

## RECONSTRUCTING A REGIONAL MIGRATION SYSTEM: NET MIGRATION IN CORNWALL

### Introduction

Historians of migration in Britain have now begun to echo the orthodoxy of economic historians, replacing the idea of revolutionary transformation with that of gradual cumulative change.<sup>1</sup> It is now proposed that no major discontinuity in migration patterns accompanied modernisation, at least until the twentieth-century. Pooley and Turnbull claim that atypicality in migration history has been over-emphasised, partly as a result of historians concentrating on the better recorded and more visible long-distance moves and in consequence ignoring the ubiquitous short distance, 'circulatory' migration of past times.<sup>2</sup> For example, they suggest that patterns of age selectivity from 1750 to 1930 were 'quite stable over time' and that 'long-term changes in the relationship between migration and the life course' were 'relatively small'.<sup>3</sup> More controversially, they claim that the experience of men and women was 'very similar', challenging the consensus of a host of studies based on the census enumerators books (CEBs) that support Ravenstein's migration 'law' that females were more migratory than males, but that men were more likely to emigrate, a conclusion often extended to longer distance moves more generally.<sup>4</sup>

Most surprisingly, Pooley and Turnbull's data led them to conclude that there was 'no evidence of any differences in the propensity to migrate by region or settlement size'.<sup>5</sup> Yet, just as the orthodox economic historians' orthodoxy is questioned by historians who uncover greater change at the regional level, this conclusion contrasts starkly with some regional studies.<sup>6</sup> For example, Baines cites the experience of other European countries which implies the existence of marked differences in regional emigration rates. Indeed, he went on in the same work to demonstrate large differences in both internal and external net migration flows (within and beyond England and Wales) at the county level.<sup>7</sup>

Such contrasting conclusions are explained partly by differences in the way migration is defined, partly to different methods, and partly to contrasts in focus – Pooley and Turnbull focusing on gross migration in order to understand individual lives and Baines on net migration to understand population structure. Pooley and Turnbull brought together the genealogical researches of family historians across Britain relating to 16,091 life histories, producing an impressive dataset from which to draw

aggregate conclusions. Their method built on a move towards nominal record linkage evident amongst historians of local and regional migration seeking to escape the restrictions imposed by studies of the CEBs. These latter have provided information on broad migration flows and enabled the testing of hypotheses about the selectivity of migration.<sup>8</sup> But it is difficult to tell from one set of census records when an individual actually made their move. As the availability of the nineteenth-century CEBs was gradually rolled out and as computerised techniques began to be applied to them, historians began to link individuals and families across censuses to measure rates of movement or persistence.<sup>9</sup> However, the nature of the source meant that it was easier to trace in-migration to a discrete place than out-migration and less laborious to undertake such studies on localities and small areas.

Studies of gross migration based on the foundation stone of the CEBs co-exist with and complement studies of net migration flows based on the published censuses, used in combination with the Annual Reports of the Registrar General for Births, Marriages and Deaths. Friedlander and Roshier supplied estimates of net migration at Registration District (RD) level while Baines evolved a method to calculate the net numbers of people born in any county of England and Wales who migrated either to other counties or overseas in the later nineteenth-century.<sup>10</sup> This was based on the birthplace tables in the published censuses of 1861 to 1901, with the addition of the mortality and fertility data in the Registrar General's *Decennial Supplements*. The method rests critically on estimating lifetime migrants' death rates and the number of non-native deaths. Local studies of migration have been unable to use this approach to calculate net migration flows because the birthplace data in the published census do not report places of birth for areas smaller than counties. Although these could be derived from the CEBs, the absence of decadal birth and death statistics for parishes then inhibits such approaches for small areas. Nonetheless, Perkyns has compared Baines' approach with a total family reconstitution study she conducted for six parishes in Kent, on which basis she challenged the assumptions of the age distributions of in-migrants made by Baines.<sup>11</sup>

Recently, Andrew Hinde has proposed an intriguing method of using the published census sources in conjunction with CEB data to calculate age specific net migration to and from small areas and applied it to four contrasting groups of parishes in Norfolk, Shropshire, Derbyshire and Yorkshire in the 1850s.<sup>12</sup> On the basis of this, he

concluded that 'female migration by age in the mid-nineteenth century was fairly similar across rural England' except where there were specific occupational opportunities for women. Patterns of male migration were, in contrast, much more variable. His work also bore out the expected link between migration and age, reinforcing those CEB studies that had tended to confirm Ravenstein's fifth law of migration – that migrants were more likely to be young adults. Hinde found that rates of net out-migration of natives peaked in the 15-24 age group, mirroring Pooley and Turnbull's findings that people were more likely to move in their early 20s in the nineteenth-century and reinforcing the conclusion cited by Baines that 'age is the only universally valid migration differential'.<sup>13</sup> Nonetheless, Hinde found that this peak was less clear for women than for men, suggesting a possible difference in age of migration between the sexes.

Hinde's method allows for an age-sensitive analysis of net migration flows but contained within an aggregate approach that potentially has a more general application than a local study. It also bridges the methodological gap that has existed between aggregate studies based on counties and CEB studies that focus on localities. This paper adopts his method but extends it by applying it to a scale larger than the parish and community level and across the whole four decades in which we can use it. The aim is to investigate the differences in net migration across a county at RD level. This work is part of a broader project that sets out to reconstruct a regional migration system, one of the themes of the research agenda for European migration history proposed by Jackson and Moch.<sup>14</sup> Another of the problems of migration history that they identified is that of selectivity and the intention here is to focus on the age and sex composition of migration flows, investigating whether the conclusions reached by Pooley and Turnbull, Hinde and others can be applied to Cornwall and its Registration Districts. The first section of the paper describes the methods and sources used to calculate the net migration rates. It then provides some brief background relating to the area of study before analysing the outlines of the migration system revealed by the net migration statistics.

### **The calculation of net migration**

Hinde's approach basically involves two stages. The first estimates the age-specific death rates and the probability of surviving within any given ten year age group to the beginning of the next age group. In order to do this we require the age

breakdowns of the population of the area under study at the beginning and the end of each ten year period in order to calculate the mean of these two figures, together with the age-specific mortality for the intervening period, each set of data broken down by sex. These statistics were conveniently published in the Registrar General's *Decennial Supplements* for the 1850s, 1860s and 1880s. The *Supplement* for the decade 1871-1880 unfortunately does not disaggregate men and women, but the sex breakdown of deaths can be relatively easily recovered from the annual Registrar General's reports for this decade.<sup>15</sup> With these data the age specific death rates and probability of survival can be calculated with the aid of an excel spreadsheet, as in Table 1.<sup>16</sup> In this way survival probabilities were obtained for Cornwall and the Isles of Scilly as a whole and then for the fourteen RDs within this area.

Having captured the survival probabilities for each ten year age group, the second stage entails working out the net migration of natives and non-natives. This requires the age breakdown of natives and non-natives at the census dates and the number of deaths by age and births for the intervening period. Unfortunately, the numbers of age-specific deaths are not available for areas smaller than RDs, or births for areas smaller than Registration sub-districts. Therefore, Hinde had to apply the birth and death rates of the RD to his smaller study areas, which consisted of groups of neighbouring parishes. As he states in his paper this is a reasonable method if the RD is relatively homogenous and his four study areas were all in consequence located in rural RDs. However, homogeneity is likely to be the case for only a minority of RDs. In Cornwall for example (Figure 1), every district combined one or more market towns with rural areas and the rural areas themselves were occupationally diverse, with the likelihood of differing death rates, particularly between agricultural and mining parishes.<sup>17</sup> For this reason the Hinde method was here applied only to the RD scale, where the numbers of both births and deaths by age were known. This difference of scale should result in lower levels of net migration in this study, as it will reduce the effect of short-distance moves, a higher proportion of which will not count as 'migration'.

A second problem is that the published census does not distinguish between natives and non-natives (or in-migrants) by age. These data have to be derived from the CEBs. This is one strong reason for confining Hinde's method to parishes or groups of parishes, where extricating the all-important age distribution of natives and non-

natives is a feasible proposition. Once we extend the method to larger areas the time required to extract these data becomes prohibitive. However, the lack of published data distinguishing between those native to the RD and those who were born elsewhere presents no problem in the Cornish case. The CEBs from all the nineteenth century censuses from 1841 to 1891 have been entered into an access database by the Cornwall Family History Society.<sup>18</sup> Using this it was possible to extract the numbers who were native and non-native in each age group in each RD, and furthermore exclude those enumerated under shipping and thus restrict the analysis to the normally resident. With the population broken down by age for 1851 it was then a relatively simple matter to apply the survival probabilities for each age group for the 1850s to obtain an expected population for 1861. Subtracting the expected population from the actual population for 1861 then gives us the net migration for natives and non-natives in each ten year age group (see Table 2).

### **The study area**

The western part of Cornwall was the core of one of Britain's early eighteenth century industrial regions. The growth of a heavily capitalised copper mining added to the region's long experience of tin streaming and mining. By the 1780s mining 'formed the basis of one of the most advanced engineering centres in the world ... a complex industrial society exhibiting early development of banking and risk-sharing'.<sup>19</sup> The Cornish industrial region then played a key role in the development of the steam engine in the first forty years of the nineteenth century, its interlocking networks of investors encouraging the growth of a dynamic and open culture of innovation among its working engineers.<sup>20</sup> In these years also the boundaries of the mining region expanded, spreading first to mid-Cornwall and then to encompass newly discovered copper and lead reserves in the east.

In 1851 the occupations of men and boys of 14 years old and over, by which time the vast majority were in the labour force, reflected the role of mining in the regional economy. As can be seen from Table 3 miners and quarrymen were in the majority in Redruth RD in the west and were the largest occupational group in the districts of Penzance, Helston and St Austell. Truro, Liskeard and Camelford RDs were the other districts with a significant presence of miners and quarrymen. (In St Austell about 10 per cent were employed in the clay works while in Camelford most were slate quarry workers rather than miners). The mines were also important employers of women as

surface labourers. William Borlase, the Cornish antiquarian, was complaining as early as 1736 about the difficulty of obtaining servants because of competition from the mines.<sup>21</sup> Only in Stratton and St Germans, at the far north-east and south-east peripheries of Cornwall, and in the Isles of Scilly was mining insignificant. Meanwhile, farming was a large employer right across Cornwall, although only employing more than half the adult men in Stratton and Launceston in the north. Proportions working in agriculture were generally lower in west Cornwall. A third important sector in some areas included mariners, fisherman, shipbuilders and others who gained their living directly or indirectly from the sea. As might be expected, maritime activities employed the highest proportion in the Scilly Isles, but they were also significant in St Germans and Falmouth. The CEBs will underestimate the numbers employed in maritime activity as they miss those men who were absent at sea at the time of the census. However, there is little evidence that fishermen are under-enumerated as the CEBs for fishing ports such as St Ives, Newlyn and Mevagissey do not betray a higher than normal female proportion of the 20-39 age groups. But mariners and sailors will be under-enumerated. Some attempt was made to compensate for this in Table 3 by adding in the number of women enumerated as wives of seamen or mariners, although this will still not include single mariners. The maritime sector was therefore more important than Table 3 indicates in St Germans, Falmouth and the Scilly Isles.

John Marshall has suggested that when choosing a region to study, it is 'no small disadvantage to select an area that is half or two thirds bounded by the sea'.<sup>22</sup> More than two thirds of Cornwall borders on the sea and, as well as producing employment, the sea for centuries offered a highway out of Cornwall. In the late eighteenth and early nineteenth century easy sea communications combined with Cornwall's role as a reservoir of mining skills to produce an early migration of its miners to new mining fields in South America as well as to Wales and Ireland.<sup>23</sup> Such contacts established long-distance migration chains that expanded rapidly in the 1840s, something reflected in the demographic history of Cornwall (Figure 2). Before 1841 its population rose in parallel with that of England and Wales. But in the 1840s and 1850s this growth abruptly decelerated to around 4 per cent per decade compared with 12 per cent in England and Wales. The census population peaked in 1861 at around 370,000 although the real peak probably occurred in 1865/66, after which a crash in copper prices produced a depression in that industry to leave a

population in 1871 a few thousand below that of 1861. A short-lived boom in the early 1870s was followed by catastrophic years for mining and the 1870s were marked by a large population decline of almost 9 per cent, implying large-scale out-migration. Despite the ability of its farmers to avoid the worst effects of the import of cheap grain,<sup>24</sup> continuing deindustrialisation meant that the population of Cornwall in the 1880s still fell by 2.5 per cent.

At the RD level the picture was more variable. During the 1850s mines in the Liskeard RD were still drawing in labour and generating a strong population growth rate of 15 per cent, although this was a figure only half that of the booming 1840s in this district, when most of the copper and lead mines had been opened. But some RDs were already seeing an absolute decline at mid-century. Population loss was concentrated in those districts more dependent on agriculture, where a general mid-century rural depopulation was beginning to bite. Population fell in Stratton, Camelford, St Columb and Bodmin in the 1850s. However, the biggest loss – of almost 8 per cent - was in Camelford RD, where problems in agriculture combined with difficulties in the slate industry. In the 1860s, the farming districts (with Camelford) showed small population rises, with the exception of Stratton RD, the population of which shrank in every decade from 1851 to 1891. Instead, population declines began to appear in the mining RDs, with St Austell, Helston and Redruth all losing more than 5 per cent of their inhabitants. In the crisis decade of the 1870s population falls became generalised. The biggest losses - of 13-17 per cent - occurred in Liskeard, Truro, Helston and Redruth – reflecting the almost complete collapse of copper mining. There were just two exceptions: non-mining Falmouth, where population increased in every decade but the 1880s, and the Isles of Scilly. In the 1880s numbers continued to fall in most RDs, with the exceptions of St Germans, St Austell (where the growth of clay extraction began to have an impact) and Redruth (where tin mining had become concentrated on the aptly named 'central mining district'). But how was this overall demographic pattern reflected in age-specific migration?

### **Age and sex specific migration in Cornwall**

Table 4 shows the native and non-native net migration for each decade for all age groups in Cornwall.<sup>25</sup> Net out-migration of the native population rose in absolute terms over the three decades from the 1850s to the 1870s for both men and women

and then fell back in the 1880s. The figures given here for absolute net native out-migration can be compared with those calculated by Baines.<sup>26</sup> While the trends both over time and between genders are identical the net migration figures produced by the method used here are consistently lower than those indicated by Baines. The difference between the two results also fluctuate. The estimates fall short of those of Baines by around 16% in the 1860s, just 4% in the 1870s and a more considerable 23% in the 1880s. However, Baines has conveniently provided a worked example for male net migration from Cornwall in the 1860s.<sup>27</sup> The difference between his calculation there and mine is lower, around 11%. Differences in the total population figures account for some of this, my study having excluded shipping and one or two parishes along the border with Devon included in non-Cornish RDs. The survival probabilities obtained here also provide higher death rates than those assumed by Baines and this, plus differences between the age structure of non-natives as derived from the CEBs and Baines' assumptions about age distributions of migrants might seem to explain more of the difference. However, at present the reasons for this discrepancy are not entirely clear.

Nonetheless, it is clear that by the 1880s native net out-migration was lower than had been the case in the 1850s. This was compensated for by smaller flows of inward non-native migrants and also by a falling birth rate as the female age structure became increasingly skewed away from the child-bearing age groups by years of steady out-migration. While the overall pattern was similar for men and women, female native net out-migration proportions were consistently lower than those for men, running at approximately two thirds of the male level.<sup>28</sup> These findings would appear to conflict with Ravenstein's 'law' that females were more migratory 'within the kingdom of their birth', although lower net migration rates may well mask a higher gross migration among women. The exception to the pattern was the 1870s when net female migration proportion reached a level 80 per cent that of the men. The 1870s, the decade of highest absolute population loss, also stands out from the rest when we consider the net migration by age group.

Taking men first, the outstanding feature of the migration pattern was the heavy outflow of those aged 20-29 at the end of the relevant decade, or aged around 15-24 when they had moved. This group accounted for nearly half (45 per cent and 48 per cent) of net out-migrants in the 1850s and 1860s. If we add those who migrated at



age 25-34 we can conclude that at mid-century over two thirds (69 per cent and 68 per cent) of the net flows of men out of Cornwall were individuals aged about 15-34, bearing out Ravenstein's law that most migrants were young adults. However, the 1870s again disrupted this pattern. In that decade net out-migration of the younger and older age groups increased and young men accounted for only 60 per cent of the net male native migrants. Nevertheless, the preponderance of this 15-34 age group was more than restored in the 1880s when 77 per cent of net out-migrants were in this age band. Indeed, in the 1880s net in-migration of natives seems to have occurred in the older age groups, a possible indicator of the increasing movement of single, young individuals and their higher rates of return migration, a pattern that may have been becoming more general in the later nineteenth-century.<sup>29</sup>

But the age distribution of women migrants betrays a significant difference. In this case the 15-24 age group accounted for a lower proportion of total net native out-migration than it did for men, at just over a quarter in the first three decades under study. Net out-migration in the 25-34 age group remained at a relatively high volume in the 1850s and 1860s but together these age groups only accounted for around 56-57 per cent of female native net out-migration, much lower than the male proportion. This suggests that young women were more likely to make short distance moves within the RD; in addition they were less likely to move overseas. As for men, the 1870s altered this pattern, with a drop to 50 per cent of net female migrants in the 15-34 age group in that decade but then a rise to 63 per cent in the 1880s when net out-migration for native women again became more concentrated on young adults

### **Net migration at Registration District level**

But was there a difference across space, at the RD level within Cornwall? Table 5 shows the overall net native out-migration for the 14 RDs for each decade. At this level net migration proportions were higher in the agricultural east than in the mining west in the 1850s for both genders, implying a greater degree of circulatory movement out of the less densely populated eastern RDs. But in the 1860s and 70s this pattern becomes less clear for men, although persisting for women. In those decades the mining districts of St Austell, Truro, Liskeard and Redruth had some of the highest native out-migrant rates. As we might expect from the migration picture at the Cornwall level, for most RDs the 1870s was the decade in which native out-

migration peaked, for both men and women. The exceptions were St Austell RD, where clay production offered an alternative to the shrinking mining sector, and the Scillies, which moved in a different rhythm to mainland Cornwall. However, the more agricultural north-east of Cornwall maintained some of the highest net native out-migration rates and retained this distinction into the 1880s.

Applying Pearsons product moment correlation coefficient to these data as in Table 6 shows that there was a relationship between net native migration and the economic structure at the Registration District level, but that this was not stable and displayed changes over the 40 years under observation. If we focus on correlations significant at the 95% confidence level, in the 1850s there was a distinct negative correlation between mining and net out-migration for women. Conversely, there was a significant positive correlation for both sexes between outward movement and agricultural districts, reflecting a greater net migration from these latter. In the 1860s and 1870s the correlations weakened. Indeed, the correlation between mining districts and net migration had reversed by the 1870s to become positive rather than negative, a possible indication of the troubles of this decade in the mining districts, although these correlations are not significant at the 95% confidence level. By the 1880s the correlations had strengthened again and reverted to the patterns of the 1850s, with the strongest and the most significant correlation remaining that between the out-migration of women and agricultural districts.

If we turn to the age distribution of native net migrants at RD level we see a relatively uniform pattern across Cornwall from east to west (Table 7). In all districts and decades, the 15-24 age group dominated the out-migration of men and in the 1870s net migration as a proportion of the numbers of this age group present in 1871 was over 50 per cent in the mining decades of Redruth, Truro and Liskeard, indicating a gross migration of well over a half. But net out-migration of young men was also high in the agricultural east. There was a somewhat greater variability in the migration propensity of men aged 25-34. In this age group the proportion of net migrants could vary considerably, for example in the 1870s from a low of 0.19 in Bodmin to 0.43 in Redruth. However, by the 1880s the standard deviation of migration proportions of this age group had become smaller (0.04 with a mean net native migration proportion of -0.24). More variability was experienced in the migration proportions of the very youngest age groups. Thus, in the 1850s the net

migration proportion of those boys moving at about 5-14 years of age was over -0.20 in the eastern farming districts of Stratton and St Germans and the mixed district of Camelford. But in this same decade it was only -0.05 in the western mining RDs of Helston and Redruth, a pattern replicated in the migration proportions of girls. This can be explained partly by the continuation of farm service at a young age in the eastern districts but could also be a function of greater family migration in the east, involving the involuntary movement of children.

The age pattern of female net native out-migration at the RD level reveals greater diversity across the different districts within Cornwall. It also suggests an interesting distinction between east and west. As Figure 3 illustrates, east of Truro RD in the 1850s the greatest proportion of female net out-migration occurred in the 15-24 age group, the same as for men although at a lower level. Net out-migration then remained high in the 25-34 age group. However, in west Cornwall the proportion of net out-migrants in the 15-24 age group was significantly lower and female net out-migration actually peaked in the 25-34 age band. This is evidence for the greater job opportunities that young women were offered as surface workers in the mining industry in the west, together with the presence there of the larger Cornish towns of Truro, Falmouth, Camborne and Penzance, all of which attracted young women from the surrounding countryside and inhibited their tendency to leave. Furthermore, the greater distance from the nearest large town – Plymouth - meant that the alternative option of moving to a city was less attractive than it may have been in east Cornwall. Significantly, by the 1880s this difference in female migration proportions was restricted only to Redruth and Penzance RDs, the two districts that maintained a sizeable mining sector into that decade. Perhaps this pattern was related to emigration, as men made the move to mining fields overseas and, on deciding to stay, their earnings financed the later moves of wives and dependents, a phenomenon that is reported in the qualitative literature.<sup>29</sup>

## **Conclusions**

At RD level the difference in the propensity to migrate across the districts was perhaps less obvious than might be expected, given the traumatic de-industrialisation Cornwall suffered from the 1860s. Migration proportions were high in farming as well as in mining districts and, indeed, the former showed some of the very highest levels of net out-migration. Rates of net out-migration of Cornish

natives ran at a high level in this period, although no higher than the proportions discovered by Hinde for the 1850s in his small rural areas, while lower than central Shropshire. However, this difference may to a large degree be due to the larger size of the Registration Districts, which increases the amount of short-distance circulatory movement that is not counted as 'migration'. But at this level of analysis, the fact that Cornwall was one of the major emigration regions of the British Isles in this period is less obvious.<sup>30</sup> Of course, we cannot know what rates of gross migration these net figures hide. It is possible that the net outflows were only a small proportion of gross migration, especially of the age groups older than 25, when return migration would have been gathering pace.<sup>31</sup> And similar rates of migration might co-exist with very different migration streams to widely separate destinations.

The pattern of net-native migration in Cornwall confirms the role of young men in net migration flows. It also supports Hinde's contention that migration varied by gender rather than Pooley and Turnbull's generalisation of little gender variation, with marked differences in the age of net migration, especially in the mining west of Cornwall. But in contrast to Hinde's conclusion that female migration was likely to be similar across space in Victorian England, this study finds that differences in the propensity to migrate within Cornwall were greater for women than for men, reflecting differential job opportunities.<sup>32</sup> Moreover, female net migration by age showed much more variation across the RDs, the peak of net migration occurring later for women in the mining districts of west Cornwall. Furthermore, for men as well as women, there were also significant variations in the net-migration of those who were older and younger than the 5-24 age group, both across RDs and over time. It would appear that this is where changing socio-economic variables impacted most strongly on migration at this level, something shown by the greater change in the net-migration of these age groups in the crisis decade of the 1870s. Furthermore, it is quite possible that there was much more variation at a lower level of analysis, either at the sub-district or parish level. The next stage will be to apply this method to that level but, because of the errors that might be introduced by the application of RD mortality and survival rates to smaller areas, this will also need to include longitudinal research and nominal record linkage.

**Table 1 Spreadsheet formulae used to calculate male survival probabilities in Falmouth RD, 1871-81**

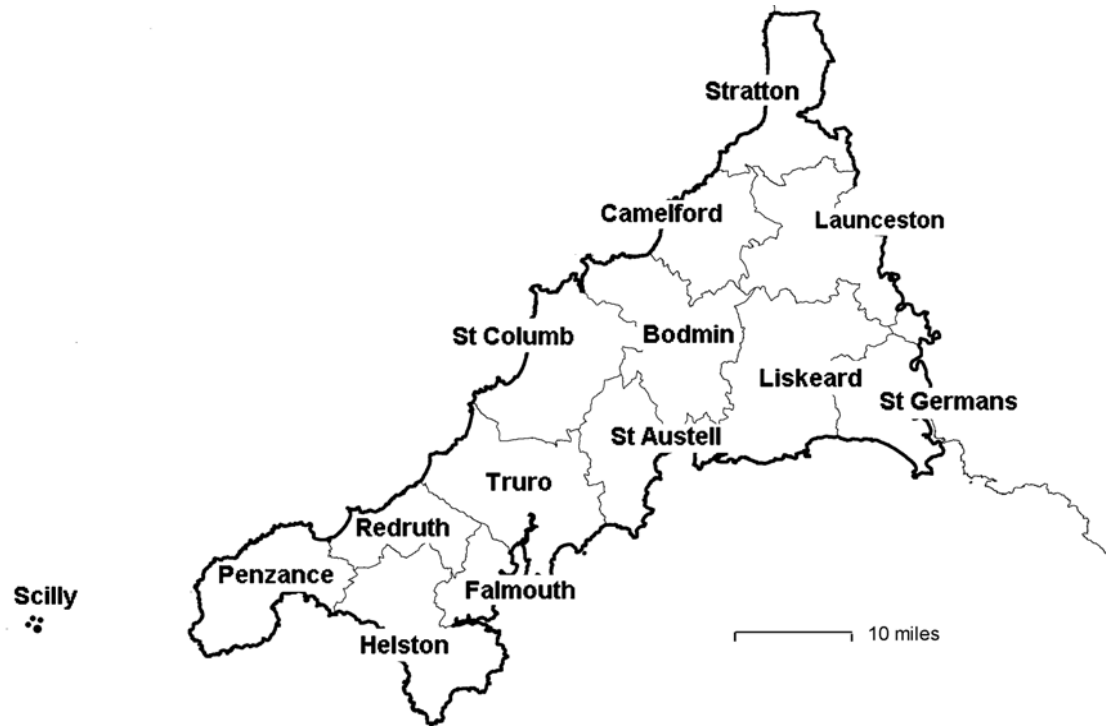
	A	B	C	D	E	F	G	H	I	J
1	Age	Mean popn 1871-81	Deaths 1871-80	ASDR	Probability of dying	Men alive per 1000 born	Men alive assuming 1000 births	Age	Estimated number of men alive	Survival probability
2	0-4	1513	985	$= (C2/10)/B2$	$= (2*5*D2)/(2+(5*D2))$	1000	$= 5*((F2+F3)/2)$	0-9	$= G2+G3$	$= I2/10000$
3	5-9	1479	86	$= (C3/10)/B3$	$= (2*5*D3)/(2+(5*D3))$	$= F2*(1-E2)$	$= 5*((F3+F4)/2)$	10-19	$= G4+G5$	$= I3/I2$
4	10-14	1268	51	$= (C4/10)/B4$	$= (2*5*D4)/(2+(5*D4))$	$= F3*(1-E3)$	$= 5*((F4+F5)/2)$	20-29	$= G6+(G7/2)$	$= I4/I3$
5	15-19	1525	79	$= (C5/10)/B5$	$= (2*5*D5)/(2+(5*D5))$	$= F4*(1-E4)$	$= 5*((F5+F6)/2)$	30-39	$= (G7/2)+(G8/2)$	$= I5/I4$
6	20-24	1082	90	$= (C6/10)/B6$	$= (2*10*D6)/(2+(10*D6))$	$= F5*(1-E5)$	$= 5*((F6+F7)/2)$	40-49	$= (G8/2)+(G9/2)$	$= I6/I5$
7	25-34	1831	162	$= (C7/10)/B7$	$= (2*10*D7)/(2+(10*D7))$	$= F6*(1-E6)$	$= 10*((F7+F8)/2)$	50-59	$= (G9/2)+(G10/2)$	$= I7/I6$
8	35-44	1375	141	$= (C8/10)/B8$	$= (2*10*D8)/(2+(10*D8))$	$= F7*(1-E7)$	$= 10*((F8+F9)/2)$	60-69	$= (G10/2)+(G11/2)$	$= I8/I7$
9	45-54	1018	172	$= (C9/10)/B9$	$= (2*10*D9)/(2+(10*D9))$	$= F8*(1-E8)$	$= 10*((F9+F10)/2)$	70-79	$= (G11/2)+(G12/2)$	$= I9/I8$
10	55-64	752	209	$= (C10/10)/B10$	$= (2*10*D10)/(2+(10*D10))$	$= F9*(1-E9)$	$= 10*((F10+F11)/2)$	80-89	$= (G12/2)+(G13/5*4)$	$= I10/I9$
11	65-74	440	285	$= (C11/10)/B11$	$= (2*10*D11)/(2+(10*D11))$	$= F10*(1-E10)$	$= 10*((F11+F12)/2)$	90-99	$= (G13/5)$	$= I11/I10$
12	75-84	188	239	$= (C12/10)/B12$	$= (2*10*D12)/(2+(10*D12))$	$= F11*(1-E11)$	$= 10*((F12+F13)/2)$			
13	85+	26	86	$= (C13/10)/B13$	1	$= F12*(1-E12)$	$= F13*3.3$			

**Table 2 Excel formulae used to calculate male net migration in Falmouth RD, 1871-81**

	A	B	C	D	E	F	G	H	I	J	K
1	Age	1871 native popn	1871 non-native popn	Survival probability	1881 expected native popn	1881 expected non-native popn	1881 native popn	1881 non-native popn	net native migration 1871-81	net non-native migration 1871-81	Total net migration
2		3691*	0	0.7849							
3	0-9	2646	454	0.8722	=B2*D2	0	2353	403	=G3-E3	=H3-F3	=I3+J3
4	10-19	1606	605	0.9261	=B3*D3	=C3*D3	1841	535	=G4-E4	=H4-F4	=I4+J4
5	20-29	971	569	0.9239	=B4*D4	=C4*D4	779	551	=G5-E5	=H5-F5	=I5+J5
6	30-39	663	561	0.8928	=B5*D5	=C5*D5	620	478	=G6-E6	=H6-F6	=I6+J6
7	40-49	539	479	0.8417	=B6*D6	=C6*D6	532	489	=G7-E7	=H7-F7	=I7+J7
8	50-59	454	342	0.7355	=B7*D7	=C7*D7	440	366	=G8-E8	=H8-F8	=I8+J8
9	60-69	293	275	0.5570	=B8*D8	=C8*D8	334	267	=G9-E9	=H9-F9	=I9+J9
10	70-79	189	138	0.3493	=B9*D9	=C9*D9	154	133	=G10-E10	=H10-F10	=I10+J10
11	80-89	37	34	0.0406	=B10*D10	=C10*D10	41	39	=G11-E11	=H11-F11	=I11+J11
12	90-99	3	3		=B11*D11	=C11*D11	3	4	=G12-E12	=H12-F12	=I12+J12

**Note:** \* births 1871-80

Figure 1: Cornish Registration Districts



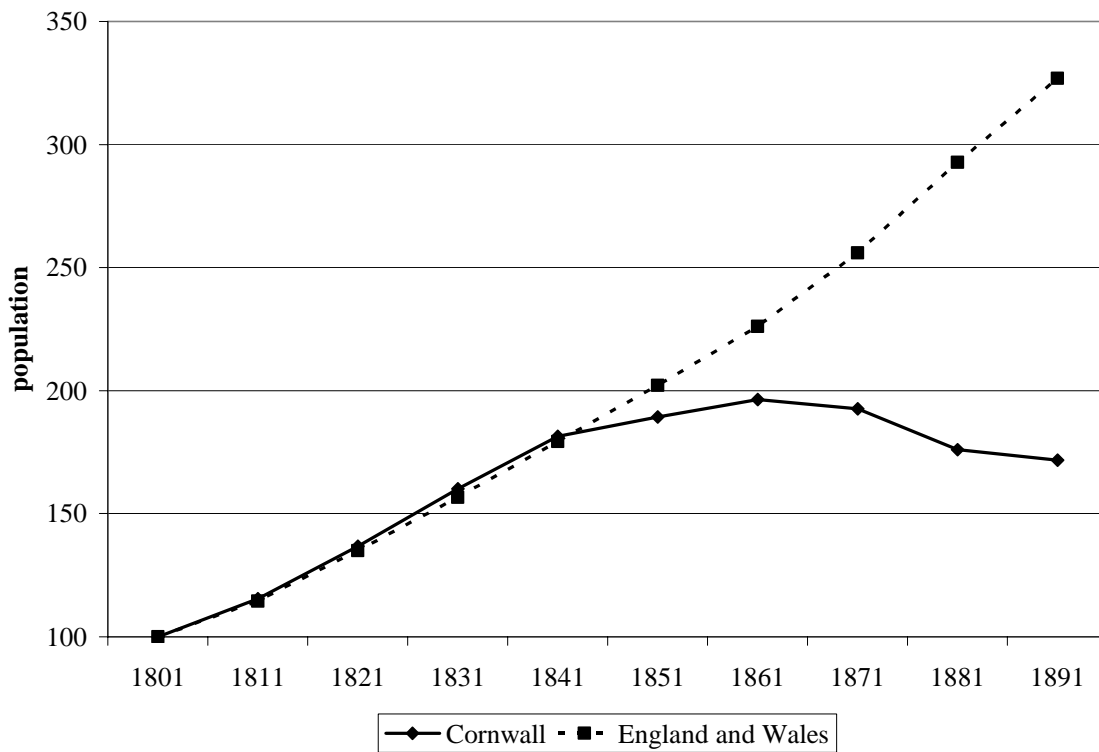
**Table 3 Male occupations in Cornwall, 1851**

Registration District	Percentage of occupied males aged 14 and over			
	agriculture	mining and quarries	maritime	other
<i>East Cornwall</i>				
Stratton	61.2	0.3	1.1	37.4
Camelford	47.0	23.5	0.5	29.0
Launceston	53.8	6.6	0.2	39.4
St Germans	43.9	2.5	17.4	36.2
Liskeard	39.4	26.5	3.9	30.2
Bodmin	43.4	13.2	1.8	41.6
St Columb	44.5	15.2	5.0	35.3
St Austell	22.2	40.3	5.7	31.8
<i>West Cornwall</i>				
Truro	25.7	30.6	5.4	38.3
Falmouth	22.3	7.9	14.0	55.8
Helston	33.1	37.7	3.5	25.7
Redruth	14.0	60.5	0.8	24.7
Penzance	21.0	37.2	8.5	33.3
Scilly	32.6	1.9	37.9	27.6

**Source:** Census enumerators' books, 1851 (CFHS database)



**Figure 2** Indexed population change, Cornwall and England & Wales, 1801-1891 (1801=100)



**Sources:** *Account of Population and number of houses, according to the Census 1841*, BPP, 1841, ii, 5-6; *Tables of Population and Houses, Census 1851*, BPP, 1851, xliii, 2-3; *Census of Population England and Wales 1861: Population Tables Volume 1*, BPP, 1862, i, xiii; *Census of England and Wales 1871 Volume 1*, BPP, 1872, lxvi, xi; *Census of England and Wales 1881 Volume 1*, BPP, 1883, lxxviii, vi; *Census of England and Wales 1891 Volume 1*, BPP, 1893-94, civ, viii.

**Table 4 Net native migration (NM) and non-native migration (NNM) by age group, Cornwall 1851-91**

Approximate age of migration	1851-60			1861-70			1871-80			1881-1890		
	Net NM	Migration proportion	Net NNM	Net NM	Migration proportion	Net NNM	Net NM	Migration proportion	Net NNM	Net NM	Migration proportion	Net NNM
Male												
2.5 – 5	-3969	-0.06	+2354	-4659	-0.07	+2611	-6372	-0.12	+2919	-3857	-0.08	+2628
5 – 14	-1971	-0.04	+868	-3138	-0.07	+900	-5457	-0.12	+959	-1660	-0.05	+642
15 – 24	-11672	-0.32	+851	-14672	-0.39	+17	-15873	-0.43	-141	-12739	-0.38	-77
25 – 34	-6145	-0.26	+421	-5951	-0.27	-9	-6180	-0.31	-82	-3668	-0.20	+151
35 – 44	-1122	-0.07	+302	-972	-0.06	+41	-1525	-0.11	-40	+19	+0.00	+179
45 – 54	-510	-0.04	+128	-489	-0.04	-116	-963	-0.07	-64	-61	-0.01	+3
55 – 64	-1	-0.00	+81	-82	-0.01	+27	-289	-0.03	+31	+164	+0.02	-12
65 – 74	-177	-0.03	+10	-170	-0.02	-13	-220	-0.03	-1	+437	+0.06	+46
75 – 84	-326	-0.09	-48	-313	-0.08	-27	-406	-0.10	+89	+204	+0.05	+34
total	-25893	-0.16	+4967	-30446	-0.19	+3431	-37285	-0.24	+3670	-21161	-0.16	+3594
Female												
2.5 – 5	-3576	-0.06	+2359	-4434	-0.07	+2610	-5909	-0.12	+2739	-3583	-0.08	+2588
5 – 14	-1877	-0.04	+931	-2826	-0.06	+856	-5938	-0.14	+861	-2040	-0.06	+941
15 – 24	-4753	-0.13	+628	-6727	-0.18	+555	-9928	-0.27	+529	-5390	-0.17	+583
25 – 34	-5387	-0.20	+280	-6623	-0.23	+108	-7944	-0.29	-4	-4588	-0.19	+34
35 – 44	-887	-0.05	+22	-1479	-0.07	-61	-2644	-0.13	+2	-668	-0.04	-162
45 – 54	-782	-0.05	+6	-903	-0.05	-67	-1894	-0.11	-88	-766	-0.05	-200
55 – 64	+114	+0.01	+23	-43	-0.00	+1	-573	-0.04	-15	+69	+0.01	-71
65 – 74	-120	-0.01	-45	-227	-0.02	-17	-500	-0.05	-3	+679	+0.06	+56
75 – 84	-415	-0.09	-60	-420	-0.08	-37	-580	-0.10	-38	+482	+0.08	+50
total	-17683	-0.10	+4142	-23682	-0.13	+3948	-35910	-0.20	+3983	-15805	-0.10	+3819

**Notes:** The migration proportion is the number of net migrants divided by the total population of that age group at the preceding Census.

**Sources:** *Registrar General's Supplement to Twenty-Fifth Annual Report*, BPP, 1865, xiii, 216-25; *Registrar General's Thirty-Fifth Annual Report: Supplement*, BPP, 1875, xviii, 220-29; *Registrar General's Supplement to Fifty-Fifth Annual Report, Part 1*, BPP, 1895, xxiii, 386-99; *Registrar General's Annual Reports*, BPP, 1873-1882.

**Table 5 Net native migration in Cornish RDs: 1850s-1880s**

RD	Net native migration 1851-60 as proportion of the 1851 native population		Net native migration 1861-70 as proportion of the 1861 native population		Net native migration 1871-80 as proportion of the 1871 native population		Net native migration 1881-90 as proportion of the 1881 native population	
	males	females	males	females	males	females	males	females
<i>East Cornwall</i>								
Stratton	-0.28	-0.24	-0.28	-0.25	-0.28	-0.27	-0.24	-0.22
Camelford	-0.33	-0.26	-0.26	-0.26	-0.32	-0.31	-0.29	-0.26
Launceston	-0.30	-0.30	-0.28	-0.28	-0.33	-0.31	-0.29	-0.29
St Germans	-0.30	-0.25	-0.27	-0.25	-0.32	-0.30	-0.24	-0.24
Liskeard	-0.24	-0.21	-0.28	-0.25	-0.36	-0.33	-0.28	-0.25
Bodmin	-0.28	-0.25	-0.24	-0.23	-0.25	-0.25	-0.27	-0.24
St Columb	-0.27	-0.23	-0.22	-0.15	-0.25	-0.24	-0.26	-0.21
St Austell	-0.22	-0.19	-0.32	-0.26	-0.27	-0.24	-0.21	-0.16
<i>West Cornwall</i>								
Truro	-0.25	-0.18	-0.24	-0.17	-0.32	-0.25	-0.26	-0.19
Falmouth	-0.25	-0.19	-0.18	-0.15	-0.28	-0.25	-0.23	-0.17
Helston	-0.17	-0.12	-0.25	-0.19	-0.29	-0.25	-0.22	-0.16
Redruth	-0.24	-0.14	-0.31	-0.21	-0.34	-0.27	-0.20	-0.13
Penzance	-0.17	-0.12	-0.18	-0.11	-0.26	-0.21	-0.20	-0.13
Scilly	-0.23	-0.16	-0.23	-0.22	-0.18	-0.13	-0.18	-0.20

**Source:** See Table 4.

**Table 6 Correlation coefficients (Pearson's product moment) of net native out migration and occupation: Cornish RDs**

	males		females	
	Net native out migration and proportion employed in mining	Net native out migration and proportion employed in agriculture	Net native out migration and proportion employed in mining	Net native out migration and proportion employed in agriculture
1851-60	-0.5284	<b>+0.6505</b>	<b>-0.6249</b>	<b>+0.7922</b>
1861-70	+0.2835	+0.1623	-0.2370	+0.5373
1871-80	+0.3390	+0.0543	+0.0522	+0.3930
1881-90	-0.2887	<b>+0.6331</b>	<b>-0.6470</b>	<b>+0.8337</b>

**Note:** The correlations significant at the 95% confidence level are in bold type.

**Table 7 Mean net native migration proportions by age and sex, Cornish RDs: 1850s-1880s**

	Approximate age of migration					
	5-14	15-24	25-34	35-44	45-54	55-64
<i>Men</i>						
<i>East Cornwall</i>						
Stratton	-0.21	-0.41	-0.34	-0.12	-0.10	0.00
Camelford	-0.18	-0.45	-0.27	-0.08	-0.08	-0.03
Launceston	-0.17	-0.43	-0.30	-0.07	-0.08	-0.01
St Germans	-0.21	-0.41	-0.21	-0.02	0.03	0.00
Liskeard	-0.16	-0.44	-0.25	-0.10	-0.05	0.03
Bodmin	-0.17	-0.44	-0.22	-0.05	-0.02	0.05
St Columb	-0.14	-0.40	-0.26	-0.07	-0.06	0.01
St Austell	-0.12	-0.43	-0.28	-0.09	-0.03	-0.01
<i>West Cornwall</i>						
Truro	-0.12	-0.46	-0.31	-0.07	-0.05	-0.02
Falmouth	-0.14	-0.41	-0.24	-0.04	-0.01	0.00
Helston	-0.10	-0.41	-0.29	-0.09	-0.06	0.01
Redruth	-0.08	-0.44	-0.37	-0.10	-0.06	-0.05
Penzance	-0.06	-0.38	-0.27	-0.07	-0.04	0.03
Scilly	-0.21	-0.45	-0.09	0.02	-0.02	0.03
<i>Women</i>						
<i>East Cornwall</i>						
Stratton	-0.16	-0.36	-0.26	-0.08	-0.11	-0.01
Camelford	-0.24	-0.33	-0.28	-0.10	-0.10	-0.04
Launceston	-0.21	-0.34	-0.30	-0.08	-0.09	-0.04
St Germans	-0.20	-0.30	-0.24	-0.09	-0.08	0.01
Liskeard	-0.20	-0.30	-0.26	-0.09	-0.08	0.00
Bodmin	-0.18	-0.35	-0.23	-0.08	-0.06	0.03
St Columb	-0.15	-0.28	-0.23	-0.10	-0.05	-0.03
St Austell	-0.15	-0.28	-0.24	-0.07	-0.07	0.01
<i>West Cornwall</i>						
Truro	-0.13	-0.27	-0.27	-0.09	-0.08	-0.01
Falmouth	-0.11	-0.24	-0.27	-0.07	-0.08	0.01
Helston	-0.14	-0.25	-0.23	-0.08	-0.09	-0.01
Redruth	-0.08	-0.21	-0.29	-0.10	-0.09	-0.04
Penzance	-0.05	-0.19	-0.25	-0.05	-0.05	-0.02
Scilly	-0.18	-0.29	-0.22	-0.12	-0.06	-0.05

**Source:** See Table 4.

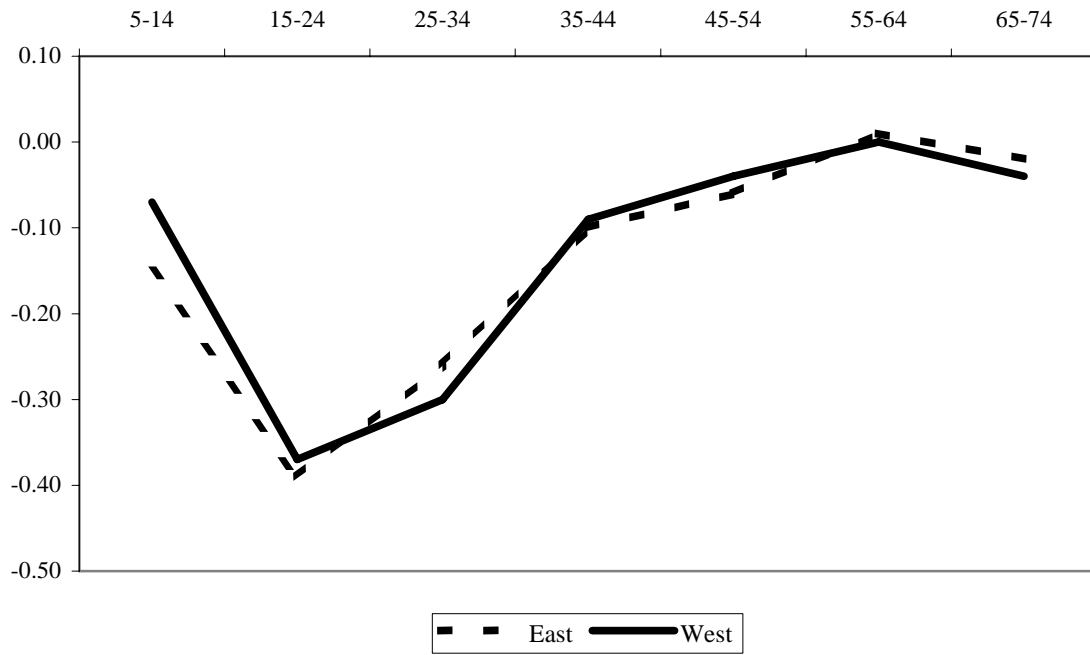
**Table 7 Mean net native migration proportions and standard deviations, Cornish RDs: 1850s-1880s**

		Approximate age of migration					
		5-14	15-24	25-34	35-44	45-54	55-64
<i>Men</i>							
1851-60	mean	-0.14	-0.40	-0.28	-0.09	-0.05	0.00
	SD	0.07	0.05	0.06	0.05	0.04	0.04
1861-70	mean	-0.14	-0.42	-0.25	-0.05	-0.02	0.00
	SD	0.06	0.05	0.10	0.05	0.06	0.05
1871-80	mean	-0.17	-0.45	-0.29	-0.10	-0.07	-0.01
	SD	0.05	0.04	0.13	0.06	0.05	0.03
1881-90	mean	-0.14	-0.44	-0.24	-0.02	-0.04	+0.01
	SD	0.05	0.04	0.04	0.05	0.03	0.03
<i>Women</i>							
1851-60	mean	-0.14	-0.25	-0.24	-0.07	-0.06	0.00
	SD	0.07	0.07	0.04	0.04	0.04	0.04
1861-70	mean	-0.14	-0.27	-0.24	-0.07	-0.06	0.00
	SD	0.06	0.06	0.04	0.05	0.03	0.04
1871-80	mean	-0.20	-0.33	-0.29	-0.11	-0.10	-0.03
	SD	0.04	0.04	0.07	0.03	0.03	0.04
1881-90	mean	-0.16	-0.28	-0.24	-0.08	-0.08	-0.03
	SD	0.06	0.06	0.04	0.05	0.02	0.04

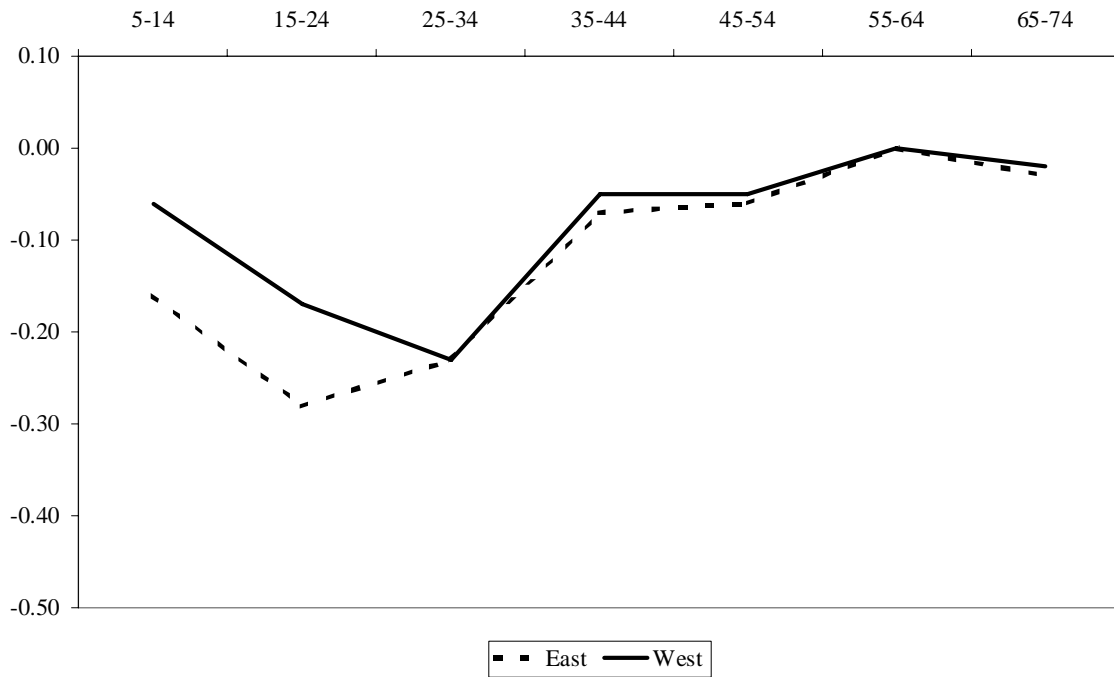
**Source:** See Table 4.

**Figure 3 Net native migration between 1851 and 1860 as a proportion of the 1851 population: Registration Districts**

**a) men**



**b) women**





## NOTES

1. N. F. R. Crafts and C. K. Harley, 'Output growth and the British industrial revolution: a restatement of the Crafts-Harley view', *Economic History Review*, **45** (1992), 703-30.
2. C. G. Pooley and J. Turnbull, *Migration and mobility in Britain since the eighteenth century* (London, 1998).
3. Pooley and Turnbull, *Migration and Mobility*, 208.
4. Pooley and Turnbull, *Migration and Mobility*, 326; D. B. Grigg, 'E. G. Ravenstein and the 'Laws of Migration'', *Journal of Historical Geography*, **3** (1977), 41-51; D. Mills and K. Schürer, 'Migration and population turnover', in D. Mills and K. Schürer, eds, *Local Communities in the Victorian Census Enumerators' Books* (Oxford, 1996), 220.
5. Pooley and Turnbull, *Migration and Mobility*, 326.
6. For the regional perspective on the industrial 'revolution' see P. Hudson, ed., *Regions and Industries: a perspective on the industrial revolution in Britain* (Cambridge, 1989), 5-38.
7. D. E. Baines, *Migration in a mature economy: Emigration and internal migration in England and Wales, 1861-1900* (Cambridge, 1985).
8. For example W. T. R. Pryce, 'Patterns of migration and the evolution of culture areas: cultural and linguistic frontiers in northeast Wales, 1750 and 1851', *Transactions of the Institute of British Geographers*, **65** (1975), 79-107 for migration flows. And see M. Anderson, 'Urban migration in nineteenth century Lancashire: some insights into two competing hypotheses' *Annales de Démographie Historique*, **8** (1971), 13-27; N. Goose, *Population, economy and family structure in Hertfordshire in 1851. Volume 1, The Berkhamsted Region* (Hatfield, 1996); S. C. F. Robinson, 'Life-time migration and occupation in Motherwell, 1851-91', *Local Population Studies*, **61** (1998), 13-24.
9. See for example K. Schürer, 'The role of the family in the process of migration', in C. G. Pooley and I. G. Whyte, eds, *Migrants, emigrants and immigrants: a social history of migration* (London, 1991), 106-42; D. Jackson, 'Occupational and geographical stability in the region of Sittingbourne, Kent, 1881-1891', *Local Population Studies*, **66** (2001), 53-75; J. Robin, *From childhood to middle age: cohort analysis in Colyton, 1851-1891* (Cambridge, 1995).
10. D. Friedlander and R. J. Roshier, 'A study of internal migration in England and Wales: Part 1', *Population Studies*, **19** (1966), 239-79; Baines, *Migration in a mature economy*, 90-125.
11. A. Perkyns, 'Migration and mobility in six Kentish parishes, 1851-81', *Local Population Studies*, **63** (1999), 30-70.
12. A. Hinde, 'The use of nineteenth-century census data to investigate local migration', *Local Population Studies* **73** (2004), 8-28.
13. Pooley and Turnbull, *Migration and Mobility*, 207; Baines, *Migration in a mature economy*, 100.
14. J. H. Jackson and L. P. Moch, 'Migration and the social history of modern Europe', *Historical Methods*, **22** (1989), 27-36.

15. *Registrar General's Supplement to Twenty-Fifth Annual Report*, BPP, 1865, xiii, 216-25; *Registrar General's Thirty-Fifth Annual Report: Supplement*, BPP, 1875, xviii, 220-29; *Registrar General's Supplement to Fifty-Fifth Annual Report*, Part 1, BPP, 1895, xxiii, 386-99; *Registrar General's Annual Reports*, BPP, 1873-1882. These were obtained from the online database of Parliamentary Papers at <http://parlipapers.chadwyck.co.uk/home>. The Decennial Supplements are also available from the UK Data Archive at the University of Essex (<http://data-archive.ac.uk>).

16. In cell G13 of Table 1 it is assumed that an 85 year old lives an average of 3.33 more years, following the suggested length of time given in Hinde, 'Use of nineteenth century census data', 23.

17. This was recognised by contemporaries and triggered a flurry of local studies of occupational mortality. For an example see R. Q. Couch, 'A statistical investigation into the mortality of the miners in the district of St Just in Penwith,' *Report of the Royal Cornwall Polytechnic Society*, **25** (1857), 1-40.

18. This database was made available as the result of a partnership with the Cornwall Family History Society. The Society has established a rigorous checking process for the transcription and the proportion of errors in the database is extremely low.

19. S. Pollard, *Peaceful Conquest: The Industrialisation of Europe 1760-1970* (Oxford, 1981), 14.

20. A. Nuvolari, 'Collective invention during the British industrial revolution: the case of the Cornish pumping engine,' *Cambridge Journal of Economics*, **28** (2004), 347-63.

21. J. Rowe, *Cornwall in the Age of the Industrial Revolution* (Liverpool, 1953), 8.

22. J. D. Marshall, 'Proving ground or the creation of regional identity? The origins and problems of regional history in Britain', in P. Swan and D. Foster, eds, *Essays in Regional and Local History* (Beverly, 1992), 13.

23. P. J. Payton, *The Cornish Overseas* (Fowey, 1999), 48-68.

24. F. M. L. Thompson, 'An anatomy of English agriculture, 1870-1914' in B. A. Holderness and M. Turner, eds, *Land, Labour and Agriculture 1700-1920* (London, 1991), 211-40.

25. The age groups are as used in Hinde, 'The use of nineteenth century census data', 20. They are 'estimates of the approximate age of migration'.

26. Baines, *Migration in a mature economy*, 289.

27. D. E. Baines, 'The use of published census data in migration studies', in E. A. Wrigley, ed., *Nineteenth-century society: essays in the quantitative methods for the study of social data* (Cambridge, 1972), 311-35.

28. Migration proportions were obtained by dividing the number of net migrants by the population of that age group at the previous census.

29. For example Payton, *The Cornish overseas*, 297.

30. Baines, *Migration in a mature economy*, 88.

31. Baines, *Migration in a mature economy*, 158-59 discusses the high rate of Cornish emigration and speculates how far it was determined by features unique to Cornwall.
32. Pooley and Turnbull, *Migration and Mobility*, 325 found that the net difference between the migration streams of their dataset was very small in relation to gross flows. See also R. Lawton, 'Population changes in England and Wales in the later nineteenth century', *Transactions of the Institute of British Geographers*, **44** (1968), 55-75.
33. The standard deviation for the female net native migration proportions across RDs is consistently higher than that for male proportions.