0	0	838	1041	953	1140

We cannot find Kent data for the 1830s; I use Owen's 1834 and include Ramsgate, Margate and Sittingbourne as having markets (since these always had markets in the later Kent directories, but were neglected in Owen's).

Candidate-towns	Time to London (hours)				Owens Market Count (4 hours)			Kent Market Count (4 hours)				Market Potential (100,000)			
	1830	1851	1881	1911	1830	1851	1881	1830	1851	1881	1911	1830	1851	1881	1911
APPLEDORE	9.84	6.81	5.40	5.67	9	9	5	9	15	17	13	5.11	8.45	16.37	25.23
ASHFORD	8.82	5.22	4.49	4.73	15	15	6	16	26	20	16	8.46	17.87	30.94	54.12
BEARSTED	6.30	4.95	3.97	3.74	17	13	7	19	24	22	16	8.52	13.67	23.85	40.46
BEXLEY	2.78	2.01	1.82	1.78	10	10	5	12	14	13	10	5.28	9.20	21.58	36.90
BIDDENDEN	8.01	5.15	4.36	4.56	18	15	7	19	27	20	16	8.80	14.86	21.72	33.49
BILSINGTON	10.64	6.41	5.49	5.49	11	10	5	11	21	17	13	5.03	10.08	16.41	28.16
BRASTED	3.77	3.04	2.38	2.17	11	11	7	14	19	17	12	5.81	10.08	19.35	33.73
BROADSTAIRS	12.44	7.61	6.24	6.90	4	5	4	6	14	13	10	5.50	13.89	25.74	40.63
BROMLEY	1.65	1.16	0.78	0.73	7	8	6	9	12	12	9	5.89	9.99	31.90	80.60
CANTERBURY	9.50	6.44	5.15	5.77	12	9	7	14	22	18	14	19.99	30.69	47.57	66.58
CHALLOCK	8.51	5.98	5.12	5.24	17	13	7	18	26	20	16	7.46	12.46	21.21	32.50
CHARING	7.94	5.45	4.65	4.83	18	15	7	19	27	20	16	7.57	12.85	24.15	37.61
CHATHAM	5.51	3.51	3.19	3.48	14	13	7	15	22	22	17	12.36	19.89	37.77	79.46
CHILHAM	9.23	5.92	5.17	5.36	18	14	7	19	26	20	16	8.58	15.75	25.39	38.11
CHISLEHURST	2.44	1.90	1.66	1.65	8	10	5	10	13	13	10	4.50	7.50	16.70	32.76
CRANBROOK	7.68	5.31	4.50	4.29	14	13	6	15	21	18	12	7.93	13.64	20.45	32.01
DARTFORD	2.92	2.12	2.02	1.94	10	11	7	12	16	14	11	8.62	15.83	31.27	61.70
DEAL	12.91	7.72	6.33	7.46	6	4	4	7	12	13	8	8.55	15.08	24.03	40.09
DOVER	11.90	6.66	6.06	6.61	7	8	6	8	19	16	9	7.84	14.86	25.97	44.62
ELHAM	11.79	7.50	6.82	6.34	7	5	3	7	14	12	12	5.35	9.23	15.30	31.85
ELMSTED	10.83	6.89	6.06	5.92	10	8	5	9	20	16	13	5.05	9.05	14.84	27.38
ERITH	3.27	1.87	2.07	1.80	9	10	7	11	16	15	10	5.03	12.46	25.34	41.17
FARNBOROUGH	2.35	1.80	1.24	1.14	7	9	6	10	13	14	11	5.45	9.13	19.74	42.49
FARNINGHAM	3.10	2.50	2.25	2.07	11	10	6	14	18	16	13	6.76	11.45	23.44	42.19
FAVERSHAM	8.23	5.99	4.62	4.98	14	8	6	14	22	19	15	7.85	12.49	28.75	43.79
FOLKESTONE	11.93	6.38	5.82	6.29	7	9	5	6	21	15	11	6.10	13.23	23.46	39.50
FORDWICH	9.94	6.61	5.24	5.98	12	7	7	14	20	19	13	8.04	15.76	26.95	38.66
GOUDHURST	6.85	4.80	3.97	3.83	13	13	7	14	20	19	14	7.24	12.09	19.11	31.03
GRAVESEND	4.06	2.78	2.64	2.57	11	10	6	14	20	19	12	10.23	19.05	36.48	58.71
HADLOW	5.45	4.04	3.23	2.98	14	13	7	15	24	19	13	7.77	13.37	22.42	37.85
HAM	11.96	7.81	6.39	7.39	6	4	3	7	13	12	7	5.96	11.67	19.13	31.13
HERNE BAY	10.80	7.33	5.32	6.09	9	6	7	11	17	17	12	5.63	10.32	21.73	33.14
HIGHAM	4.84	3.14	2.99	3.09	12	11	7	15	21	20	14	8.15	14.71	29.66	52.35
HYTHE	10.66	6.24	5.62	5.74	13	9	5	12	21	15	13	5.88	11.88	19.31	35.98
IGHTHAM	4.37	3.66	2.85	2.65	14	12	7	17	22	18	13	7.95	13.10	25.51	43.07
KEMSING	4.39	3.66	2.70	2.48	12	10	7	14	19	16	13	6.33	10.12	21.64	38.27
LENHAM	7.30	5.86	4.78	4.47	17	13	7	18	26	20	16	7.50	11.91	20.58	33.78
LYDD	12.28	8.23	6.79	6.07	4	2	3	4	4	7	10	3.66	6.23	11.10	23.61
MAIDSTONE	5.83	4.53	3.60	3.47	18	12	6	20	23	19	15	10.57	17.78	30.13	50.11
MARGATE	12.52	7.68	6.30	6.90	4	5	3	5	13	11	9	5.26	12.68	22.70	38.05
MILTON	7.00	4.86	4.08	4.50	11	10	7	12	23	22	17	8.28	13.06	31.54	48.71
NEW ROMNEY	11.82	7.81	6.41	6.09	5	5	5	5	7	10	11	3.86	6.58	11.56	23.68
ORPINGTON	2.95	2.34	1.72	1.50	7	7	6	10	10	14	10	4.34	7.22	16.84	32.40
OTFORD	3.99	3.31	2.42	2.01	12	11	7	15	20	18	12	6.42	10.87	22.43	39.48
QUEENBOROUGH	8.39	6.13	4.22	4.43	5	5	7	6	7	22	17	6.10	9.61	27.00	45.08
RAMSGATE	12.20	7.63	6.27	7.27	4	5	4	5	13	12	7	6.50	13.35	22.89	38.60
RECULVER	11.65	7.84	5.49	6.24	3	4	7	5	13	17	12	4.70	8.73	19.92	30.36
RICHBOROUGH	11.73	7.49	6.10	7.10	6	5	5	8	15	14	10	6.12	13.83	22.20	35.10
ROCHESTER	5.27	3.29	3.08	3.31	14	12	7	16	22	21	15	10.75	17.92	36.70	67.35
SANDWICH	11.49	7.47	6.09	7.16	7	5	5	8	14	13	9	8.20	16.01	24.67	41.87
SEVENOAKS	3.84	3.16	2.36	2.16	12	12	7	15	21	18	13	7.52	12.84	25.88	44.80
SHEERNESS	9.32	6.84	4.63	4.41	2	2	6	3	4	18	17	4.02	6.60	19.21	36.75
SIDCUP	2.13	1.61	1.49	1.51	9	10	7	11	14	15	11	5.95	10.10	23.57	49.25
SITTINGBOURNE	7.01	4.87	4.09	4.51	12	10	7	12	22	21	16	8.38	13.24	31.85	49.41
SMARDEN	8.22	5.02	4.26	4.42	16	15	7	17	26	21	16	6.93	13.94	21.57	33.61
ST MARY CRAY	2.84	2.26	1.51	1.86	8	10	7	10	14	14	11	4.78	8.01	20.15	35.58
STONE	3.35	2.18	2.08	2.18	12	11	7	15	17	15	12	6.72	13.98	28.07	46.56
STROOD	5.09	3.15	3.01	3.27	15	12	7	19	22	22	15	10.08	17.26	36.64	65.99
SUTTON VALENCE	6.76	5.19	4.35	4.14	18	14	7	19	28	22	17	7.75	14.06	22.65	36.44
TENTERDEN	8.76	5.83	4.97	5.10	13	13	7	13	23	17	13	6.05	10.45	16.44	25.77
TONBRIDGE	4.91	3.49	2.74	2.55	15	14	6	16	25	18	12	7.71	15.46	26.80	43.74
WEST MALLING	4.95	4.18	3.18	2.97	17	13	7	19	23	20	13	8.86	14.16	27.98	46.04
WESTERHAM	3.47	2.78	2.14	1.95	8	10	6	11	19	13	11	5.54	10.39	17.99	32.06
WHITSTABLE	10.36	6.69	4.89	5.23	10	7	7	11	20	19	16	6.08	14.48	28.34	38.76
WROTHAM	4.14	3.45	3.04	2.78	13	10	7	16	20	18	13	7.90	12.77	24.39	41.46
WYE	9.64	5.58	4.83	5.04	13	14	7	14	26	19	15	15.38	27.30	36.59	61.11

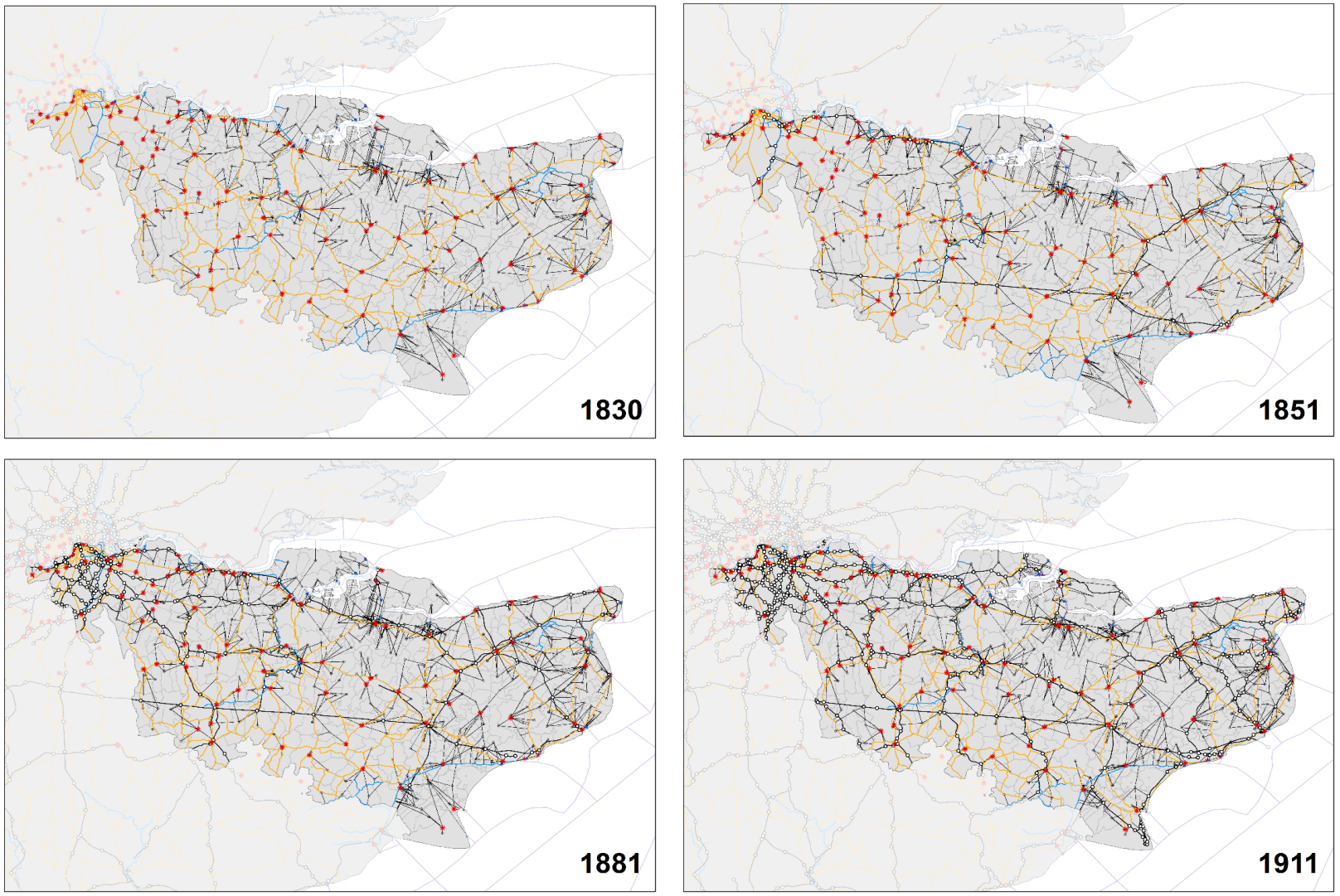

Figure 1: The GIS transport network of railways and stations (bold black lines, white circles), roads (yellow) and waterways (blue) connecting every candidate-town (red) to every parish (grey). Source: Cambridge Population Group – The Transport Project

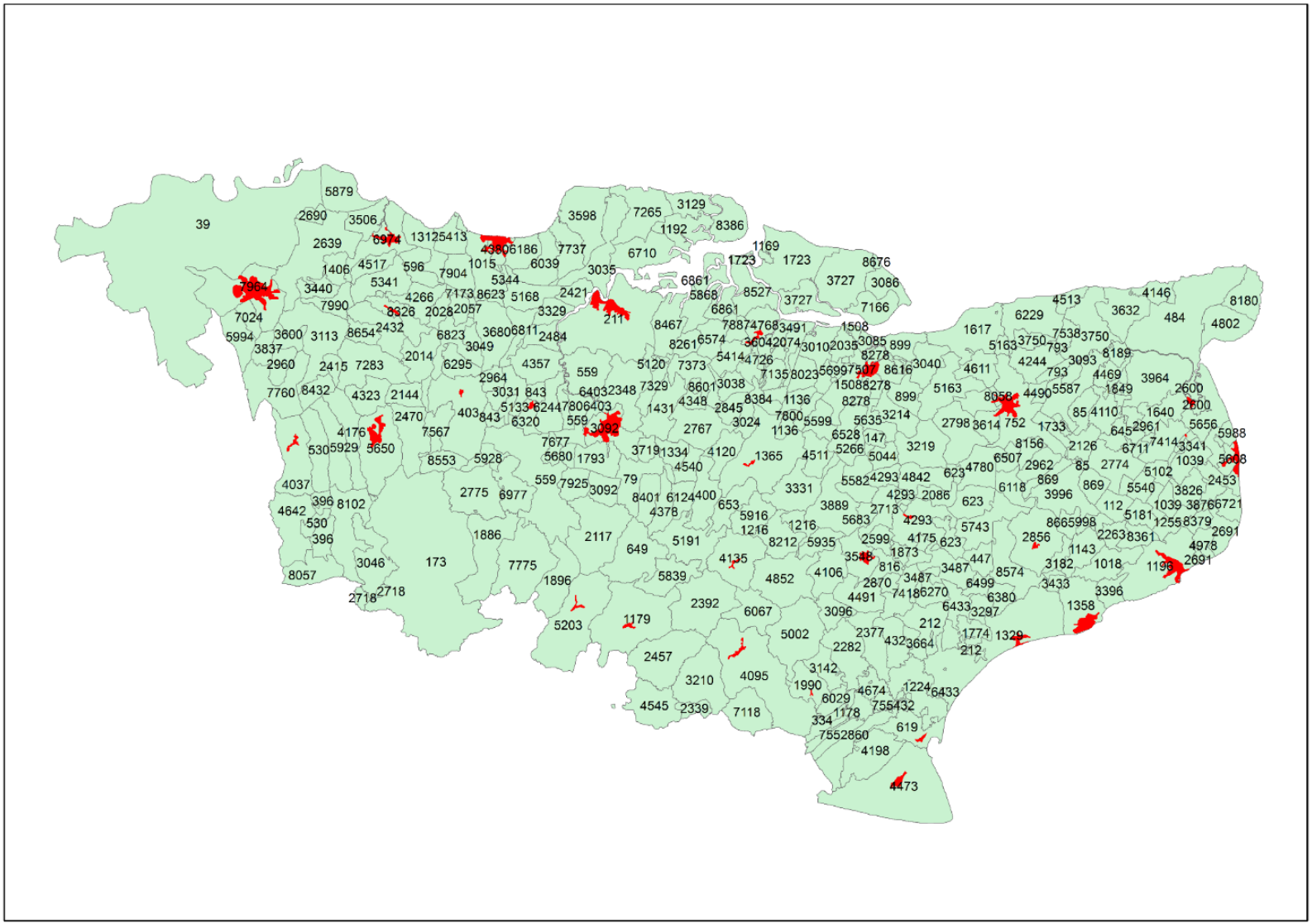

Figure 2: Figure 2: Examples of candidate-town urban footprints (red) overlapping parishes (green and numbered). Source: Cambridge Population Group – The Transport Project