

Citation for published version:

Adam Crymble, Adam Dennett, and Tim Hitchcock, 'Modelling regional imbalances in English plebeian migration to late eighteenth-century London', *The Economic History Review*, July 2017.

DOI:

<https://doi.org/10.1111/ehr.12569>

Document Version:

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Modelling regional imbalances in English plebeian migration to late eighteenth-century London

Between 1650 and 1750 the population of London grew from approximately 400,000 to 675,000 people. According to E.A. Wrigley, to sustain this rate of growth the metropolis needed to attract in excess of 8,000 migrants per year more than it lost through death or out-migration.¹ In the following half-century, this rate of growth and associated migration accelerated. By 1801 the population was approximately 960,000.² And yet we know very little about who made up this host of newcomers. By applying a multi-variable gravity model to a unique set of 11,500 ‘failed’ migrants removed from London as vagrants between 1777 and 1786, this article seeks to both add to our understanding of the origins of a subset of English migrants to London, and to test the balance of motives that led to their decisions to migrate. By measuring the effect of distance, population at origin county, wages and the cost of living, on the behavior of this vagrant subset of male and female migrants it will add new detail to our understanding of the early industrial English labour market, and the life-cycle experience of many of those who chose to leave their home county for opportunities elsewhere in the country.³

This article builds on both a strong tradition of scholarship applying theoretical modelling of historic population movements in general, and an extensive literature on the case of early modern and nineteenth-century London in particular. The work of E.G. Ravenstein (1885-9) and George Kingsley Zipf (1946) form the starting point for all modern discussions of migration, and successfully defined universal rules for understanding migration patterns. Ravenstein’s seminal work on migration theory was based on the 1871 and 1881 British censuses, and proposed that migration tended to be step-wise, that women tended to travel shorter distances than men, and that long-distance migrants tended to end their journey in a great centre of commerce or industry.⁴ Half a century later, George Zipf’s ‘P1 P2D Hypothesis’ added mathematical precision to this approach, and concluded that people travelled only as far as required to find an acceptable economic opportunity, reinforcing the

¹ Wrigley, ‘Simple Model’, p. 46.

² Wrigley, *People, Cities and Wealth*, Table 7.3, p. 166.

³ Studies of motivation and migration have been conducted by both historians and scholars studying contemporary society. For historical examples, see, Pooley and D’Cruze, ‘Migration and Urbanization’; Lovett *et al* ‘Poisson regression analysis’; Patten, ‘Rural-urban migration’; Freilander and Roshier, ‘Internal migration’; Pickles, ‘Labour migration’. For contemporary analyses, see, Taylor, ‘Migration and motivation’; ‘Karema *et al* ‘Gravity model analysis’; Stouffer, ‘Intervening opportunities’; Schwartz, ‘Interpreting the effect of distance’; Mabogunje, ‘Systems approach’.

⁴ Ravenstein, ‘Laws of migration’ (1885) and ‘Laws of migration’ (1889).

importance of short-distance migration.⁵ These insights have been used, in turn, to define the concept of a ‘migration field’, or the average distance travelled by migrants, as an important measure of the influence a city had on its hinterland. With few caveats, these early insights and approaches have held up remarkably well in the face of more detailed analysis and direct measurement.⁶

In the specific case of eighteenth-century London, John Wareing has suggested that London’s migration field extended to a radius of 130km by the beginning of the century (having declined from a much larger area of 212km in 1486).⁷ Ian Whyte’s analysis of London beggars has similarly demonstrated the pull of the metropolis on more local migrants, with 38 per cent of adult beggars in the 1790s hailing from within 16km of London, and only half as many coming from elsewhere in England.⁸ Most recently, Jelle van Lottum’s work on London and the Dutch Randstad provides a comprehensive attempt to measure London’s migration field. Using data from the 1851 census, van Lottum has argued that London’s hinterland, or the average distance travelled by migrants was 136km in the early nineteenth century – a near match for Wareing’s estimate for a century earlier.⁹ But van Lottum’s model significantly extends the notion of a ‘migration field’, by dividing this into four distinct regions or zones, defined by a straight-line Euclidian distance from London (see Figure 1). In van Lottum’s model, zone one includes the counties immediately bordering Middlesex, zone two stretches not quite to Bristol in the west, and to the Wash in the north, zone three includes the remainder of England and Wales, and zone four consists predominantly of Scotland and Ireland.¹⁰

Figure 1. *The hinterland of London during the early modern period*

Source: van Lottum, ‘Labour Migration and Economic Performance’, p. 542, fig. 4.¹¹

⁵ Zipf, ‘The P1 P2D Hypothesis’.

⁶ For studies confirming Ravenstein’s ideas, see, Saville *Rural depopulation in England and Wales*; Redford, *Labour migration in England*. Many studies have focused on testing one or more of Ravenstein’s original conclusions. For more on the idea of step-wise migration see, Pooley and Turnbull, ‘Migration and mobility in Britain’, pp. 55-62; Pooley, ‘Residential Segregation’; Withers, and Watson, ‘Stepwise migration and Highland migration’. For an alternative approach based on ‘family reconstitution’ see Souden, ‘Movers and stayers’.

⁷ Wareing, ‘Changes in geographical distribution’; Wareing, ‘Migration to London’, p. 356, 369.

⁸ The rest came from Ireland and Scotland. Whyte, *Migration and Society in Britain*, 76.

⁹ Clark, ‘Migration in England’, pp. 64-68.

¹⁰ Van Lottum’s four regions were defined by distance from London in kilometers. Region 1: 0-60km, region 2: 61-170km, region 3: 171-450km, region 4: >451km. Van Lottum, ‘Labour migration’.

¹¹ Van Lottum, ‘Labour migration’, 542.

Focusing on English internal migration, this paper seeks to build on van Lottum's work in two ways. First, it uses a new source: the *Vagrant Lives* (2015) dataset containing the details of some eleven and a half thousand vagrants processed by the county of Middlesex between 1777 and 1786. This dataset draws the analysis backwards from 1851, into the pre-census era of the late eighteenth century – halfway between the periods covered by Wareing and van Lottum.¹² And second, it combines a 'gravity model', with a range of county-level data to build a more nuanced understanding of the forces that explain the observed regional differences and anomalies in internal English migration patterns.¹³ In the process, this article will demonstrate how a geospatial gravity model approach can identify counties and regions that were sending too many or too few vagrants to London, considering their size, distance, local wage rates, and cost of living.

I

The data analysed in this article come from a series of bills listing vagrants expelled from Middlesex between December 1777 and April 1786 and transported to the county border by the county's dedicated vagrancy contractor, Henry Adams. Many had been arrested under the authority of the 1744 Vagrancy Act for 'wandering and begging' on the streets.¹⁴ Following arrest and an examination designed to determine their parish of origin and legal settlement, the Act permitted local magistrates to punish 'vagrants' with hard labour in a house of correction and a whipping, prior to their forcible removal. Others, particularly from 1783 onwards, had applied to the Lord Mayor for a 'vagrant pass' which allowed them access to the system of removal to their parish of settlement without suffering hard labour and whipping. Having been carried to the county border, both types of vagrants were then passed on to either the vagrant contractor for the adjacent county or the local constable, to be passed in turn from hand to hand, until they reached home.¹⁵ The surviving records were created by Adams and submitted to the county eight times per year, and detail the names as well as the final destinations of each 'vagrant'.¹⁶ For Adams the lists form part of his bill to the county

¹² Crymble *et al* 'Vagrant Lives'.

¹³ Lovett *et al* 'Poisson Regression Analysis'.

¹⁴ For a fuller discussion on settlement, see, Taylor, 'Pauper Settlement 1691-1834'; Snell, 'Pauper Settlement', p. 382.

¹⁵ Vagrancy Act of 1744: (17 George II c. 5). The system was not substantially altered until the passage of the Vagrancy Act of 1824: (5 Geo. IV c. 83, s.4). For a comprehensive over view of the legal system of vagrancy, see, Eccles, *Vagrancy in Law and Practice*, esp. chs. 2 & 8.

¹⁶ Hitchcock *et al* 'Loose, idle and disorderly'.

for work completed; but for historians they represent a detailed account of the origins of a substantial set of lower class ‘failed’ migrants to London.

For the nine years between 1777 and 1786, 42 out of a possible 65 lists survive.¹⁷ And following the geo-coding of the place names, they detail the settlement of 11,489 individuals removed from urban Middlesex. When compared with Adams’ own total figures for removals incorporated in a 1785 report to the Middlesex bench, this amounts to roughly seventy-five per cent of all vagrants transported by him in this period.¹⁸ As the county’s only dedicated removal contractor, Adams’ records therefore provide an incomplete but unique and substantial snapshot of vagrancy within his jurisdiction.

To interpret these data effectively and to recognise potential selection bias resulting from the nature of these sources and the contemporary system of vagrant removal, two further characteristics need to be born in mind. First, Henry Adams was hired to shepherd vagrants from and through Middlesex, and was not directly employed to transport vagrants from the City of London. This meant that while the majority of vagrants arrested in and processed by the City of London went through his hands (Middlesex surrounds the City north of the river), vagrants with a settlement to the south or east of the City, were not dealt with by Adams. As a result, removals to the counties of Norfolk, Suffolk, Essex, Kent, Sussex, and Surrey are not detailed in these lists (Table 2 and Figure 3 excludes these counties), and only a portion of those destined for Hampshire were included. The lists also encompass a substantial number of people from Ireland, Scotland and Wales, for whom detailed settlement information was not included. Because of these limitations, it is not possible for these data to be directly compared with results offered by van Lottum for his ‘zone four’ migrants. And second, as mentioned above, the lists elide two distinct types of vagrants, with very different characteristics: those who had been arrested for disorderly behavior in Middlesex and processed through the houses of correction before being forcibly removed (referred to hereafter as the ‘disorderly poor’), and those who had presented themselves to the Lord

¹⁷ Names of dependents – including wives – are not included; instead the number of dependents is listed. If a woman is the lead vagrant in a family group, her name is given.

¹⁸ In the autumn of 1785 Adams reported to the Middlesex bench, that he had processed 11,183 vagrants in the preceding five years. The surviving vagrant lists record some 8,365 removals in this period, amounting to seventy-five per cent survival. In terms of dates covered this same period saw a survival rate of only two-thirds. This reflects the extent to which longer lists involving more costs were disproportionately likely to have survived. For Adams’ report see London Metropolitan Archives, ‘Middlesex Sessions Papers, April 1786’, in *London Lives*, LMSMPS508090268. Note: thirty-three of the original 11,522 entries could not be geo-coded due to ambiguity and have been left out of the analysis.

Mayor requesting a ‘vagrant pass’, and expecting the vagrant removal system to aid their travel home. This group was particularly numerous in the years after demobilization following the American war in 1783 (referred to hereafter as ‘volunteers’).

Figure 2. *Map of county of origin of Middlesex vagrants, 1777-86, clustered using Jenks natural breaks classification method.*

Source: Vagrant Lives dataset.

The first of these types of vagrants, the ‘disorderly poor’ were a constant problem for the governors of the metropolis, and the object of a complex system of local policing. ‘Failed’ migrants of this sort were arrested – normally either by a constable, beadle or nightwatchman, and following an examination by a magistrate, taken to the houses of correction at either Tothill Fields in Westminster, or at Clerkenwell north of the City for punishment, before being shipped by cart to the edge of the county by Henry Adams and sent onwards to their place of settlement. The vagrancy laws were very loosely drafted, and we have no detailed records of precisely what these individuals did to warrant arrest beyond appearing offensive to the eyes of authority; nevertheless it is probable that nearly all of these people were noticeably poor and at risk of becoming a burden to the poor relief system in London. There was no doubt a selection bias in the identification of these migrants, formed by the perception and assumptions of those who initially arrested them, but what they shared most fully was an inability to take advantage of the employment opportunities offered by the capital. The *Vagrant Lives* dataset includes a record of 4,333 individuals in this category, making up 3,262 groups (husbands and wives, parents and children), of which 3,309 individuals and 2,020 groups can be linked to a precise settlement.

The second type of vagrant, the ‘volunteers’, represent a very different set of people, who had significantly different characteristics and places of origin. They include a higher proportion of adult males traveling on their own than do the disorderly poor; and include demobilized servicemen deposited in South-east England as a result of government policy, eager to get home after the American war, and seasonal labourers heading home following the harvest. From 1783 the City of London appears to have stopped whipping vagrants or putting them to hard labour and instead simply began issuing vagrant passes on request. The ‘volunteers’ include 7,156 individuals, composing 5,431 groups. The demographic breakdown of these two groups by gender and relationship is reflected in Table 1.

Table 1. Demographics of Disorderly Poor and Volunteers Removed from Middlesex 1777-1786.

Source: Vagrant Lives dataset

One final caveat should be noted. Many vagrants were removed as family units, and hence represent a single decision to move to London. To account for this, the following analysis is based on the behavior of ‘groups’ – defined either as a family, or an individual recorded as travelling on their own. This ensures that large families from the same region do not skew the analysis.

Any study of a population sub-set must consider the problem of selection bias in the sample, and there can be no doubt that this sample of migrants reflects a series of biases. At the point of entry into our dataset, the ‘disorderly poor’ were actively selected by constables for arrest as a result of their anti-social behaviour on the streets. Conversely, the ‘volunteers’ were in part ‘selected’ by the state, which chose to demobilize soldiers in South-east England; and were in part self-selecting, in that they approached the Lord Mayor for a pass, in the hope of free (if uncomfortable) subsidized travel. Prior to leaving their home county for London or the army, the motivations of the larger group of lower class migrants and army volunteers from which our data are drawn could well have differed from others making similar moves. We cannot say with certainty whether either group was made up of ‘typical’ migrants. To address this issue, this study has adopted a number of strategies. First, the migration patterns analysed have been limited to the English counties for which we have complete coverage (those north and west of London). This ensures that we can test the effects of distance, population density, wages and the cost of living, on groups for which we have comparable data. Second, the two vagrant groups were analysed separately to test for substantial differences between them. None were found.¹⁹ And finally, we have tested our results against the migration patterns apparent in a control set of plebeian Londoners – criminals. These samples of both the ‘disorderly poor’ and the ‘volunteers’ remain atypical, and selection bias inevitably remains, and remains difficult to fully account for. The only characteristics that all these plebeians share is their poverty and marginal social position. However, as these were

¹⁹ Hampshire does show significant variation, but as a ‘partial’ result has been excluded from this analysis. The greatest apparent variation in behavior between ‘volunteers’ and the ‘disorderly poor’ can be found among those removed to Northamptonshire and Lincolnshire, but even here, the distinction is not substantial. Results for Rutland and Huntingdonshire are affected by the very small numbers involved. See Figure 3.

the characteristics that marked the lives of a majority of London's migrants, the behaviour of these eleven thousand vagrants should reflect a wider experience.

II

The data derived from Adams' bills have been analysed using county-level aggregates with a negative binomial regression specification of a traditional gravity model to predict the attraction between two geographic points – in this case, the point or county of origin and urban Middlesex.²⁰ This methodology has the all-important characteristic of both predicting expected migration flows, and allowing us to explore the effects of different variables on observed behavior. Its use makes it possible to identify anomalous origin/destination pairs and to highlight distinct patterns associated with regions, counties and individual urban centres; providing much more information than a migration field alone.²¹ The model and data have been used to test the impact of five specific variables for their effect on migrant flows: (log) population at origin (initially at county level), (log) distance from London,²² average wages in the county of origin, the trajectory of those wages, and the aggregate price of wheat in the county (used as a proxy for cost of living).

Population at origin and distance form the basic components of Zipf's 'principle of least effort' – which argues that humans typically travel short distances using easy to travel paths, and that the size of the population at both the origin and destination are important predictors in migrant flows.²³ If applied to the London vagrants this observation would imply that there should be more vagrants coming from Berkshire, which is both heavily populated and close to London, than would come from, for example, Westmorland, which is both farther away and less heavily populated. This approach predicts how common migration from a given county to London should be, and allows us to compare that prediction to the observed levels of migration recorded in Adams' bills. Distance was calculated using the 'sp' (Pebesma and Bivand, 2005) package in *R* and is measured as the straight-line Euclidean distance in kilometers between the geometric centroid of Middlesex (as defined by 1851 County

²⁰ For examples of gravity models on migration studies, see, Karema *et al.* 'Gravity model analysis'; Lovett *et al.*, 'Poisson Regression Analysis'. For a close reading, see Pooley and D'Cruze, 'Migration and Urbanization'.

²¹ For an example of this type of model in use on historical data, see, Lovett *et al.* 'Poisson regression analysis' and for a comprehensive account of migration theory, see Lee (1966) 'A Theory of Migration'.

²² Logs of population are taken as the populations of largest and smallest counties are an order of magnitude different and exhibit a log-linear relationship with the numbers of migrant moving groups – see Figures A1 and A2 in Appendix. Distance has a similar log-linear relationship with volume of migration.

boundaries) and the geometric centroid of the parish of settlement (average distances are then calculated for the county) of the vagrants listed. Aggregate county population figures for 1781 have been used throughout, and are based on the work of E.A. Wrigley, using the 1801 census in combination with the marriage rate to generate a model of change over time.²⁴

Additionally, we sought to test the impact of wage rates (and whether these were rising or falling), on the decisions of vagrants to migrate. Wage data come from estimates assembled by E.H. Hunt and published as ‘Industrialization and Regional Inequality: Wages in Britain, 1760-1914’.²⁵ Here we have used both Hunt’s estimates for absolute wages for each county in 1767-70 (the years just before our data begin) and the rate of change observed between 1767-70 and 1794-5. This was a particularly important factor in the rapidly industrializing counties of the North, and the declining counties of the West. Changing wage rates are likely to reflect rising or falling demand for labour, with associated opportunities and unemployment acting as a direct influence on the decision to migrate. Though Hunt’s figures have been criticized for failing to account for changes in winter and summer employment, we believe they represent a good indicator of relative wages between counties.²⁶ Burnette’s research, suggesting that women’s wage rates varied in proportion to male wages, means that these data can also be used as a proxy for the relative wages of women.²⁷

Finally, we have used the price of wheat as a measure of the local cost of living. In this case, we have incorporated the data from Blunt and Cannon’s ‘Weekly British Grain Prices from the London Gazette, 1770-1820’ to provide a simplified cost of living index for each county.²⁸ Wheat price was calculated as the average price of wheat in the home county of the migrant over the period of 1776-86. As we do not know exactly when a specific vagrant left their place of settlement – it could have been many years prior to their removal – and as prices and wages fluctuated, these added measures are necessarily rough indicators of general conditions at their point of origin. Nevertheless, these aggregate data provide an added variable to the model that can help explain general flows between the origin and destination, enriching our understanding of the factors contributing to the decision to migrate.

²³ Zipf, ‘Principle of least effort’. See also, ‘Olsson, ‘Explanation, prediction, and meaning variance’ for more on distance interaction models.

²⁴ Wrigley, ‘English county populations’.

²⁵ Hunt, ‘Wages in Britain’.

²⁶ Lyle, ‘Regional Agricultural Wage Variation’.

²⁷ Burnette, ‘Female day-labourers’.

²⁸ Cannon and Brunt, *Weekly British Grain Prices*; Cannon and Brunt, ‘English Corn Returns’.

By comparing the projections generated by our model, against the observed flows of migrants recorded in Adams' bills we are able to identify counties, regions, and urban centres that were sending either more or fewer migrants to London than the model predicts. By incorporating wage and cost of living variables into the model, we are able to test the extent to which push and pull factors correlate with, and arguably explain, these anomalous migration flows. A detailed description of the model used can be found in the *Appendix: A Five Variable Gravity Model of London Migration*.

III

Since we know the number of vagrants (both disorderly poor and volunteers) that *did* travel between their point of origin and London, we can use the model described in the appendix to estimate the variation between the distribution of actual vagrants from each county, and the numbers the model predicts. Table 2 details the differences between the observed flows and the modeled predictions for each county, divided between the 'volunteers' and 'disorderly poor'.

Table 2. Observed flows versus model estimates: volunteers and disorderly poor 1777-86²⁹

Source: Vagrant Lives dataset.

What is apparent from this comparison is that the results produced by the model are quite close to observed data for counties within about 160 kilometers of London. At the same time, Table 2 highlights a number of anomalous results that consistently over- or under-supply London's vagrant population.

Figure 3. Difference between observed and estimated flows 1777-86.

Source: see tables 5 and 6.

Figure 3 illustrates these same results, showing the percentage error against observed migration flows for each group, by county. The errors themselves are generally quite small, showing that the model does a good job of estimating the likely flows of migrants.

²⁹ Totals in this table are different from those in Table 1 as some individuals were dropped from the final analysis, either due to unreliable entries or lack of spatial reference. We also note that analysis of the spatial distribution of the residuals using a Global Moran's I test indicates no spatial clustering of the residuals (I statistic of -0.03 for the volunteers and 0.2 for the disorderly poor), which might otherwise indicate a misspecification of the model.

To test if these results are skewed by substantial selection bias in the original *Vagrant Lives* dataset, we ran the model on another dataset: the *Middlesex Criminal Registers* from 1801 to 1805, which includes demographic details of 1,642 individuals who entered the gaol system in Middlesex in those years. Though vagrants and criminals entered the historical record via different routes, they all tended to be from similarly economically marginal backgrounds.

When compared to the results of the model, the *Criminal Registers* dataset shows remarkably similar patterns of migration to those generated by the disorderly poor and volunteers, suggesting that any selection bias in the *Vagrant Lives* dataset reflected a shared experience of poverty common to most migrants, rather than a systemic process of selection associated exclusively with vagrant removal. Table 3 and Figure 3 illustrate that criminals from 1801 to 1805 – two decades after the vagrants were removed – follow an almost identical pattern with almost precisely the same counties being over and under-represented. The model's percentage error amongst the criminals is frequently between those of the vagabond poor and volunteers (i.e. Northampton and Lincolnshire), suggesting that these flows are representative of migration patterns amongst plebeian migrants more broadly. The consistency apparent in the relationship between the model outputs from these two data sets both re-enforces our trust in the validity of the model itself, and in the significance of observed variations from its predictions.

Table 3. Observed flows versus Model estimates, vagrants and criminals

Source: Vagrant Lives dataset, Middlesex Criminal Registers.

Perhaps the most noteworthy result is that the model's predictions coincide almost precisely with the observed flows of migrants from a group of counties in the Midlands and Welsh borders, including Leicestershire, Nottinghamshire, Staffordshire and Shropshire. To the north of these counties, however, the observed migrant flows deviate noticeably from those predicted. Cheshire, Derbyshire, and particularly Yorkshire and Lincolnshire contributed substantially fewer migrants than the model predicts. Most of these counties were among those experiencing rapid industrialization and urbanization in this period, providing significant competition for London in the labour market. The cities of the industrial north tripled in size over the course of the eighteenth century, and like London, their growth was

fueled by migration.³⁰ Those migrants had to come from somewhere.³¹ With London's gravity pulling at those in the south and east of England, the industrial north seems to have been a bigger draw for those north of the Midlands. Those in rural areas, particularly in the north would, in many cases, have to pass through another major urban centre on their way to London. In some cases they must have stopped to find work rather than risk the longer journey, adhering to George Kinsley Zipf's 'principle of least effort', and Samuel Stouffer's theory of intervening opportunities.³²

As is shown by the z-scores in Tables 4 and 5 in the Appendix, after the size of a county's population and distance from London, the trajectory of its average wage (rising or falling), and hence demand for labour, is the most important predictor of whether a migrant is likely to make the journey to London, with rapidly rising wages likely to encourage potential migrants to stay at home. Running the model without the wage trajectory data flags that without the influence of rising income, counties such as Lancashire, Leicestershire and Yorkshire would be sending far more lower-class migrants to London. This in turn suggests that the growth in wages and demand for labour, rather than static high wages was a more significant pull factor for migrants.

We can also infer from the same anomalies that the counties surrounding this industrializing region were affected by the draw of industrial employment in different and distinct ways – in turn affecting flows of migration into London differently (Figure 3). The different patterns reflected in the figures for Lancashire and Yorkshire illustrate this. Both were industrializing. And both counties sent large numbers of vagrants to London (362 and 376 moving groups respectively), however, the former is flagged by the model as sending more people than we would expect, while the latter sent far fewer. Closer analysis reveals that Lancashire's migration to London is dominated by people coming from Liverpool, who in turn are composed of a significantly higher proportion of solo male travelers (44 per cent compared to 26 per cent nation-wide). Nearly all of the deviation from the expected values in Lancashire occurs amongst the volunteer group, and may be explained by the importance of the port of Liverpool as a recruiting ground for the navy. As the home to a large itinerant Irish population looking for work, it may be that the semi-settled Irish in the city were

³⁰ Clemens, 'The rise of Liverpool'.

³¹ Whyte, *Migration and Society in Britain 1550-1830*, 67.

³² Zipf, *Principle of Least Effort*; Zipf, 'The P1 P2/D Hypothesis'; Stouffer, 'Intervening Opportunities: A Theory Relating to Mobility and Distance'.

amongst those former soldiers and sailors dumped in London at the end of the American war (the first imperial war in which Irish Catholics comprised a substantial proportion of the British Army).³³ Without the volunteers, Liverpool, and thus Lancashire, moves from an anomalous county, to one fairly accurately represented by the model.

The data for Yorkshire tell a different story. As the largest English county both in size and by population, it contributed a large absolute number of migrants, but significantly fewer migrants than the model predicts. This strongly suggests that either life in Yorkshire gave would-be migrants proportionately few reasons to leave, or that the draw of regional urban centres such as Leeds, Liverpool and Manchester ensured that fewer people saw a reason to make the trip to London. Wages in North and West Yorkshire nearly doubled between the 1770s and 1795, again suggesting that demand for labour leading to changing wage rates formed a significant explanation for the observed patterns.³⁴

To the south, the flows are even more varied, notably with the East Midland counties of Northamptonshire and Rutland, along with the eastern counties of Bedfordshire and Huntingdonshire, sending fewer than expected migrants to London, despite their proximity to the capital. Conversely, the West Midland counties of Warwickshire, Gloucestershire, and Worcestershire, as well as neighbouring Berkshire and Oxfordshire, all send more migrants than we would expect, despite, in many cases, being further from the metropolis. This suggests that we can significantly revise van Lottum's original migration field, defined as a series of concentric circles (Figure 1) to a more complex pattern as revealed in Figure 3. Van Lottum included all of these Midlands counties amongst London's hinterland. Instead, it would appear that for the inhabitants of the eastern counties, the draw of higher wages in the north was slightly stronger in the late eighteenth century than was the draw of London. The opposite was true for the counties of the West Midlands. This means van Lottum's original circle, and hence London's migration field, could be more accurately represented as an 'L' shape, stretching across the southern midlands to the west, before turning northwards to follow the Welsh border.

This 'L' shaped cluster of counties centred on the West Midlands was the source of a disproportionate supply of urban migrants; and the cities they contain, are also prominent.

³³ Denman, 'Hibernia officina militum'.

³⁴ Hunt, 'Wages in Britain'.

Birmingham, Bristol, Worcester, Coventry, Bath and Gloucester are particularly prominent starting points for migrants, as can be seen in Table 4 (Exeter also features in this list, though Devon as a whole is not a significant point of departure). More than ten per cent of all vagrants in the data set hailed from one of these towns (781), making this urban-to-urban migration a significant force in the late eighteenth century that transcends the pattern revealed by county-level analysis and the straight-line Euclidean definition of London's migration field.

This urban-to-urban pattern is surprising. Britain was still an overwhelmingly rural society in the eighteenth century. According to Malanima and Volckart, by the mid-eighteenth century 16.4 per cent of the English and Welsh lived in urban centres, rising to 22.3 per cent by the end of the century.³⁵ It would therefore be easy to assume that most newly arrived Londoners were fresh from the farm. However, London vagrants are considerably more urban than the population as a whole, with 28 per cent coming from one of the forty-two largest English towns.³⁶

Table 4. Number of London vagrants in the urban centres of the west, focusing on those counties that were sending disproportionate numbers of vagrants to the metropolis.

*Source: de Vries, *European Urbanisation*; Herbert, 'Gloucester'; Wrigley, 'English county populations'.*

According to Wrigley's estimates of population growth (1761-1801), the counties for which we have full vagrancy data included just over five million people in 1781.³⁷ That is a ratio of 1 vagrant to 435 people. Unfortunately, we do not have accurate populations for these urban centres in 1781. Corfield urges a 'polite skepticism' of pre-census urban figures, as 'residents in more than one town expressed disbelief in 1801, when the first census showed their populations to be much smaller than they had expected'.³⁸ Nevertheless, it is possible to give

³⁵ Malanima and Volckart, 'Urbanisation'.

³⁶ These include: Bath, Bermondsey, Berwick upon Tweed, Birmingham, Bristol, Cambridge, Canterbury, Carlisle, Chester, Coventry, Deptford, Derby, Dover, Ely, Exeter, Gloucester, Hertford, Hull, Ipswich, Lancaster, Leeds, Leicester, Liverpool, Manchester, Newcastle upon Tyne, Northampton, Norwich, Nottingham, Oxford, Plymouth, Portsmouth, Reading, Salisbury, Shrewsbury, Southwark, St Albans, Stafford, Warwick, Winchester, Windsor, Worcester, and York – all of which had at least 10 vagrants returned during the period.

³⁷ Wrigley, 'English county populations'.

³⁸ Corfield, *Impact of English Towns*, pp. 6-7.

a rough idea of the ratio of these urbanites to London vagrants by using figures from the turn of the nineteenth century collected by de Vries and Herbert. When compared to the countywide ratios of vagrants per capita, the results show that these urban centres in the west are sending a disproportionate number of vagrants to London. Nearly all of these urban regions are sending more than twice as many vagrants per capita as were sent from the surrounding countryside. Worcester and Bristol sent nearly four times as many as the rural regions of their counties.³⁹

This means, in turn, that this group of London's poor were in many cases not from agricultural backgrounds, but were experienced urbanites that were familiar with life in a city, though not one of the size of London. This suggests in turn that migration to London was part of a pattern of trading up from rural-to-urban-to-London. Birmingham and Bristol along with a host of industrial and port cities, grew substantially between 1750 and 1800.⁴⁰ Given the rapid growth of these urban centres, it is likely that large numbers of London vagrants who had settlements in these towns were on a second or third leg of migration. A growing city offers many opportunities for gaining a settlement – particularly through either apprenticeship or domestic service – and this evidence suggests a significant pattern of ‘trading-up’ on the way to London, supporting Peter Clark’s work on the period to 1750 and Paul Slack’s findings on vagrancy from the Tudor and Stuart period.⁴¹ Besides their urban starting point, migrants from these western cities were anomalous in a second way: they were much more likely to be female and to be travelling on their own, than were migrants from elsewhere. This is the opposite of Souden’s findings for this part of the country in the early modern period, which argued that male out-migration tended to dominate the narrative in the west.⁴² It also implies that step-wise migration could be significantly associated with domestic service opportunities in urban centres.

Though these western towns – Birmingham, Bristol, Worcester, Coventry, Bath, Exeter, and Gloucester – were all located in the same part of the country, they had significantly different histories. In Bristol, wages were stagnant, and the city was gradually losing out to Liverpool as the chief port on the west coast. In Devon, where wages actually dropped between 1770

³⁹ Bristol has been considered part of Somerset for the purposes of this paper.

⁴⁰ Liverpool’s population rose from 22,000 to 78,000 between 1750 and 1800. Manchester rose from 18,000 to 70,000; Glasgow went from 24,000 to 77,000, and Birmingham from 24,000 to 69,000; de Vries, *European Urbanisation*, 270-271.

⁴¹ Clark, ‘Migration in England’; Slack, ‘Vagrants and Vagrancy’.

⁴² Souden, ‘East, west’, 306-308.

and 1795, Exeter sent larger than expected numbers of vagrants – though the county on the whole did not.⁴³ The city's industry was in decline by this period, but was seeking to reinvent itself as a leisure centre on the model of Bath, and in combination with its role as a county town, and ecclesiastical centre, was therefore home to a large number of domestic servants who may have been tempted by opportunities in London. Other western towns historically focused on textile production also found themselves in decline as the mills of the north began picking up steam.⁴⁴ The large number of migrants originating in these towns suggests their relative decline encouraged out-migration.

Of course, not all of the towns in the region, or among those contributing a disproportionate number of migrants, were in decline. Birmingham was growing as the economic centre for the industries of the Black Country. Unlike in the other towns under discussion, Birmingham's very success may help to explain its higher than expected contribution to London's migrants. The city's importance as a centre of commerce and industry led to the development of both a substantial trade network and canal system.⁴⁵ By 1777, fifty-two coaches per week made the trip from Birmingham to London, each carrying up to six passengers, meaning that as many as 312 people per week could now make the trip to the capital in relative comfort.⁴⁶ While not all poor migrants would have been able to afford a coach journey, writing in 1768 Arthur Young commented that such journeys were now frequently within the financial reach of servants who saved money to come to London.⁴⁷

With the notable exceptions of Bristol and Exeter, all of the large towns in Table 4 are inland rather than ports, meaning the majority of these urban vagrants likely arrived in London over land. The counties in this region are in some cases quite far away from the capital. Both Bristol and Birmingham are approximately 170km as the crow flies. However, Britain's road network had been dramatically improved over the course of the eighteenth century by the turnpike trusts, which were established to improve the long-distance thoroughfares.⁴⁸ From 1750 and 1790 the average speed of passenger coaches rose from four kilometers per hour to nearly ten, connecting the major towns and cities to London in a new way, and both

⁴³ Hunt, 'Wages in Britain'.

⁴⁴ Corfield, *Impact of English Towns*, 35; Chalkin, *Provincial Towns*, pp. 33, 49.

⁴⁵ Ellis, *The Georgian Town*, p. 39.

⁴⁶ Money, 'Birmingham and the West Midlands', pp. 296-297.

⁴⁷ Young, *The Farmer's Letters to the People of England*, 340.

⁴⁸ Guldi, *Roads to Power*.

facilitating internal travel and reducing its cost.⁴⁹ This would have made it much easier for people traveling over land from places such as Bristol and Birmingham to reach London efficiently.⁵⁰

IV

At the other end of the country was Northumberland, which sent nearly twice the number of migrants predicted by the model. It stands out as a distinct and unique regional case. This unusual character is confirmed by the higher than expected number of criminals from the region appearing in the *Middlesex Criminal Registers*. Northumberland's prominence flies in the face of the wider evidence, which suggests that the North of England was not a major contributor of plebeian migration to London – at least not disproportionately so. A closer look at the vagrants involved reveals that the connection is not county-wide, but is instead once again concentrated on urban migration, with 131 out of 220 vagrants (60 per cent) from Newcastle-upon-Tyne and Berwick-upon-Tweed – the two principle towns in the county. Drilling down even further reveals that a disproportionate number of these migrants are women (42 and 48 per cent respectively, compared to 33 per cent nation-wide).

The most likely explanation is the prominence of coastal shipping from Newcastle to London.⁵¹ Between 1751 and 1792, the weight of goods shipped via Newcastle rose from 21,600 tons to 121,200, the vast majority carried by colliers supplying the energy needs of the capital.⁵² The importance of the 'coaly Tyne' meant that ship traffic between Newcastle and London probably exceeded that between any other two points along the British coast, with estimates of between 600 and 1,000 ships participating in the trade.⁵³ Despite Northumbria's distance from London, it contributed disproportionately to the capital's growth.

Dorset also emerges as an unusual case, both in deviating from the model estimates by contributing fewer than expected migrants, and because it is geographically isolated from similarly outlying counties. Sherborne, a small Dorset town of approximately 3,000 people, contributed the largest single collection of vagrants from the county. A specialized centre for

⁴⁹ Bogart, 'Turnpike trusts'.

⁵⁰ Gerhold, 'Development of stage coaching'.

⁵¹ Hausman, 'English coastal coal trade'; Chalkin, *Rise of the English Town*, p. 1.

⁵² Corfield, *Impact of English Towns*, pp. 35-36.

⁵³ Ville, 'Total factory productivity', p. 359.

silk throwing, Sherborne both had strong direct links to the capital, and suffered along with London in the late eighteenth-century decline in that silk industry, suggesting if anything, that Dorset should be producing more vagrants than Adams' bills contain.⁵⁴ However, evidence from Hunt suggests that the county as a whole fared quite well in terms of wages, rising nearly a fifth between 1770 and 1795, compared to neighbouring Devon, where wages dropped eight per cent in the same period. As in the case of Yorkshire, this growth in wages in the area may have resulted in fewer reasons to emigrate.

One prominent pattern that is not obvious from Figure 3 is that affecting the area immediately adjacent to the capital. Included in this category is the area within about 130 kilometers of London, in the South East, particularly the regions immediate north and west. The number of distinct places from which vagrants claimed a settlement near the Middlesex border is higher than anywhere else, reflecting the extent to which London voraciously absorbed lower-class migrants from its immediate hinterland – its pull increasing the closer one approached. This is in contrast to the findings in the west, dominated by urban-to-urban flows. For this immediately adjacent area, our findings fully support the work of both van Lottum and Wareing, as well as Souden's findings about higher female out-migration from counties in the south east – probably driven by domestic service positions in London.⁵⁵

V

The 5-variable gravity model used in this paper has identified a series of anomalous migration flows towards London that begin to describe a more granular pattern of regional and gendered behavior than can be deduced using a straight line 'migration field' approach. What emerges from these data and this model are three distinct patterns of lower-class migration. The first, identified on the basis of an analysis of the county-wide figures, affects the industrializing areas of the Midlands and the North. With few exceptions, counties in the industrializing north, sent fewer plebeian migrants to London than the model predicts. The model suggests that the disproportionately strong draw of the industrial north extended at least as far south as Northamptonshire, if not further, and that Lancashire and Yorkshire experienced the pull of industrial employment in very different ways. Yorkshire benefited from rising local wage rates that kept people at home, whereas Liverpool in particular was subject to higher than

⁵⁴ Herts, 'The English Silk Industry', p. 721; Berg, 'Age of Manufactures', p. 197.

⁵⁵ Souden 'East, west'.

expected levels of male migration to London reflecting its role as a major port and transshipment site for Irish migration.

The second pattern to emerge concerns the urban centres in the west of England, from Birmingham to Bristol, and on to Exeter. If those in the industrial north generally eschewed London, the people of the West Midlands took the opposite approach. These counties contributed a much higher number of migrants than we would expect given their population, distance, local wage rates, and cost of living. The proximity to the industrializing north seems not to have drawn people from these counties as strongly as it did east of the Pennines – at least not at the expense of migration to London. Within this pattern, women also provide a story of note, with female migrants dominating this urban-to-urban flow. The decline of the textile industries in the West Midlands, and South West and the associated fall in wage rates, and the creation of a more efficient and extensive transport network, may have underpinned this phenomenon. Bristol, Birmingham, Coventry, Worcester, Bath, Exeter, and Gloucester, were substantially over represented among the vagrant poor.

The third pattern to emerge from these data relates to the counties and region immediately surrounding London. Within a migration field of approximately 130 km – close to that defined by van Lottum and Wareing – there are few significant anomalies in the overall pattern predicted by our model. These South Eastern counties sent higher proportions of women than men, and evidence a great diversity of places of origin compared to the rest of the country, with vagrants claiming settlement in a huge array of parishes and small towns. This suggests that migration to London from the South East was more likely to be direct – from the countryside to London – rather than disproportionately step-wise; and that the pull of London employments in domestic service were significant.

Finally, the counties of Dorset and Northumbria stand out as unusual cases, both nationally and regionally. Dorset's lack of major urban centres and rising wages appears to have placed it in a different relationship to London than its neighbouring counties. While in Northumberland, the prevalence of cheap transport via the colliers heading from Newcastle to London appears to have encouraged migration.

These three distinct patterns of London migration, and the experiences of Dorset and Northumbria provide nuance to our understanding of the migration field defined by van

Lottum. And while this work largely confirms the pull of London on its immediate hinterland – as described by both van Lottum and Wareing, as well as Souden – it also suggests a substantial pattern of regional differentiation, in which different forces – primarily rising and declining wage rates, urbanization, and the effect of domestic service – affected individual decisions to migrate.

Appendix: A Five Variable Gravity Model of London Migration

The model used in this analysis builds upon the work of Flowerdew and Aitkin (1982), Flowerdew and Lovett (1988), Abel (2010), and Congdon (1993), and uses a negative binomial regression approach. The work of these authors is part of the large canon of research using gravity models in migration analysis, all of which can be traced back to the gravity modeling work of Zipf.⁵⁶ This model, based on the traditional Zipf-style gravity model would take the form:

$$M_{ij} = k \frac{P_i P_j}{d_{ij}^2} \quad (1)$$

Where M_{ij} is the flow of migrant groups between origin i and destination j , and where P_i and P_j are the populations at origin and destination respectively, and d_{ij}^2 represents the distance d between the origin and destination (squared) and k is a constant of proportionality.

Wilson (1971) formally extended the gravity model into a family of ‘spatial interaction’ models that improved the accuracy of the estimates produced through using either (origin or destination) or (origin + destination) data constraints. One of the problems with the mathematical formulation of the traditional gravity model is that when all flow estimates produced by the model are summed they can exceed any observed flows. The constraints imposed by Wilson ensured this is no longer the case, although Wilson’s approach was subsequently adapted by a number of scholars, including Flowerdew and Aitkin (1982), who noted that by taking the logarithms of the terms in Wilson’s model, we arrive at a more flexible regression model, which allows us to extend the gravity model and test the effects of

⁵⁶ Flowerdew and Aitkin, ‘A method of fitting the gravity model’; Flowerdew and Lovett, ‘Fitting Constrained Poisson Regression Models’; Wilson, ‘A family of spatial interaction models’; Zipf, ‘The P1 P2D Hypothesis’.

a range of additional explanatory variables (such as wages and cost of living) on the flows exhibited in the data.

When modeling migration, simply taking the logs of both sides of the gravity model and fitting a log-log regression model is not entirely appropriate for a number of reasons. First, since migrant data are counts of individuals in fixed space, they are described by a discrete probability distribution rather than a normal or log-normal probability distribution. When modeling such discrete probabilities, Flowerdew and Aitkin (1982) suggest that a Poisson regression is most appropriate, although, Congdon (1993), Flowerdew (2010), and Abel (2010) contend that where these Poisson migration models are frequently a poor fit (either due to missing explanatory variables or migrant groups not moving entirely independently from each other) and exhibit what is known as ‘over dispersion’ (the observed variation in the data being greater than that in the theoretical model) a more appropriate generalized linear model to use is the negative binomial model.⁵⁷ The original gravity model in Equation 1 can be re-written in its negative binomial regression form as:

$$\ln \lambda_{ij} = \beta_0 + \beta_1 \ln P_i + \beta_2 \ln P_j + \beta_3 \ln d_{ij} \quad (2)$$

Figure A1 – log(population) plotted against log(disorderly poor migrants)

⁵⁷ Negative binomial models account for unexplained extra variance in the model with an additional parameter – this means that explanatory variable standard errors (and therefore statistical significance) are less likely to be biased by unaccounted for factors. In practice, experimentation with both Poisson and Negative Binomial models in this research produced almost identical fitted estimates (with the exception of one county), however the dispersion parameter indicated that the negative binomial model was more appropriate than the Poisson model and so we use this specification. An additional advantage of using a regression model rather than a conventional multiplicative gravity model is that parameter estimates for each of the independent variables can be easily obtained thus revealing the relative importance of each variable in the model.

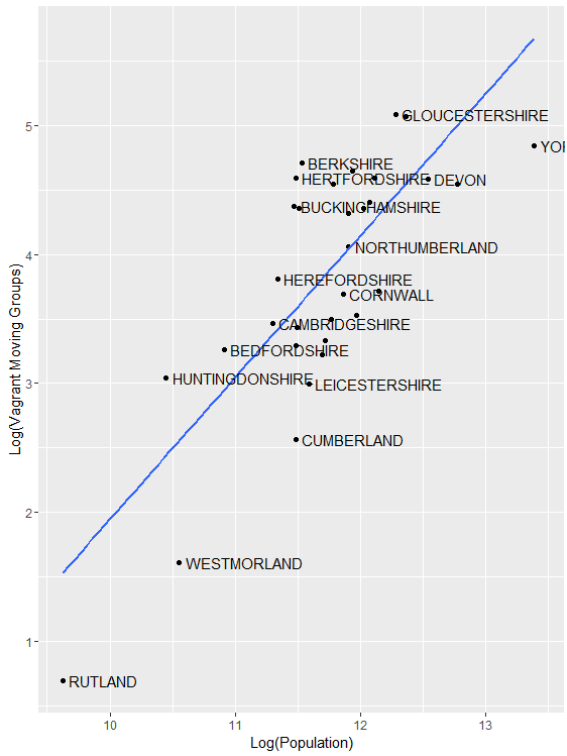
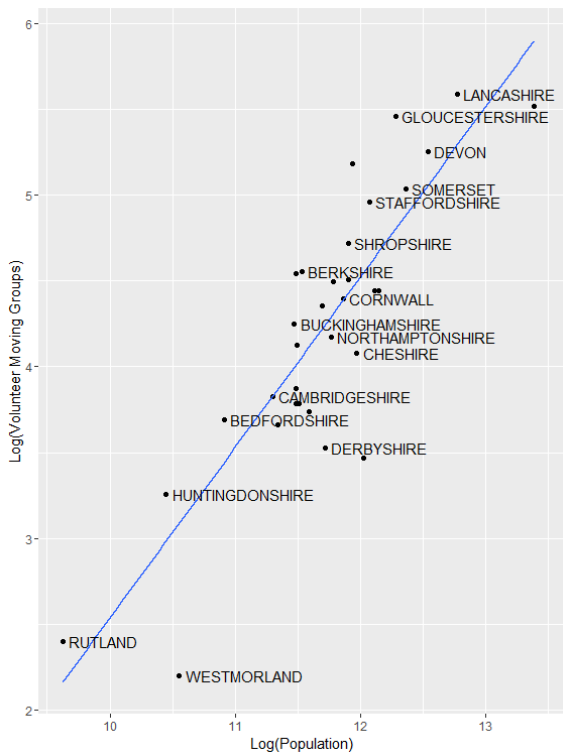


Figure A2 - log(population) plotted against log(disorderly poor migrants)



Where $\ln \lambda_{ij}$ is the conditional mean of the expected migration flow, which is logarithmically linked (\ln) to a combination of the logged population and distance variables (see Figures A1

and A2 for the log-linear relationship between population and numbers of disorderly poor and volunteer migrants). The parameters β (which indicate the relative importance of each explanatory variable) are estimated by the model. Dropping the London (P_j) population from the equation (as London is the only destination in our data and therefore redundant) and incorporating wheat price data (Wh_i) at origin, wage (Wa_i) and wage trajectory (WaT_i) data (not logged) and sub-models for subsets of the full migrant dataset differentiating between migrant types T of disorderly poor or volunteer (M_{ij}^T), we arrive at the final model:

$$\ln \lambda_{ij}^T = \beta_0^T + \beta_1 \ln P_i + \beta_2 \ln d_{ij} + \beta_3 Wh_i + \beta_4 Wa_i + \beta_5 WaT_i \quad (3)$$

We are then able to estimate expected migrant flows, λ_{ij} by simply taking the exponential of Equation 3:

$$\lambda_{ij}^T = \exp(\beta_0^T + \beta_1 \ln P_i + \beta_2 \ln d_{ij} + \beta_3 Wh_i + \beta_4 Wa_i + \beta_5 WaT_i) \quad (4)$$

As we only know when a vagrant was expelled from London, but do not know when he or she arrived in the city, we cannot accurately determine the population of their home county when they migrated. Therefore we have used the aggregated county-level population figures for 1781, as published by Wrigley to represent the population at origin P_i .⁵⁸ The relative population of each county is more important than the absolute population, so these estimates are sufficient.

A series of models were run to determine the explanatory power of each of the variables. As with any regression modelling exercise, a series of assumptions should be met before we can be confident of the results obtained. Catch-all plots for both vagrant and volunteer models indicate linearity assumptions are met, whilst tests for independence of observations – specifically spatial autocorrelation of the residuals, tested by calculating a global Moran's I statistic (binary spatial weights matrix, using the Queens case) – showed that there was very little evidence of spatial autocorrelation in both the volunteer and vagrant models. Early experimentation with the wheat price variable (or cost of living proxy) returned a significant (and positive) influence on the flows of both vagrants and volunteers (as wheat prices increased, so did the flows of groups to London), however the subsequent addition of both

⁵⁸ Wrigley, 'English county populations.

wage and wage trajectory data confounded this influence suggesting that wages are a better proxy for understanding the ability someone has to support their existence in an area. In the final models reflected in Tables 5 and 6, we keep wheat in the model rather than rejecting it, as one would expect the interplay between cost of living and wages to vary across the study area and there are no good theoretical reasons for rejecting cost of living as an explanatory factor outright. Both the disorderly poor and volunteers must be modelled separately, as they represent different types of migrants. Tables 5 and 6 show the outputs for these models, with their corresponding significance and a number of goodness of fit statistics.

Table 5. Model outputs from model including total disorderly poor moving groups. English counties

Table 6. Model outputs from model including total volunteer moving groups. English counties

To read these tables you need to understand the raw parameters and the standardized z-scores. The raw parameters are the calculations for each variable. For Table 5 (disorderly poor), the model shows that on average, for every e -fold (the base of a natural logarithm is Euler's constant, e , or around 2.72) increase in distance away from London, there were 0.54 fewer moving groups from a particular point of origin. For every e -fold increase in a county's population, there were an extra 1.24 moving groups. For every shilling increase in the price of a bushel of wheat, there were 0.024 fewer moving groups (although the standard errors are such that this figure is not statistically significant) for every single pence of additional wages there were 0.03 fewer moving groups and for every percentage point increase in wages between 1767-1770 and 1794-95, there were 0.014 fewer moving groups migrating to London.

As each of the variables are measured on different scales (km, people, £), the standardized (z-scores) make it possible to compare all variables on the same scale and get an impression of the relative importance of each. To assess the goodness-of-fit of each model in a way that is easy to interpret, we calculate a pseudo R^2 statistic using McFadden's method (

$R^2 = 1 - \frac{\text{Residual Deviance}}{\text{Null Deviance}}$). Focusing on Table 5: a pseudo R^2 value of 0.78, reveals that around 78 per cent of the variation in the migration patterns observed in the data can be

explained by the four variables: population mass of the vagrants' home county (z-score = 10.434), distance from London (-3.922), wages (-2.177) and wage trajectory (-3.034). The standardized coefficient for wheat price is lower (closer to 0) than those for distance and population, indicating that cost of living is a less influential factor than the core gravity model variables, however, it is statistically insignificant.

The standardized coefficients reveal the relative importance and direction of the relationship between the variable and migration in the model (positive parameters showing that as the variable increases, so does the volume of migration, negative showing that as one goes up, the other goes down). That means that the model indicates that a large population in the migrant's home county was the most important indicator of their likelihood to migrate to London, followed by distance, wage trajectory and average wages.

The model of the volunteers shows a slightly different relative importance. With an R² value of 0.80, the model suggests that 80 per cent of the variation in patterns can be explained by the variables, with population (10.370) again the most significant factor, followed this time by wage trajectory (-2.423). All other variables in the Volunteers model are statistically insignificant, but given the very different routes to London taken by this group, this is not entirely unexpected.

The raw parameter values in the tables above can be used to directly estimate the numbers of migrants. For example, as Table 2 shows, the model estimate for the disorderly poor from Buckinghamshire is 83 with Table 7 showing the model inputs for that county.

Table 7. Sample Model Inputs for Buckinghamshire.

Given the values for the various predictor variables in the table above, we can use the model parameters in Table 5 or 6 to compute our model estimates:

$$\lambda_{ij}^T = \exp(\beta_0^T + \beta_1 \ln P_i + \beta_2 \ln d_{ij} + \beta_3 Wh_i + \beta_4 Wa_i + \beta_5 WaT_i)$$

Estimated migration, λ , of vagrant groups between Buckingham (i) and London (j) = 83 = $\exp(-3.84814068+(1.23523249*\ln(95936))+(-0.54165632*\ln($

46.73214286))+(-0.02397521*63)+(-0.02517889*96)+(-0.01378304*-8.33333333)