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Internal migration in England, 1818–1839

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From indents of 10,151 English men and women transported to the penal colony of New South Wales, Australia, it is possible to measure English intercounty migration between 1818 and 1839—a period of industrialization for which data on population movement are absent. Comparisons with the 1841 census indicate that transported convicts were broadly representative both of the English prison population and of the non-criminal working class. Almost one-third of the workers in the sample moved between counties. The working-class intercounty migrant was young, literate and skilled; the median distance travelled was 59 miles. Regional migration pathways are described. Rural workers moved more frequently than urban workers, but urban workers travelled a greater median distance than their rural counterparts. Estimating a gravity-flow migration model, migration is found to be highly sensitive to intercounty job opportunities and wage rate differentials, but relatively insensitive to distance (which acted as a deterrent to movement). While regional biases existed, the regression results imply that labour market signals were effective in transferring labour from rural to urban locations.

Introduction

The popular picture of British industrialization characterizes an agrarian society uprooted and then displaced by an industrial economy centred around the city. This picture is not very different from the model held by economists and economic historians. Using a different terminology, economic historians have emphasized that successful industrialization required a structural transformation of the economy whereby agriculture yielded abundant labour and natural resources for employment and production of the growing industrial sector.[1] While population growth, demographic sex-age changes and increased labour participation rates explain much of the increased employment needed by the expanding industrial sector, labour migration is considered to be an important contributory factor. Since migrant labour streams tend to be biased towards young males with high participation rates, migration has a greater impact on the labour force than comparable natural increases in the population. Further, migration is thought to be sensitive to wage levels, reducing wage-income differentials between geographical areas and creating a more homogenous national labour market. Similarly, migration may change the national distribution of skill and literacy to the extent that these characteristics are causal factors in migration.

Only in 1851 did the English census give county of birth as well as county of residence, allowing decadal intercounty mobility to be calculated. Before then, only aggregate county population data were tabulated, preventing the study of internal migration as a source of labour in British industrialization. As a result, little is known about the extent and nature of labour mobility for the early

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nineteenth century.[2] By comparing the estimated natural increase (surplus of births over deaths) with the population census, Deane and Cole argued that natural increase—not migration from the rural south—was the major factor accounting for the growth of population in the industrial areas of the North after 1780.[3] While rejecting a south–north migration, they found that many of the industrial centres were heavily dependent on migration from surrounding counties with high natural increases in population.[4] For example, Cheshire and Lancashire with large urban centres but low rates of natural increase relied on migration from surrounding counties for almost 30% of the estimated increase in population between 1801 and 1831.[5] In the industrial and commercial south, Middlesex and Surrey acted as magnets drawing migrants both before industrialization and after. Between 1801 and 1831 Middlesex depended on migration for nearly three-quarters of its population increase. In short, migration was an important factor accounting for the growth both of county population and of the labour force in the industrialization phase of British development.

Unfortunately, there are many aspects of migration during this crucial period which remain hidden. Little is known of how labour markets coped with regional imbalances in the supply and demand for labour. More fundamentally, the selectivity bias of migrants, in terms of the age–sex profile, human capital endowments, conjugal status and occupations of the migrants, are unknown. So, too, are the source counties, urban–rural location and distances travelled by migrant workers. Our knowledge of migration during British industrialization tends to be based on largely untested hypotheses drawn from much earlier or later periods. For example, Ravenstein posited a short distance wave model in which the bulk of internal migration was perceived as a "drift" toward the great urban centres by successive stages.[6] His thesis that migrants drawn from nearby catchment areas were replaced by migrants from further afield was based on the 1881 census. Deane and Cole presented an alternative scenario for large urban areas such as Lancashire, in which towns stimulated natural population growth in the surrounding counties and then absorbed part of this excess population thereby eliminating the need for longer distance migration.[7] Neither of these competing models have been properly tested for the pre-1840 period. However, Anderson's pioneering studies of migration to Preston in 1851 suggested that the concept of two step (wave) migration—in which the same individual moves to urban areas in progressive steps—explained little of Preston's population growth.[8] The most telling point was that less than a third of the migrants to Preston travelled distances of over 30 miles.[9]

Other studies appear to confirm Anderson's analysis. Tranter found that only a minority of family heads in 1792 had lived their whole lives in the Bedfordshire parish of Cardington, but less than 12% ventured outside their county of birth.[10] Cornwall found that only 47% of the males resided in the Sussex parish in which they were born between 1590 and 1640.[11] However, 26% moved to the next parish and only 9% moved more than 30 miles.[12] Using marriage and baptism records, Buckatzasch found considerable short distance mobility of mostly less than 10 miles in both Sheffield and Westmorland.[13] Recently, Souden has used the ecclesiastical court records for the six dioceses of Exeter, Bath and Wells, Salisbury, Oxford, Leicester and Norwich between 1661 and 1787 to study geographical mobility.[14] Accounting for between half and two-thirds of his sample, Souden found that the migrants were younger, more

literate and more likely to be female than non-movers.[15] Distances moved tended to be short, a finding in line with Peter Clark's results from a much larger sample of court depositions from seven dioceses where the overwhelming majority of movers travelled 10 miles or less.[16]

The overall impression is that Englishmen were mobile before industrialization, but only over short distances. Although a local study of Hawkshead parish in Lancashire indicated that geographic mobility was considerably greater for the 1700–1840 period than for the 1588–1699 period, small distance migration remained the norm, with most movers travelling to and from contiguous parishes.[17] Movement to London presented contradictory evidence. The East London Population Studies Group found, on the basis of baptism and burial registers, that most migrants to Stepney in the early seventeenth century came from a relatively small surrounding area.[18] In contrast, Cressey, using ecclesiastical court depositions for the same period, indicated that 69% of migrants had moved more than 50 miles into Stepney and Whitechapel.[19]

The conflict over movement into Stepney illustrates a major problem facing historical demographers. The small size of the samples, their possible unrepresentativeness and their concentration on the pre-1780 period cautions against their use for economy-wide generalizations about mobility during the Industrial Revolution. As a result, economic historians have extrapolated backward to the industrialization period the empirical results of aggregate gravity-flow migration models estimated using post-1850 data. Basically, gravity-type models hypothesize that migration is directly related to the population size of the origin and destination counties and inversely related to distance.[20] The basic model is then modified by introducing behavioural variables such as income differentials between counties, transport costs and non-monetary psychic costs. The gravity-flow formulation has somewhat tenuous links with economic theory which posits that migration is an individual utility maximization decision to improve human capital. The gravity models are not derived directly from utility functions. Pre-1850 aggregate wage and intercounty economic opportunity data may be imperfect proxies for the income differences, transport and non-monetary psychic costs which should occur in individual utility functions. Even if early 19th century aggregate data such as wage rates were adequate, intercounty income differences might be proxied more accurately by expected wage differences rather than intercounty aggregates.

Given these problems, gravity-flow models using 1861 and 1851 census data suggest that intercounty migration was greater the lower the wage of the source county, the higher the wage of the receiving county, the shorter the distance between the two, and the greater the supply of non-agricultural job opportunities.[21] The models suggest that migrants responded to economic factors, showing a pronounced sensitivity to costs imposed by distance. How well these results proxy pre-1851 mobility (and the working of the pre-1851 labour market) is uncertain. The wage and opportunity variables were sensitive to model specification and by mid-century there had already been a significant labour transfer from agricultural to non-agricultural pursuits and emigration offered a major alternative to internal migration.[22] Recently, Williamson has analysed the selectivity bias in city immigration during the Industrial Revolution.[23] Using the population censuses reconstructed by Wrigley-Schofield, Williamson found high city immigration rates, even by the

standard of today's Third World countries.[24] Specifically, he discovered a young adult selectivity bias amongst the emigrants, concluding that city job pull was more important than the rural push induced by enclosure or technical change.[25] However, for the industrialization period the human capital characteristics of migrants remain hidden.

Using a new data set for the period 1817–1839, this paper investigates the character and process of intercounty internal labour mobility in England during the Industrial Revolution. The migrant is identified by age, sex, human capital endowments and location, and compared to non-migrants. Second, the major migration routes and patterns are analysed. The impact of migrants on source and receiving counties is then evaluated. Finally a migration model is estimated allowing some hypotheses on the operation of the labour market to be tested.

The data

The data base comprised 10,151 men and women convicted in English courts and transported to the colony of New South Wales, Australia, between 1818 and 1839. Data on each individual were contained in indents which accompanied each ship. Data were not complete for every individual, but occupation, urban–rural birthplace and county of trial was available for 9,744 individuals. Intercounty migrants were defined as English workers born in a different county from their place of trial. While place of birth included both town and county for urban convicts, only county of trial was given for the convicts' current location. Therefore, the convict indents only provide data on intercounty migration. Before 1840, trial of a crime was conducted in the county in which it was committed before magistrate's courts, courts of Quarter Sessions or the Assizes held in each county.[26] On this basis, we assume that crimes were committed in the offenders' county of residence. Undoubtedly some crimes were committed in counties contiguous to the criminals' place of residence. However, such cross-border crimes were random and there is no evidence to suggest any systematic bias. Workers transported to New South Wales were not professional criminals travelling long distances to commit planned crimes.

All those in the sample were criminals, tried by English courts, found guilty and transported. Males aged 50 years or less, in good health and sentenced to life or 14 years were selected first for transportation; then prisoners with 7-year sentences, priority being given to those who were unruly or had committed "atrocious" crimes. Females 45 years or less were selected on the basis of health.[27] Over half of all transportees were sentenced to 7 years.[28] There is no evidence to suggest that the selection process depended on whether a convict was a migrant. Of course, local officials might have selected for transportation those "out-of-county" convicts who were footloose and more mobile. One test of this hypothesis is whether the transported convicts differed significantly from the convict population in England.

Convicts transported to New South Wales were similar to the convicts who remained at home. In terms of age, Black Country offenders and transported convicts were both bunched in the less than 19 years (32% of the sample) and 20–29 years (49%) age groups. Both convict groups were young relative to the 1841 English population in which (excluding those aged 13 years or below) only 17% were less than 19 years and 28% aged 20–29 years. All the contemporary and modern migration evidence points to a similar selectivity bias, with migrants

over-represented in the young-adult age groups. Using the 1851 census Baines constructed a hypothetical female age distribution for migrants in 1846 in which 35% were aged 19 years or less and about 50% aged 20–29 years.[29] This is remarkably close to the transported convict age distribution. On this evidence, the convict sample is biased towards an age structure similar to that of migrants.

Between 87% and 90% of transportees committed offences against property, overwhelmingly larcency, and less than 3% offences against the person.[30] This compares closely with Black Country offences, where 87% of offences were against property, mainly larcency, and less than 6% against the person. Occupational comparisons are notoriously hard to make between a national sample and a regional population. For example, nailors accounted for 1·9% of the occupations of Black Country offenders, but only 0·004% of the convict sample. However, 49% of all nailmakers in the convict sample came from the counties surrounding the Black Country—Worcester, Warwick and Stafford—and the Black Country town of Stourbridge was the principal birthplace of transported nailors. Philips gave the 1844–5 occupational breakdown of Black Country offenders as 58·8% unskilled and semiskilled, 38·4% skilled with the upper and middle class accounting for the remaining 2·8% of the offenders.[31] The breakdown for the total convict sample was 53·4% unskilled and semiskilled, 43·6% skilled and 2·9% middle and upper class. Transportees did not differ significantly from criminals who remained in England.

Recent work by historians has shown that the offenders at home were ordinary working men and women.[32] The once popular view of a criminal or "dangerous class", of prostitutes, young delinquents, hawkers and vagrants who were born to lives of crime, who lived entirely by it and who inhabited the "low lodging houses", gambling joints, brothels and beer houses of English cities is incorrect.[33] Jones found that in the great metropolis of casual labour, London, convicted offenders who committed the occasional petty crime were little different from the rest of the working population. There was little evidence of a criminal class in Manchester, and vagrants categorized by contemporaries as a "dangerous class", were, according to Jones, criminals because they were vagrants. Most people convicted were fairly young and poor.[24] Most Black Country crime was committed by people who were not full-time criminals, who worked at jobs normally, but also stole articles on some occasions.[35] What was noticeable about Black Country crime was its casualness and lack of professional planning. Recently, Australian economic historians have questioned the received view that transported workers were permanent outcasts or dregs of society trained to crime from the cradle.[36] The fact that 67% appear to have been first offenders, and that the overwhelming majority were sentenced for theft, provides no support for the criminal class thesis. In short, transported offenders were broadly representative of working men and women.

This claim is supported by comparisons of the occupations of the transported convict with the 1841 census occupations. All convict trades were standardized into 342 occupations and distributed using Armstrong's classification scheme for the 1841 census: 1—professional, 2—intermediate, 3—skilled, 4—semi-skilled and 5—unskilled.[37] Occupations from the 1841 census were similarly classified and compared with the convict sample. Armstrong's scheme, for all its deficiencies, is the only consistent classification for our period which allows the sample convict data and the census occupation data to be compared.

The skill distribution of the convicts and the English population were not significantly different although convicts made up a higher proportion of unskilled occupations than did workers enumerated in the census. Thus the convict sample appears to be a cross-section of the English working population in terms of its skill distribution. Not only were the transported convicts representative of the convicts at home but, on the basis of their occupational skills, were broadly representative of the working population. On this basis the convict sample is treated as a random sample of the population. In other respects, as shown below, the sample's age, sex and literacy characteristics differ significantly from the English working population.

All English counties were represented in the data set. The sample sizes for each county were greater than the minimum size needed for 90% confidence level tests of the population except for Cornwall, Dorset, Huntingdon, Rutland and Westmorland. The data, therefore, was not subject to any major spatial biases. Indeed, the convict indents are unique in providing socio-economic data on individual migrants not only for a period before the 1851 census but in much finer detail than even the post-1851 census data. For example, the indents gave both town and county of birth for urban convicts and only county of birth for rural convicts allowing the urban–rural birthplace of migrants to be identified.

In common with all aggregate migration data, the convict data on movers compares only current location (county of trial) with county of birth, thereby obscuring the date and frequency of moves and giving no evidence of the age, skill, literacy level and marital status at the time of the move. Assuming mobility was a random process, the number of movers in each age category was estimated using a uniform distribution. The share of actual movers in each age category was found to be significantly different from the share estimated by this random process. The actual movers were under-represented among those aged 20 or less, and over-represented in the 20–29 and 30–39 age groups. This supports the contention that mobility was more likely to occur after human capital investments in education and job skill had been made. However, data limitations impose the assumption, common to all aggregate migration studies, that skill, occupation and literacy had been attained before migration.

Who were the migrants?

Thirty-two per cent of the workers in the sample moved.[38] Most movers were unmarried although single movers fell from about 90% of movers aged under 24 years, to 65% aged 24–29 years to only 32% of those aged 30 years or more. However, the selectivity bias was towards young unmarried adult males, with family movement predominating only for the higher age groups. The demographic profile of internal migrants contrasts sharply with Erickson's picture of British emigrants to the United States in 1831 as family groups largely from urban areas.[39] The age distribution for these transatlantic migrants matched the 1841 population census showing none of the bias towards the 14–30 year age group found in the convict data.

Our estimates of mobility were derived from intercounty movement. Distance was measured by road mileage in 1821 between the largest town in each county.[40] This technique obviously underestimates mobility insofar as movement within counties, which in large counties like Yorkshire could be over long distances, cannot be identified. It also fails to identify those who had moved

but had returned to their counties of birth before criminal conviction. Nevertheless, the data appear to confirm the view that during the nineteenth century the English were the most mobile people of Europe, at least as regards internal migration.[41] English intercounty migration was over medium distances; half the sample moved between 30 and 110 miles (see Table 1). While significantly more migrants were rural-born workers than urban-born workers, there was little difference between the distance the two groups travelled. The median distance travelled was approximately 59 miles. Out of 741 possible intercounty migration routes, English migrants travelling 59 miles could utilize 149 routes, and had, on average, a choice of 7·7 counties. Of course, short distance movers, for example the 23% of all movers travelling less than 35 miles, had reduced choice of only 2 counties. These figures refer only to England. Inclusion of migrants from Scotland, Wales and—in particular—Ireland, would have increased median distances.

TABLE 1
Distances moved by English workers

Miles Travelled	%	Cumulative %
10–19	11·4	11·4
20–29	4·6	16·0
30–39	9·4	30.0
40–49	5·8	35·8
50–59	8·7	44·5
60–69	8·0	52·5
70–79	5·0	57·5
80–89	2·8	60·3
90–99	4·7	65·0
100–109	5·0	70·0
110–119	2·6	72·6
120–129	2·4	75·0
130–139	3·0	78·0
140–149	3·4	81·4
150+	18·6	100.0

Source: Convict Indents

Distance was also calculated in terms of adjacent and nonadjacent intercounty mobility. Contemporaries suggested that most nineteenth-century English migration was short-distance in character, and that by far the larger proportion was confined to contiguous counties.[42] At least for the industrial revolution period this does not appear correct. Since 49% of English migrants moved to adjacent counties, while 51% moved to nonadjacent counties, internal mobility amounted to more than a simple shift across county boundaries. The capital, London, drew 21% of English migrants from all parts of the country, although counties adjacent to the capital were over-represented. Three per cent of the migrants moved abroad. Comparison with the evidence for earlier eras, presented in our introduction, suggests that the intercounty migrants of the industrialization period were not short distance movers. During the Industrial Revolution medium distance intercounty mobility was the norm. Some 70% of movers travelled 40 miles or more. The geographic concentration of industrial

job opportunities, combined with improvements in transportation, stimulated a greater willingness to migrate further afield even before the construction of an effective railway network.

We measure human capital investment by the ability to read and write, read only, or neither read nor write. It was found that 72% of all convict workers were able to read or to read and write, a proportion significantly higher than the 66% of English males or 51% of English females able to sign the marriage registers between 1839–42.[42] English movers had significantly higher literacy levels than non-movers and workers who could both read and write moved further than those movers who were illiterate.[44] Human capital reduced both the information costs of moving and the non-monetary pyschic costs of leaving friends and family. Specifically, education reduces attachments to family and tradition by increasing an individual's awareness of opportunities in other localities, thereby weakening the forces which hold him in his present location.

A further human capital investment measure was the workers' skill classification. Using skilled, semiskilled and unskilled classifications, movers were significantly more skilled than non-movers and the skilled worker moved further than the unskilled. To test whether certain occupational groups tend to move more frequently, all occupations with more than 50% of its members moving were calculated (see Table 2). Seamen, soldiers, sailors, were disproportionately represented in the migrant population and the most over-represented occupational groups were in service employment. The distance occupational groups travelled was also calculated, but no occupational group was significantly over-represented as short or long distance movers.

Convict workers engaged in agriculture, manufacturing, industrial service, and labour not elsewhere classified were over-represented amongst the English

TABLE 2
Mobility by occupation and skill (only occupations with more than 20 observations)

Occupations with more than 50% movers	Movers %	Skill classification
Allwork	52	5
Baker	57	3
Coachman	61	4
Cook	60	3
Dairyhand	63	4
Engineer	57	3
General Servant	53	4
Greengrocer	58	4
Groom	64	4
Hawker	63	5
Kitchenhand	55	5
Laundress	62	4
Porter	51	5
Saddlemaker	55	3
Sailor	58	3
Seaman	59	3
Soldier	93	3

Source: Convict Indents

movers. Agricultural and transport workers generally moved short distances. Domestic service workers moved greater distances. Public service, while only a small fraction of all industrial categories, had high mobility rates and longer distance migration due to the fact that soldiers and sailors dominated this category.

The internal migrant was likely to be a skilled worker with significantly higher human capital investments measured by literacy than stayers. The workers' skill reduced the costs of job search and their human capital investments meant that they faced lower information costs and psychic costs (distress of leaving family and community). This encouraged mobility. Internal mobility involved a high quality labour stream and not a flood of unskilled workers forced out of a disintegrating rural economy.

Pattern and consequences of migration

The pattern of internal mobility was dominated by two features: first the pull of London; and second, high inter-industrial county mobility especially between Cheshire and Lancashire but also between Staffordshire and Warwickshire and between Lancashire and Yorkshire. Comparing these major industrial revolution migration routes against the dominant routes between nonadjacent counties for 1851 migrants, Table 3 shows that the migration pathways forged in the early industrialization period continued to prevail at mid-century. While London pulled labour from all over the Kingdom (but especially from nearby counties) there was no great south–north migration stream.

TABLE 3
Major paths of nonadjacent mobility

County Movement	Friedlander/Roshier (21+ migrants per 100 population) 1851 Rank[1]	Convict Rank[1]
Norfolk–Middlesex	1	1
Suffolk–Middlesex	1	1
Essex–Surrey	1	1
Wiltshire–Surrey	tie	2
Wiltshire–Middlesex	tie	1
Oxford–Middlesex	1	2
Herts–Surrey	tie	2
Herts–Middlesex	tie	1
Cambridge–Middlesex	1	1

Source: Convict Indents; D. Friedlander and R. Roshier, "A Study of Internal Migration in England and Wales, Part I", *Population Studies*, **19** (1966), p. 252

[1]Rank defined as the highest flow between counties: e.g. the most important path from Norfolk to a non-adjacent county was to Middlesex.

High absolute inward flows characterized Middlesex–Surrey, the bordering counties of Kent and Essex, and the industrial belt stretching from Warwick–Worcester in the Midlands to Lancashire–Yorkshire in the north. While the consequences of migration have been largely neglected in the migration literature, high levels of intercounty mobility might be expected to

impact on the county level qualitative variables, especially literacy and skill.[45] It has been hypothesized that during industrialization migrants of rural origin will be educationally superior to stayers but inferior to the natives of the urban centres to which they move, but that migrants of urban origin will be superior to both stayers and natives.[46] However, even this complex picture is clouded by a "bimodal pattern", namely that urban possibilities attract both the innovative and ambitious farmers and the rural failures. As Moreland has emphasized, *a priori* expectations are ambiguous.[47] Those with more skills are likely to move to areas where their skills are marketable, a trend accentuated by the probability that the better educated may have better information on job prospects and be better searchers. Alternatively, less-educated migrants may have potentially higher gains so that a negative association of skill/literacy and migration may result.

Our data allows empirical testing of these conjectures. Three characteristics are clear. Urban workers were more educated than rural workers. Rural and urban movers were more literate than rural or urban stayers. Urban educated workers moved further than less well educated urban workers. Interestingly, a comparison of place of birth and place of residence showed that no English county suffered a significant loss of skilled workers (or gain of unskilled workers) nor a significant change in literacy levels, due to migration. However, when the percentage of skilled workers and the percentage of literate workers were ranked by county, the before migration correlation coefficient fell from 0·573 to 0·434 after migration, indicating a wider dispersal of skill and literacy. There was a similar change in the correlation coefficient for unskilled workers and literacy. The relatively small impact of migration on the distribution of skill and literacy at the county level is consistent with Ravenstein's fourth "law of migration", namely that "each main current of migration produced a compensating counter-current".[48] Where county in-migration rates were high, out-migration rates also tended to be high, leaving little net gain or loss.[49] This was the case in Yorkshire, Stafford, Derby, Nottingham, Warwick and Essex where high gross in-migration was accompanied by high out-migration, leaving little net migration change and little impact on skill and literacy. The major areas of net immigration were the industrializing areas of London and the home counties, Cheshire–Lancashire and Worcestershire.

A migration model

A gravity-flow migration model was estimated from a log-linear function by ordinary least squares regression. The model tested two hypotheses: whether migrants improved their social-economic status through migration: and whether labour markets coped with regional imbalances in the supply and demand for labour. Using the gravity-flow framework M_{ij}, the proportion of persons born in origin county i and residing in destination county j, was hypothesized to depend on the distance between i and j, W_i (W_j) the 1827 labourer's wage rate,[50] DIFFU, the difference between the average of the 1801 and 1851 county urbanization percentage,[51] E_i (E_j) the average 1839–1842 Registrar General's county literacy rate, P_j, the 1831 population in the destination county and random errors. Since the dependent variable is the rate of migration, it can be interpreted as the probability that an individual born in county i will migrate to county j. The dependent variable runs over a long period of time, as much as 50

years, but it is related to explanatory variables at a moment in time. Single equation gravity-flow models implicitly assume that the independent variables influence migration, but migration does not influence the explanatory variables. If this assumption is invalid, the mis-specification in gravity models leads to simultaneous equation bias. Given the data limitations and the nature of gravity-flow models the empirical results must be interpreted cautiously.

The regression results reported in Table 4 show that distance was a deterrent to migration.[52] The distance variable captured not only the actual costs of movement, but also the psychic costs of migration and other variables such as regional cultural differences and information costs. While a deterrent, the distance elasticity is not significant implying that it only weakly constrained migration. The intercounty difference in urbanisation, DIFFU, proxies job opportunities. The negative and significant value of DIFFU indicates that opportunities at home discouraged migration. P_j, the destination population variable was used to measure market size. Usually, P_j is expected to be positive, with the large market of the destination county attracting migrants. But many agricultural counties had large populations before 1831, making P_j an ambiguous measure of market opportunities. In this instance DIFFU provides a better measure of market benefits and shows that migrants moved to industrializing counties.

TABLE 4
Gravity-flow model of internal migration, 1818–1839

Variable[1]	Estimated coefficient	Standard error
In Distance	−0·047	0·062
In DIFFU	−0·476	0·081
In P_j	−0·150	0·056
In W_i	−2·200	0·289
In W_j	0·391	0·333
In E_i	1·300	0·334
In E_j	0·560	0·337
Constant	7·216	1·853

$R^2 = 0{\cdot}17$
D.F. = 644
[1]See text for key.

At best, Bowley's agricultural labourer's wage data are rough measures in intercounty earnings potential. Nevertheless, the negative and significant value of W_j indicates that out-migration was low from high wage counties. W_j has the right sign, but is not significant. In so far as the better educated respond to higher earning opportunities, the literacy levels in the origin and destination counties pick up the effect of additions to real income at alternative locations. A significant and positive E_j indicates that the greater the level of education in the origin county, the greater the out-migration, and a positive E_j reveals that the more educated the destination county, the more attractive it was to migrants. Together, the wage and literacy variables suggest that migrants improved their economic status by moving. More generally, the gravity-flow model suggests that labour markets coped with the imbalances of supply and demand

regionally. Labour markets sent out economic signals to which migrants responded.

Conclusion

There is a paucity of data on intercounty migration before 1851. Only by tapping data sources such as the convict indents can hypotheses about internal labour mobility be framed and tested for the Industrial Revolution period. Convicts transported to New South Wales were broadly representative of the English working class. Almost one-third of the English workers in our sample moved between counties. Migration pathways were dominated by London and high inter-industrial county migration. The average move was over medium distances, breaking the pre-industrial pattern of short distance migration. This result is supported by the negative, but relatively small, elasticity of distance in the gravity flow migration model. The probability of moving and the distances travelled were correlated to each individual's human capital, measured by literacy and skill. In the regression model, migration was dependent on intercounty income earnings proxied by wages and education. Since the theory underpinning the gravity-flow model assumes migration maximizes the economic returns from human capital, the empirical results from the regression equation were consistant with other data relating human capital to migration. Labour market signals were not only heeded by migrants, as the regression results show, but were effective in transferring labour from rural to urban locations since more rural than urban workers moved. While there were undoubtedly regional biases, long and medium distance mobility suggests that labour markets corrected regional labour supply and demand imbalances even during the early years of British industrialization.

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Notes

[1] S. Kuznets and D. S. Thomas, Internal migration and economic growth, in *Selected studies in migration since world war II* (N.Y. 1958) 126–211
[2] N. L. Tranter, The labour supply, 1780–1860, p. 218 of R. Floud and D. McCloskey (Eds), *The economic history of Britain since 1700*, Vol. I (Cambridge 1982)
[3] P. Deane and W. Cole, *British economic growth 1688–1959* (Cambridge 1962) 11–18; See also A. Redford, *Labour migration in England 1800–1850* (Manchester 1976 edition) 66
[4] Redford *op. cit.* 65; Deane and Cole *op. cit.*, 119
[5] Calculated from Deane and Cole, *op. cit.*, Table 25, 108–109
[6] E. G. Ravenstein, The laws of migration, *Journal of the Royal Statistical Society* **XLVIII** (1885) 183, 199
[7] Deane and cole *op. cit.*, 166–121
[8] M. Anderson, *Family structure in nineteenth century Lancashire* (Cambridge 1971) and Urban migration in nineteenth-century Lancashire: some insights into two competing hypotheses, pp. 131–144 of M. Drake (Ed.), *Historical demography: problems and projections* (Milton Keynes 1974)

[9] *Ibid.*, 135
[10] N. L. Tranter, Population and social structure in a Bedfordshire parish: the Cardington listing of inhabitants, 1782, *Population Studies* **21** (1967) 278
[11] J. Cornwall, Evidence of population mobility in the seventeenth century, *Bulletin of the Institute of Historical Research* **XL** (1967) 145
[12] *Ibid.*, 150
[13] E. J. Buckatzasch, The constancy of local population and migration in England before 1800, *Population Studies* **5** (1951) 65
[14] D. Souden, Migrants and the population structure of late seventeeth-century provincial cities and market towns, pp. 133–168 of P. Clark (Ed.), *The transformation of English provincial towns* (London 1984)
[15] *Ibid.*, 138–148
[16] *Ibid.*, 142; P. Clark, Migration in England during the late seventeenth and early eighteenth centuries, *Past and Present* **83** (1979) 74–75
[17] K. Ooserveen, Hawkshead (Lancs.) mobility as shown by the reconstruction of the parish from the register, *Local Population Studies* **12** (1974) 38–39
[18] East London Population Study Group, The population of Stepney in the early seventeenth century, *Local Population Studies* **3** (1969) 48
[19] D. Cressey, Occupations, migration and literacy in East London, 1580–1640, *Local Population Studies* **5** (1970) 57
[20] M. Greenwood, Research on internal migration in the United States: a survey, *Journal of Economic Literature* **XII** (1975) 398
[21] M. Greenwood and L. Thomas, Geographic labour mobility in nineteenth century England and Wales, *Annals of Regional Science* **VII** (1973) 94–6; R. Vedder and D. Cooper, Nineteenth century English and Welsh geographic labour mobility: some further evidence, *Annals of Regional Science* **VIII** (1974) 133–135
[22] Greenwood and Thomas, *op. cit.*, 92
[23] J. G. Williamson, The urban transition during the first industrial revolution: England 1776–1871 (Harvard Institute for Economic Research, Discussion paper 1146 April 1985); City immigration, selectivity bias and human capital transfers during the British industrial revolution (Harvard Institute for Economic Research, Discussion Paper 1171 July 1985)
[24] Williamson, City immigration, 28–37
[25] Williamson, Urban transition, 8–14
[26] E. Jenks, *The book of English law* (London 1935) 63–67; S. and B. Webb, *English local government: the parish and the county* (London 1963) 446–448
[27] *Select Committee Report Execution of Sentence, Parliamentary Papers,* 341, Vol. II, 1812, 9–10; 77–78
[28] A. L. Shaw, *Convicts and the colonies* (Melbourne 1966) 149; L. L. Robson, *The convict settlers of Australia* (Melbourne 1965) 177
[29] For evidence on migrant groups most at risk to migration, see D. Baines, The use of published census data in migration studies, p. 134 of E. A. Wrigley (Ed.), *Nineteenth century society: essays in the use of quantitative methods for the study of social data* (Cambridge 1972)
[30] Shaw, *op. cit.*, 153., Robson, *op. cit.*, 179
[31] D. Philips, *Crime and authority in Victorian England* (London 1977) 141, 283
[32] *Ibid.*, 167; D. Jones, *Crime, protest, community and police in nineteenth century Britain* (London 1982) 28
[33] See J. Tobias, *Crime and industrial society in the 19th century* (London 1967) Ch. I–II
[34] Jones, *op. cit.*, 134, 178–198 and 28
[35] Philips, *op. cit.*, 287
[36] S. Nicholas and P. Shergold, A labour aristocracy in chains: elite convict workers in early New South Wales, (mimeo ANU 1985); N. Butlin, White human capital in Australia, 1788–1850 (ANU Working Paper in Economic History, 1985); M. Sturma, *Vice in a vicious society: crime and convicts in mid-nineteenth century New South Wales* (Lucas 1983) vii
[37] W. A. Armstrong, The use of information about occupation, in E. A. Wrigley (Ed), *op. cit.*, 215–223
[38] The convict sample is biased towards males since female convicts accounted for only 6% of the sample
[39] C. Erikson, Emigration from the British Isles to the U.S.A. in 1831, *Population Studies* **XXXV** (1981) 183
[40] K. Baedeker, *Great Britain handbook for travellers* (London 1910)

[41] A. F. Weber, *The growth of cities in the nineteenth century* (London 1899) 250–251
[42] *Ibid.*, 255
[43] The average for 1839–42 from Register General's *Annual Reports* 1839, 1840, 1841, 1842
[44] All statements of significance are based on Chi-square tests
[45] Greenwood, *op. cit.*, 387, 412
[46] L. Bouvier, J. Macisco and A. Zarake, Toward a framework for the analysis of differential migration: the case of education, pp. 31–3 of Richmond and D. Kubat (Eds), *Internal migration: the new world and the third world* (N.Y. 1976)
[47] R. S. Moreland, Population, internal migration and economic growth: an empirical analysis, *Research in Population Economics* **4** (1982) 186
[48] Ravenstein, *op. cit.*, 186
[49] Greenwood, *op. cit.*, 400
[50] A. L. Bowley, The statistics of wage in the United Kingdom during the last hundred years, *Journal of the Royal Statistical Society* **61** (1898) 702–722
[51] Private Communication of urbanisation rates from C.M. Law based on the definition given in C.M. Law, The growth of urban population in England and Wales, 1801–1911, *Transactions of the Institute of British Geographers* **41** (1967) 125–144
[52] Note that the Durbin Watson statistic is not appropriate when the data cannot be uniquely ordered

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