Monograph:
Biswas, T., McHardy, J. and Nolan, M.A. (2009) Inter-regional Migration: The UK experience. Working Paper. Department of Economics, University of Sheffield ISSN 1749-8368

Sheffield Economic Research Paper Series 2008003

Sheffield Economic Research Paper Series

SERP Number: 2008003

ISSN 1749-8368

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INTER-REGIONAL MIGRATION: THE UK EXPERIENCE

September 2009

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Abstract:

We analyse the intensity, balance and trends in migration amongst the four nations of the UK (1975-2006). Some flows have persistent or deteriorating imbalances. Average annual flows for England are comparable in size to international migration flows for the entire UK. We also examine the impacts of several economic variables along with the source and destination of migrants on regional migration using panel analysis. Source and destination effects are dominant explanatory factors behind inter-regional migration whilst unemployment and per capita GDP growth of the destination region in the recent past also have a significant effect on migration.

Key words: Inter-Regional Migration, UK
JEL: J61, O50

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Acknowledgments: Earlier versions of this paper have been presented at the SOEGW Conference, Ontario (2008), the European Economics and Finance Society Conference, Prague (2008), and the Work and Pensions and Labour Economics Group Conference, Sheffield (2009). We are grateful to participants for useful comments and suggestions. The usual caveats apply.

1. Introduction

It is predicted that sustained net immigration and a continued imbalance between birth and death rates in the UK will combine to generate a population explosion, with the population reaching 65 million by 2016 and 71 million by 2031 (ONS, 2007). Whilst such projections have inevitably been a motivating force behind recent changes in national immigration policies they have also caused alarm amongst regional planners responsible for social and economic provisions. However, in the case of regional planning, it is the regional movement and distribution of population that matters most and hence it is important to understand the nature of inter-regional as well as international migration.

Inter-regional migration differs from international migration in one important aspect. In the case of international migration, the flow is mostly unidirectional: from the poorer to the richer countries. On the other hand, inter-regional migration within a country is usually a two-way flow. Frequently, in the case of international migration from a poor country to a rich country, the difference in wages is so high that immigrants often do not mind accepting a lower-status job for which their skills may be irrelevant. In contrast, inter-regional migration is largely based on the exchange of skills. It bears some similarity with intra-industry trade (Brander, 1981), where different brands of the same commodity (e.g., cars or TV sets) are traded between two countries. Diversity of skills increases productivity. However, the distribution of skills relative to their demand in different regions within the same country may not be the same. It was pointed out in Borjas (1987), that skills have observable as well as unobservable components. It is quite possible that a highly-skilled worker's unobservable skills are more effective in his or her own country than anywhere else. In such cases, workers may not migrate. On the other hand, a low-skilled worker's unobservable skills may be more effective in a country away from his or her country of birth. In such cases, the worker will have an incentive to migrate. Borjas argued that, because of this asymmetric realisation of unobservable skills, it is not correct to assume that only high-skilled workers migrate. In the literature, this is known as the *self-selection model of immigration*.

The word *migration* is commonly understood as a movement from one environment to another for the purpose of either temporary or permanent settlement. This may involve long-distance travelling, travelling across the borders of a country or travelling within a country from one region to another region with a distinctly different cultural, political or social environment. In the decision to migrate, apart from economic factors, cultural, political and social considerations are expected to play an important role. In some countries, different regions have little cultural or linguistic differences. Inter-regional migration in these countries is a matter of labour market adjustments explained by economic factors. In other countries, cultural and/or linguistic barriers for inter-regional migration are significant and play dominant roles. In this paper, we address the issue of inter-regional migration within the UK (using the four countries of the UK as macro-regions) with a particular focus on the *balance* (between emigration and immigration) and *intensity* of the migration flows. It is important to note that all four regions of the UK claim themselves to be distinctly different nations. Northern Ireland, Scotland and Wales have separate national assemblies. In several world and European sports competitions (e.g., football and rugby) the UK often has four recognised national teams.

In the following section we examine the pattern and magnitude of migration flows amongst the four regions of the UK and make comparisons with flows of migrants entering the UK from abroad over a common time period. Section 3 addresses the issue of balance in the intra-UK migration flows. Two approaches are taken. The first approach involves creating and analysing a time series of (*weak*) bilateral indices of balance (Biswas and McHardy, 2004) and the second involves creating and analysing a time series of an overall (*strong*) bilateral index of balance (Biswas and McHardy, 2005) within the UK. Section 4 contains a Panel analysis, examining the importance of economic factors (income prospects, unemployment, house prices and undergraduate university enrolment as a proxy for intellectual skill) as well as regional factors in inter-regional migration within the UK. Section 5 is a conclusion.

2. INTERNATIONAL AND INTRA-UK MIGRATION FLOWS

In this Section we seek to characterise the migration flows amongst the four macro-regions of the UK in terms of net and gross flow size and their time trends. We also consider the importance of these flows relative to international UK migration. Ultimately, our interest at this stage lies in the magnitude of the population movements into and out of regions at an aggregate level, but we also analyse the disaggregated (country-to-country) data to get an understanding of the underlying flows which reflect the behavioural characteristics we later seek to explain.

Data

For our analysis of intra-UK migration flows we use National Health Service Central Register (NHSCR) data, reported by the Office for National Statistics[1], for the period 1975-2006. This annual data series, which dates back to 1975, is a record of changes in the regional location of individual's National Health Service registrations detailing both the old and new region in which an individual has registered. We use these registration movements as a proxy for migration with the old and new registration locations being interpreted as the source and destination, respectively.

The figures for international UK Migration were based upon Eurostat (2008) data. Unfortunately the international migration statistics are not available before 1985 and are patchy with the entries post 2000 being particularly poor. Consequently, we only report statistics for the period 1985-2000 and we present the data in five-year averages to deal

[1] National Health Service Central Register Table 4A: NHSCR Inter-regional moves within the UK.

with missing values (which are averaged out) and the general poor quality of the data (e.g. some series are reported to the nearest thousand whilst others are reported in units).

Results

Beginning with intra-UK migration, Table 1 reports the disaggregated average annual flows of migrants for each of the four regions, detailing the unidirectional flows, the gross (sum of inward and outward) and net flows as well as the gross and net aggregate (each country with respect to the rest of the UK) flows. Time trends and average annual growth rates are also reported.

During the period 1975-2006, the total volume of migration amongst the regions was growing at a rate of about 600 per annum. Of the four member states, England enjoyed the highest level of migration with an annual average aggregate flow of 200,000, approximately twice the level for Scotland and Wales and ten times greater than for Northern Ireland. Aggregate migration has been increasing over time for England, Northern Ireland and Wales, with the latter enjoying the largest absolute and relative growth rate. Wales also has the largest net aggregate flow, gaining on average over 6,000 migrants per year from the rest of the UK. The remaining members of the UK are each net losers of migrant numbers on average. However, both Scotland and Northern Ireland have highly significant positive *net immigration* time trends, which in the case of Scotland (with an average growth rate of almost 50%) will soon reverse the average outflow to a net inflow. England, on the other hand, has a highly significant time trend worsening the net emigration.

Insert Table 1 Here

At a disaggregated (country-to-country) level, the largest net bilateral flow is from England to Wales with an annual average of above 6,000. This net flow appears to be fairly persistent over time. Flows from England to Scotland and Wales are the next largest and in both cases the flows have a highly significant positive time trend. The largest unidirectional bilateral flows are from England to Wales followed closely by Scotland to England, England to Scotland and Wales to England. All the unidirectional bilateral flows are increasing over time with the exception of Northern Ireland to England, Scotland to England and Northern Ireland to Wales, with the first two declining significantly over the period.

Table 2 reports the average volume of both total and net annual immigration into the UK from regions around the world. The largest average unidirectional intra-UK flows (between England and Wales and between England and Scotland) are in the region of 50,000 per annum. This is bigger than the immigration flows into the UK from any region of the world except EU15 and Asia (based on the 1991-5 averages). Indeed, the annual average intra-regional movement of population for England for 1975-2006 is of the same order of magnitude (around 200,000) as the gross average international immigration into the UK for 1986-1995. This comparison is important because there is a certain degree of disorder and cost associated with accommodating inflows of population from abroad as well as within the UK. However, in terms of the impact on public services and planning issues, it is perhaps net migration that plays a more important role.

Insert Table 2 Here

The largest net intra-UK flows are between Wales and England and between England and Scotland, with averages in the region of three to six thousand per year - in the same range as net migration flows with Oceania, SE Asia and S Africa based on the 1991-5 averages. Though intra-regional migration has been growing over time, the jump in international migration from the 1991-5 to the 1996-2000 period reflects even faster growth. However, whilst in recent years intra-regional population movements reflected in the NHSCR data may not have kept up with international migration, the figures are still substantial.

The importance of net migration between the regions of the UK brings us to a consideration of the balances in the migration flows. Whilst the average net migration figures in Table 1 give a picture of migration balance for the entire period 1975-2006, we now turn to consider time series of indices of balance calculated on an annual basis to elicit underlying patterns and trends in migration balance. Any index of the balance of migration is an indicator of the pattern of migration. If in the past, the value of the index has been stable over time, it implies that in the past the pattern of migration had been stable. We are interested to know whether recent social, political and economic changes (*e.g.* peace in Northern Ireland, devolution of Scotland) have affected the indices of balance in inter-regional migration and require any action by central and regional governments.

3. MEASURING THE BALANCE OF INTRA-UK MIGRATION

In this Section we use three measures of migration balance to address the questions: how balanced is intra-UK migration and has the degree of balance changed over time? The first two measures are termed 'weak' indices and measure the balance of bilateral migration for one region with respect to another region (where another region is 'the rest of the UK' for the *aggregated* case and 'another country' in the *disaggregated* case). The third measure is termed the 'strong' index which attempts to capture the degree of overall bilateral balances amongst the four countries of the UK.

Data and Methodology

Beginning with the 'weak' indices, we define:

$$\text{Index 1: } I_{ij} = 1 - \frac{|m_{ij} - m_{ji}|}{m_{ij} + m_{ji}} \qquad \text{and} \qquad \text{Index 2: } I_{ij}^* = \frac{m_{ij}}{m_{ij} + m_{ji}}$$

where m_{ij} denotes the number of people migrating from region *i* to region *j.* For perfectly balanced migration $I_{ij} = 1$ and $I_{ij}^* = 0.5$. For perfectly unbalanced (unilateral) migration $I_{ij} = 0$, whilst for unilateral migration into region j (i) from region i (j), $I_{ij}^* = 0$ ($I_{ij}^* = 1$). Therefore, index 2 gives us a measure of balance as well as the direction of any imbalance. The first index was first proposed by Grubel and Lloyd (1975) in the context of intra-industry trade. Note, unlike the first index, I_{ij} the second index I_{ij}^* is not *monotonic* with respect to improvement in the balance of migration. For detailed discussion of these two indices see Biswas and McHardy (2004). The values of m_{ij} used in constructing the indices are derived using the NHSCR data described in Section 2.

Results

Table 3 reports the average values of the two weak indices along with a time trend for the period of the study under two categories: aggregated balances which report the degree of balance between each individual country i and the rest of the UK (UK_{-i}) and the disaggregated balance bilaterally between each individual country.

Insert Table 3 Here

Given the index *I* is monotonic, statistical analysis of the time series can be used to identify trends in balance. In the case of Northern Ireland, there is a highly significant improvement in index *I* over the period of the study. England experiences a downward trend in balance at the 10% significance level. The disaggregated indices indicate significant improvement in country bilateral flow in just two cases - between England and Northern Ireland and between Northern Ireland and Wales.

The annual average values of the index I^* (which measure net relative to total migration) tell a similar story to the net figures in Table 1: Wales, on average has a relative migration imbalance with respect to the rest of the UK with a an average value of I^* some way below 0.5, whilst the opposite is true for Northern Ireland. England and Scotland both have average values of I^* above but very close to 0.5, indicating a slight relative tendency towards emigration.

Figure 1 illustrates the values of index I^* for each disaggregated bilateral flow over the period of the study. For convenience, England, Northern Ireland, Scotland and Wales are abbreviated E, NI, S and W respectively, and for the series $i - j$ $(i \neq j = E, NI, S, W)$ values for I^* above 0.5 indicate net emigration from country *i* to country *j*.

Insert Figure 1 Here

In the case of *E-NI* the index begins some way below the 0.5 level (net immigration into England) with a sharp movement above 0.5 in the early 1990s which preceded the IRA ceasefire and the subsequent Good Friday Agreement, oscillating close to the 0.5 level during the 21st century. Interestingly, the index for *E-S* follows a similar pattern. The indices for *NI–S* and *NI-W* both briefly jump from above 0.5 (net emigration from *NI*) to below 0.5 in the early 1990s returning to below 0.5 again in the 2000s. Finally, in the case of *E-W* the index remains just above 0.5 throughout the period of the study, whilst for *S-W* the index oscillates above and below 0.5 fairly evenly.

Methodology

We now introduce the 'strong' index of migration balance. Suppose we construct a $n \times n$ matrix $\mathbf{A} = [I_{ij}]$ of bilateral migration indices (based upon index *I*) across the countries of the UK. According to Biswas and McHardy (2005), $= \frac{\rho-1}{n-1}$, where ρ is the Perron-Frobenius root of the matrix **A**, can be interpreted as an index of overall balance in bilateral migration flows amongst the n regions. Furthermore, the normalised elements of the eigenvectors of **A** can be interpreted as a measure of the relative contribution of each region to the overall 'strong' balance.

Results

Figure 2 reports the values of β for two cases: the UK and GB (UK excluding Northern Ireland) over the period of our study.

Insert Figure 2 Here

For the purpose of comparison, Biswas and McHardy (2005) calculated average values of $\beta = 0.85$ for seven northern EU countries (Denmark, France, Germany, Ireland, Netherlands, Sweden and the UK) over the period 1988-2001, and $\beta = 0.63$ four southern EU Countries (Greece, Italy, Portugal and Spain) for the period 1993-1999.[2] In the case of intra-UK

[2] The period in the later case is shorter because of the non-availability of the data for the construction of the **A**-matrix.

migration, the average value of β over the period 1975-2006 for GB is 0.93 and for the UK it is 0.90. Based upon a two-tailed t-test, the strong balance for GB has no significant time trend whilst the UK strong balance has a positive time trend which is statistically significant at the 1% level. It seems likely that the later is due in part at least to the fact that the balance of migration between Northern Ireland and the rest of the UK is improving over time as a result of peace and the devolution of political power in Northern Ireland.

Referring to the normalised Eigenvectors of the matrix of bilateral indices, the average values for each country across the period of the study are remarkably similar. Within GB, England and Scotland contribute 33% each towards the overall balance, whilst Wales' average contribution is 34%. For the UK, England, Scotland and Wales each contribute just over 25% towards the overall balance on average whilst Northern Ireland's contribution is 24%. The latter's contribution has a statistically significant positive time trend for the period of the study based upon a two-tailed t-test at the 1% level of significance. This again appears to reflect the effect of peace in Northern Ireland on the overall balance of migration.

4. EXPLAINING INTRA-UK MIGRATION

We have seen that some migration flows amongst the macro-regions of the UK are quite considerable and some flows have persistent or worsening balances. In planning for regional job allocations and provision of social services, it is important to know why people migrate from one region to another region. There are several micro- and macro-economic factors which may affect inter-regional migration. Amongst these factors, the unemployment level, income prospects, house-prices and shortage of skilled workforce have often been mentioned in the literature (Ghatak and Levine, 1996). McCormick (1997) finds that regional unemployment levels are not a major determinant of inter-regional labour mobility in the manual workers group. On the other hand, Pissarides and Wadsworth (1989) find that the level of unemployment and the status (employed or unemployed) significantly affects the probability of migration for an individual. Both McCormick (1997) and Pissarides and McMaster (1990) agree that a high level of aggregate unemployment reduces the level of immigration. In this section, we consider house prices as well as regional undergraduate university enrolment (as a proxy for intellectual skill in the region). High house prices in the Greater London Area have often been blamed for discouraging people from other parts of the UK from accepting jobs in that area (Cameron *et al.*, 2006). We include the house price (deflated) in the destination region in the list of explanatory variables and expect it to have a negative influence on migration to that destination.

Data and Methodology

One of our explanatory variables is regional full-time undergraduate population (per 1000 regional population) in UK universities. This is used as a measure of intellectual skill for the potential migrants in the region. University education contributes to both observable as well as non-observable skills. As noted earlier, in the context of the literature on self-selection in migration, the impact of an increase in skill on the decision to migrate may either be negative or positive. Of course, there are other varieties of skills which should be considered. It is possible that manual skills are more significant in migration than university education. However, it is difficult to obtain regional time-series data on various manual skills and construct a comprehensive index of skill for the UK regions.

Apart from regional house prices and full-time university students, we consider the impact of two seemingly important macroeconomic factors: change of per capita regional GDP in the immediate past and the regional unemployment level, which may affect inter-regional migration within the UK. Historically, the UK is divided into four regions: England, Northern Ireland, Scotland and Wales. In alphabetical order, we call them regions 1, 2, 3 and 4 respectively. We are interested in finding out the impacts of change in per capita GDP and (level of) the unemployment rate in the source and destination regions, the house prices of the destination region and the undergraduate enrolment of the source region on the relative volume of emigration (deflated by the population of the source region). [3] We use the fixed effects model of Panel regression where η_{ij}, $(i \neq j = 1,2,3,4)$ is the source-destination effect associated with each of the 12 cohorts. The subscripts i and j refer to the source and the destination of migration respectively.

It is well-known that in balanced panels, dummy variable-OLS regression and the fixed-effects Panel data (within) regression give the same estimates of the coefficients of regression (Hsiao, 1986). We use the following notations to define the variable.

$\boldsymbol{Re}$: *The index of relative volume of emigration ≡ Number of emigrants from region i to region j, divided by the population in the (source) region i in millions.*

$\boldsymbol{Ly_D}$: *Lagged (1 year) change in per capita price-deflated GDP in the destination region.*

$\boldsymbol{Ly_S}$: *Lagged (1 year) change in per capita price-deflated GDP in the source region.*

$\boldsymbol{Lu_D}$: *Lagged (1 year) unemployment rate in the destination region.*

$\boldsymbol{Lu_S}$: *Lagged (1 year) unemployment rate in the source region.*

$\boldsymbol{UG_{SR}}$: *Full-time university undergraduate population in the source region deflated by the regional population.*

$\boldsymbol{HP_{DR}}$: *Regional index of house prices (deflated by GDP deflator) in the destination region.*

Migration relative to source population from one region of the UK to another is a very small fraction, as the population of a region (deflator) is in millions. Therefore, in deflating the number of migrants the unit for regional population is chosen as one million. Regional

[3] We are aware that there is a likelihood of one or more of the data series being non-stationary, as well as it being likely that given variables exhibit common (similar) trends for most or all of the regions of the UK. However, in the interests of facilitating the most straightforward economic interpretation of our results, we do not analyse the data in differences – and confine ourselves to OLS and fixed effects regression. Some further details are included in the appendix.

per capita GDP is measured in pounds (with a base year of 2003, which appears in 2004, given the one period lag). Two of the explanatory variables (change in regional per capita GDP and regional unemployment) are lagged by one year. Like many other researchers, we are interested in fairly short-run impacts of regional economic variables on relative migration. The data used covers a period of 32 years (1975-2006) which means lagged variables cover the period 1974-2005. The data on GDP per capita was obtained from Regional Trends databases.[4] The unemployment rate is the number of unemployed divided by the sum of the number of employees, self-employed (with or without employer) and the unemployed. From the year 1995, it is based on a series from the Labour Force Survey (LFS) (for the ILO unemployment definition) in Monthly Digest of Statistics.[5] Data on population has been obtained from the mid-year population estimates - partly from Regional Trends and partly from STATBASE (National Statistics). Sources of data on regional undergraduate enrolment are Universities statistical record (on behalf of University Grants committee) and Higher Education Statistical Agency: Students in HE Institutions. Data on regional house prices comes from the Department for Communities and Local Government, deflated by the Gross Value Added (GVA) deflator. Up to 2002 it is drawn from a 5% sample and then an enhanced sample from 2003. Data from September 2005 is collected *via* the Regulated Mortgage Survey. The 2005 data is based on combined data from the Survey of Mortgage Lenders and the Regulated Mortgage Survey.

We begin the analysis with the dummy-variables OLS regression:

(1) $$R_e = \beta_0 + \beta_1 Ly_D + \beta_2 Ly_S + \beta_3 Lu_S + \beta_4 Lu_D + \beta_5 UG_{SR} + \beta_6 HP_{DR} + \sum d_j + \sum s_i + e$$

The design of the regression is not straightforward. The source dummies are denoted by 's_i', ($i = 1,2,3,4$). Since England is treated as the base, country s_1 does not appear in the table.

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[4] The income data is GDP per head from Regional Trends up to 1997, and (smoothed, but not seasonally adjusted) Gross Value Added per head from the Monthly Digest of Statistics thereafter.

[5] For 2002-2005, the unemployment data was based upon a calculation of the ratio between the unemployed and the sum of the unemployed plus employees in employment.

s_2 refers to the source dummy associated with Northern Ireland, the second region in alphabetical order, and so on. The source-related destination dummies are denoted by 'd_j' ($j = 1,2,3,4$). The dummies d_1, d_4, d_7 and d_{10} do not appear in the table. The importance of the 'd_j's and 's_i's will be clear later on when we discuss the intercepts (constants) of the regression for each cohort.

Results

From Table 4, it is clear that the regression coefficients associated with the past year's changes in GDP as well as the unemployment levels (in both the source and the destination regions) have the expected signs. The two coefficients associated with the destination region are significant – one at 1% and the other at 5% level. The two coefficients associated with the source region are insignificant even at the 10% level, although the coefficients have the expected signs. Note, McCormick (1997) did not find a significant impact of relative regional unemployment levels on migration. On the other hand, we find that the unemployment level in the destination region has a significant effect on migration. Normally, the decision to emigrate is taken after long-term deliberation. When someone makes up his or her mind to emigrate, current economic improvements in the destination region may be more important for him or her to put the decision into effect than current economic changes in the source region. This could be the explanation why the coefficients associated with L_ys and L_us are not highly significant.

Insert table 4 Here

The coefficient associated with university undergraduate enrolment is positive but insignificant. This is not surprising given our earlier discussion of the self-selection model. With the improvement of one's skill and qualification, one may feel secured that he or she will find a suitable job in his own region and there is no need to start a life elsewhere. On the other hand, one may feel that his or her qualification and skill will be better appreciated elsewhere than in his home region. Our result implies that on average the two forces may largely cancel out each other (the second one dominating to a statistically insignificant extent).

The regression co-efficient associated with the regional house-prices is negative as expected, and is significant at the 1% level. This suggests that the cost of accommodation matters for movement of workers from one macro-region to another, even though house prices vary enormously within the regions. From the summary statistics at the top of Table 4, it seems that apart from England (highly influenced by Greater London house prices), the mean house prices in the other three regions are fairly similar.

However, the coefficients associated with the source and source-related destination dummies are highly significant. The R^2 of the Dummy-variable OLS regression is also very high. Source and destination dummy variables contribute significantly to the stability of inter-regional migration in the UK.

<u>Methodology</u>

Now, define $\beta_{ij} \equiv \beta_0 + \eta_{ij}$ as the constant (intercept) of regression for each cohort of the panel regression (1). The derivation of β_{ij}'s are given as follows:

$$
\text{(2)} \quad
\begin{array}{lll}
\beta_{12} = \beta_0 & \beta_{13} = \beta_0 + d_2 & \beta_{14} = \beta_0 + d_3 \\
\beta_{21} = \beta_0 + s_2 & \beta_{23} = \beta_0 + s_2 + d_5 & \beta_{24} = \beta_0 + s_2 + d_6 \\
\beta_{31} = \beta_0 + s_3 & \beta_{32} = \beta_0 + s_3 + d_8 & \beta_{34} = \beta_0 + s_3 + d_9 \\
\beta_{41} = \beta_0 + s_4 & \beta_{42} = \beta_0 + s_4 + d_{11} & \beta_{43} = \beta_0 + s_4 + d_{12}
\end{array}
$$

The magnitudes of the β_{ij}'s are the stable parts of relative migration. We can estimate the probability of emigration from one particular region to another as follows. Let $\overline{Ly_D}$, $\overline{Ly_S}$, $\overline{Lu_S}$, $\overline{Lu_D}$, $\overline{Ly_D}$, $\overline{UG_{SR}}$ and $\overline{HP_{DR}}$ be the average values of the corresponding variables.

$$
\text{(3)} \quad P_{ij} = \overline{R_e} = \beta_1\overline{Ly_D} + \beta_2\overline{Ly_S} + \beta_3\overline{Lu_S} + \beta_4\overline{Lu_D} + \beta_5\overline{UG_{SR}} + \beta_6\overline{HP_{DR}} + \beta_{ij}
$$

P_{ij} is the expected number of migrants from region i to region j *per million of population* if the GDP and the unemployment rate for the regions are at their average level. Dividing P_{ij} by one million, we get the estimated probability of migration of a representative individual from region i to region j.

Results

The estimated values for P_{ij} 's are given below:

(4)

$P_{12} = 149.4503$	$P_{13} = 990.387$	$P_{14} = 1106.848$
$P_{21} = 6192.232$	$P_{23} = 1007.102$	$P_{24} = 208.4101$
$P_{31} = 9603.299$	$P_{32} = 236.6634$	$P_{34} = 281.4332$
$P_{41} = 16355.32$	$P_{42} = 35.95619$	$P_{43} = 540.7347$

$E_{ij} = \sum_{j \neq i} P_{ij}$ is the expected migration per million population from the region i to other parts of the UK. Hence, $E_1 = 22246.7$, $E_2 = 7407.7$, $E_3 = 10121.4$ and $E_4 = 16932.0$, from which it is clear that Wales tops the list followed by Scotland, Northern Ireland and England. From Wales approximately 15 times more people per million of population are expected to arrive in England each year than English people going to Wales. It is also clear from above that England is expected to take in most of the regional immigrants from other regions.

The impact of specific source and destination regions for each cohort on the magnitude of relative emigration for each cohort is very important. It can be seen by considering the fixed effect (within) regression model and comparing the R^2 with that of the dummy-variables regression model. The fixed effects (within) regression results are presented in Table 5. The value of overall R^2 drops from 0.9887 in Table 4 to 0.2055 in Table 5. This is not surprising. The intercept (constant) in Table 4 is separated from the specific source and destination effects for each cohort. In the fixed effects regression the constant term takes into account the constant β_0 together with the source and the destination effects and lumps them together into one constant term. Hence, it is not surprising that the value of R^2 in the fixed effects regression drops dramatically. It also emphasises the importance of the source and destination dummies.

Insert Table 5 Here

The fixed effects, associated with the destination and source regions, which dominate β_{ij}'s, are influenced by several long-run factors - social, political, economic and geographical. The values of P_{i2} (Northern Ireland as the destination country) are very low. It seems likely the past history of political violence has played a major part in this. With the change in political scenario, it is expected that immigration into Northern Ireland will step up. During the period covered in this study, the UK economy was enjoying a boom period. The regional GDP in England was growing at a relatively fast rate. Therefore England as a destination country was very attractive. We must emphasise that emigration is usually the result of a long-term deliberation. Short-run economic changes in the destination region only affect the realisation of the decision to migrate.

5. Conclusion

In this paper, we have looked at the scenario of intra-UK migration between the four regions of the UK, namely England, Northern Ireland, Scotland and Wales. We have seen that the level of intra-UK migration is quite large and is increasing over time. Is this increase in the level of migration creating any imbalance in inter-regional migration within the UK? We used several measures of the balance in migration to determine whether the regional balance in migration has been improving over time. Whilst Wales and Northern Ireland have on average large relative imbalances in migration over the period of the study, the tendency towards net immigration in Wales has remained persistent whilst the imbalance in terms of net emigration from Northern Ireland to the rest of the UK has a highly significant time trend towards more balanced migration. The overall balance of inter-regional migration for the UK, as captured in the 'strong' index, has also improved significantly over the period of the study.

It seems that as Northern Ireland is gaining political and economic stability the balance in migration between Northern Ireland and the rest of the UK is improving. There may be another factor behind the improvement in the balance of regional migration. It was observed by Hatton and Tani (2005) that as a result of competition with the migrant workers in the South of England and higher house prices in the South, the native workers in the UK are finding it increasingly attractive to migrate to other parts of the UK. This could be a balancing factor in the intra-UK migration story. Seeking jobs away from the cities with high house prices may be the reason why house prices appear as a significant factor in inter-regional migration. Using the fixed-effects model of Panel analysis, we examined the impact of short-run changes in the regional per capita GDPs and unemployment levels (both in the source and destination regions) on bilateral emigration relative to the regional population at source. It seems that one year lagged changes in per capita GDP (as a proxy for prospective wage) and the unemployment level in the destination region have a significant effect on regional migration. On the other hand, the same factors in the source region are not highly significant. We have argued that migration decisions depend on many factors and are the result of long-term deliberation. Once the decision has been taken, its realisation depends on the short-term indicators like economic growth and employment prospects in the destination region. In the case of international migration, it has been found by several authors that income prospects and the unemployment level in the home country are significant factors in the decision to emigrate (Ghatak and Levine, 1996). However, in this study we found that from a short-term perspective, it is economic growth and employment prospects in the destination country which affect relative migration. The stable and the most significant part of relative migration is explained by regional social and political factors reflected in the source and destination of migration.

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TABLE 1 - INTRA-UK MIGRATION FLOWS (1975-2006)

Source	Destination	Average	Time Trend	Growth (%)
Unidirectional Bilateral Flows				
England	Northern Ireland	8,281	97.6655***	1.18
Northern Ireland	England	9,885	-68.3120**	-0.69
England	Scotland	47,394	190.2005*	0.40
Scotland	England	48,578	-313.3821***	-0.65
England	Wales	52,499	346.5986***	0.66
Wales	England	46,340	235.4056***	0.51
Northern Ireland	Scotland	1,741	32.6492***	1.88
Scotland	Northern Ireland	1,575	55.2707***	3.51
Northern Ireland	Wales	399	-0.3902	-0.10
Wales	Northern Ireland	316	6.7603***	2.14
Scotland	Wales	1,636	6.1389*	0.38
Wales	Scotland	1,667	10.6212***	0.64
Gross Bilateral Flows				
England	Northern Ireland	18,166	29.3536	0.16
England	Scotland	95,972	-123.1816	-0.13
England	Wales	98,838	582.0042***	0.59
Northern Ireland	Scotland	3,316	87.9199***	2.76
Northern Ireland	Wales	715	6.3701***	0.91
Scotland	Wales	3,303	16.7601***	0.51
Net Bilateral Flows				
England	Northern Ireland	-1,604	165.9775***	-10.35
England	Scotland	-1,185	503.5827***	-42.51
England	Wales	6,159	111.1930	1.81
Northern Ireland	Scotland	165	-22.6215**	-13.71
Northern Ireland	Wales	83	-7.1505***	-8.62
Scotland	Wales	-31	-4.4822	14.46
Gross Aggregate Flows				
England		212,977	488.1761*	0.23
Northern Ireland		22,197	123.6435**	0.56
Scotland		102,591	-18.5016	-0.02
Wales		102,856	605.1343***	0.59
Net Aggregate Immigration Flows				
England		-3,371	-780.7531***	23.16
Northern Ireland		-1,852	195.7495***	-10.57
Scotland		-989	485.4434***	-49.10
Wales		6,211	99.5603	1.60

Level of significance: *** = 1%, ** = 5%, * = 10%.

Table 2 – Five Year Average Annual Total and Net Immigration into the UK by World Region (1986-2000)

	Total Immigration			Net Immigration		
	1986-1990	1991-1995	1996-2000	1986-1990	1991-1995	1996-2000
EU15	59400	67800	108812	3400	7800	35939
Central and Eastern Europe	1400	6800	7931		1600	1935
Africa	26400	22600	36396	11400	9400	22739
E. Africa		7600	9373		2800	6025
N. Africa	2200	1800	2407	-400	200	1020
S. Africa	10000	8400	20231	5000	3400	13706
W. Africa	3400	4200	4362	1600	2600	2364
N. America	33400	31000	38227	-10600	-8400	2842
Central America		1000	1057		-500	20
Caribbean America	1400	1600	2449	400	-400	788
S. America	2600	2200	3808	400	-1000	1207
Asia	65400	60600	80717	25800	20800	39991
E. Asia	7400	18200	25086	2400	3200	11053
S.E. Asia	6200	14600	17983	2400	6600	6188
S. Asia	24200	19800	2 6375	17200	13400	20719
Near and M.E. Orient	3600	8000	11273	1200	-2800	2031
Oceania	34600	32200	48144	-12600	-5000	-434
Total	238800	238000	318767	19800	25600	87000

Level of significance: *** = 1%, ** = 5%, * = 10%.

Table 3 – Aggregated and Disaggregated Weak Migration Balances (1975-2006)

Source (i)	Destination (j)		Average (p.a.)	Time Trend
Aggregated flow balance				
England	UK_{-i}	I	0.95218	-0.00122*
		I*	0.50743	
Northern Ireland	UK_{-i}	I	0.88123	0.00619***
		I*	0.54325	
Scotland	UK_{-i}	I	0.91900	0.00038
		I*	0.50510	
Wales	UK_{-i}	I	0.94127	-0.00065
		I*	0.47063	
Disaggregated flow balance				
England	Northern Ireland	I	0.87358	0.00668***
		I*	0.45645	
England	Scotland	I	0.91480	0.00032
		I*	0.49375	
England	Wales	I	0.93941	-0.00080
		I*	0.53029	
Northern Ireland	Scotland	I	0.87733	-0.00008
		I*	0.52687	
Northern Ireland	Wales	I	0.83641	0.00590***
		I*	0.55987	
Scotland	Wales	I	0.93294	0.00126
		I*	0.49534	

Level of significance: *** = 1%, ** = 5%, * = 10%.

TABLE 4 - LINEAR REGRESSION (OLS)

	REGION SAMPLE MEANS					
	1	2	3	4	**Number of obs**	= 372
Re	748.8921	2469.245	3373.795	5644.006	**F(17,354)**	= 856.76
GDP	12276.05	9471.12	11608.71	9945.121	**Prob > F**	= 0.0000
Ly_S	261.4199	220.4807	243.067	174.713	**R-squared**	= 0.9887
U	0.071099	0.113095	0.089358	0.085875	**Root MSE**	= 532.44
UG	5.404300	11.12291	10.58986	8.438449	(per 1000 of regional population)	
HP	65511.11	74974.39	73371.61	73228.29		
Pop	47877.33	1612.36	5113.465	2852.439	(in 000's)	

Re	**Coef**	**Robust Std.Err.**	**T**	**P>|t|**	**[95% Conf. Interval]**	
Ly_D	0.704233	0.172878	4.07	0.000	0.364236	1.04423
Ly_S	-0.19506	0.129765	-1.50	0.134	-0.45027	0.06015
Lu_S	2779.232	2325.602	1.20	0.233	-1794.5	7352.97
Lu_D	-3976.06	1671.798	-2.38	0.018	-7263.97	-688.154
UG_{SR}	18.36955	15.55222	1.18	0.238	-12.2168	48.9559
HP_{DR}	-0.00669	0.001888	-3.54	0.000	-0.01041	-0.00298
d_2	730.6482	60.64097	12.05	0.000	611.3863	849.91
d_3	881.3994	61.22274	14.40	0.000	760.9934	1001.81
d_5	-5099.61	199.4475	-25.57	0.000	-5491.86	-4707.36
d_6	-5864.01	187.2453	-31.32	0.000	-6232.26	-5495.76
d_8	-9170.82	164.9832	-55.59	0.000	-9495.29	-8846.35
d_9	-9202.05	160.745	-57.25	0.000	-9518.19	-8885.92
d_{11}	-16123.6	211.9322	-76.08	0.000	-16540.4	-15706.7
d_{12}	-15729.1	198.4448	-79.26	0.000	-16119.3	-15338.8
s_2	5680.553	214.3889	26.50	0.000	5258.917	6102.19
s_3	9161.063	205.2093	44.64	0.000	8757.481	9564.65
s_4	15947.99	208.8633	76.36	0.000	15537.23	16358.8
β_0	636.4328	169.7633	3.75	0.000	302.5614	970.30

TABLE 5 - FIXED-EFFECTS (WITHIN) REGRESSION

Fixed-effects (within) regression		**Number of obs**	= 372
Group variable (i): source		**Number of groups**	= 4
R-sq: Within	= 0.9870	**Observ per group:**	
		min	= 93
Between	= 0.9960	**Avg**	= 93
Overall	= 0.2055	**Max**	= 93
		F(14,354)	=1032.45
Corr(u_i,X)	=-0.6637	**Prob > F**	=0.0000

Re	**Coef**	**Robust Std.Err.**	**t**	**P>|t|**	**[95% Conf. Interval]**	
Ly_D	0.704233	0.172878	4.07	0.000	0.364236	1.04423
Ly_S	-0.19506	0.129765	-1.50	0.134	-0.45027	0.06015
Lu_S	2779.232	2325.602	1.20	0.233	-1794.5	7352.97
Lu_D	-3976.06	1671.798	-2.38	0.018	-7263.97	-688.154
UG_{SR}	18.36955	15.55222	1.18	0.238	-12.2168	48.9559
HP_{DR}	-0.00669	0.001888	-3.54	0.000	-0.01041	-0.00298
d_2	730.6482	60.64097	12.05	0.000	611.3863	849.91
d_3	881.3994	61.22274	14.40	0.000	760.9934	1001.81
d_5	-5099.61	199.4475	-25.57	0.000	-5491.86	-4707.36
d_6	-5864.01	187.2453	-31.32	0.000	-6232.26	-5495.76
d_8	-9170.82	164.9832	-55.59	0.000	-9495.29	-8846.35
d_9	-9202.05	160.745	-57.25	0.000	-9518.19	-8885.92
d_{11}	-16123.6	211.9322	-76.08	0.000	-16540.4	-15706.7
d_{12}	-15729.1	198.4448	-79.26	0.000	-16119.3	-15338.8
β_0^*	8333.837	229.2709	36.35	0.000	7882.933	8784.742
σ_u	6671.638					
σ_e	532.4448					
ρ	0.993671	(fraction of variance due to u_i)				

FIGURE 1 – WEAK INDEX *I OF INTRA-UK MIGRATION BALANCE**

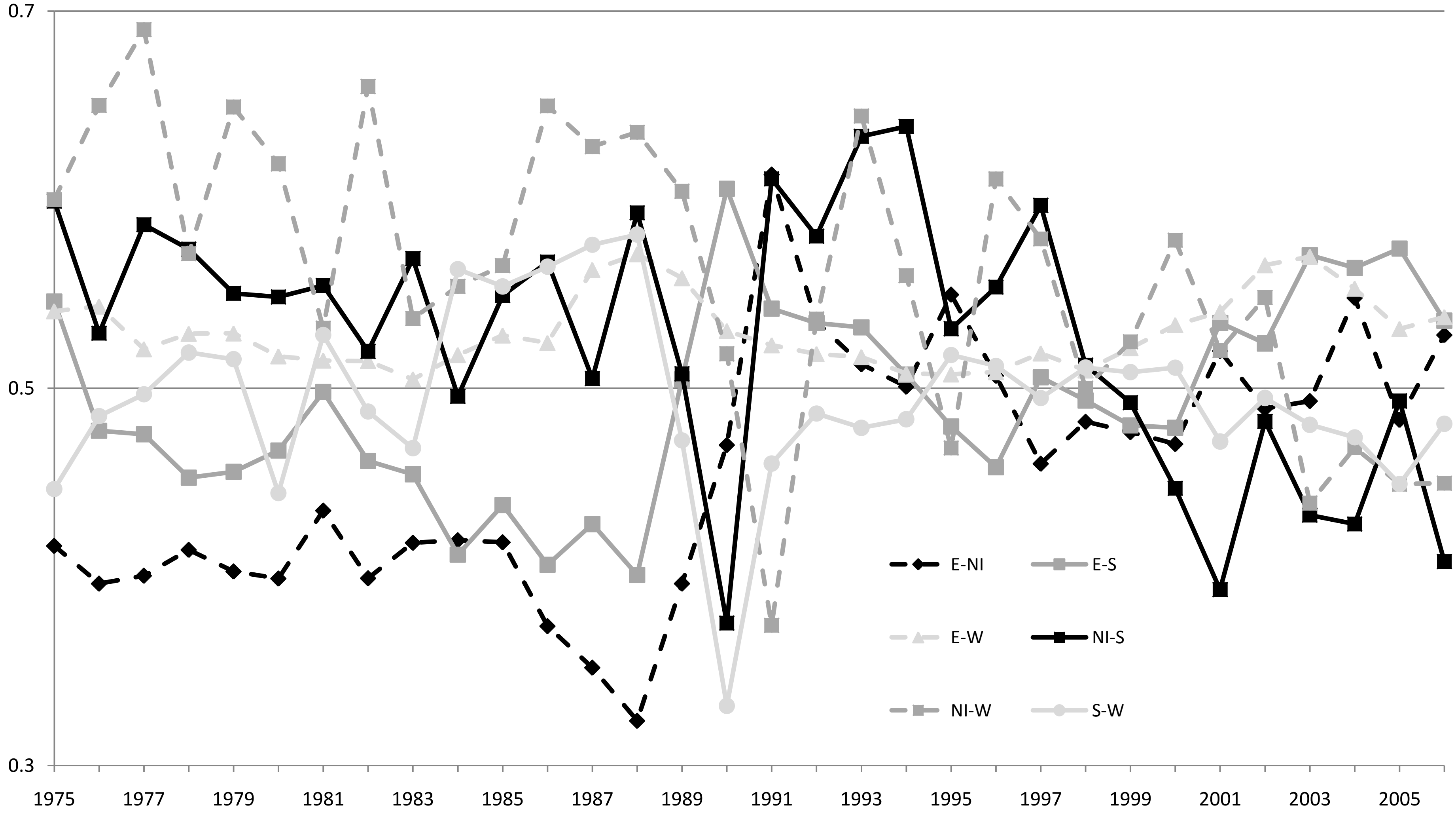

FIGURE 2 – STRONG INDEX OF INTRA-UK MIGRATION BALANCE FOR GB AND UK

APPENDIX (CHARACTERISTICS OF THE DATA).

When considering the characteristics of our data series, we need to bear in mind that they do not quite constitute a classical panel dataset. This is because emigration takes place, by definition, between pairs of countries (or regions). In our dataset, there is a level of emigration (each year) from a given (source) country to three other (destination) countries. Thus, although there are only four countries for which annual emigration is observed for a period of 32 years, there are twelve (four times three) 32-year emigration series. Additionally, we should bear in mind that our data are low frequency (annual) and over quite a limited time period, so the *T*-dimension of our panel is rather smaller than we should prefer when testing for unit roots.

Viewed separately, some of the twelve relative emigration series are stationary and the rest (between 66% and 75% depending on the test) are non-stationary. Using a Phillips-Perron (1988) test[6] at a 5% significance level, the stationary emigration series are E-S, N-W, S-W and W-S. Under an augmented Dickey-Fuller test[7] at the same significance level (with the data transformed by a generalised least squares regression, as by Elliott et al (1996), to yield better small sample performance and power than a standard (augmented) Dickey-Fuller test), E-W is added to the list, while E-S and N-W are taken away. When emigration is differenced once, both tests find the result to be stationary apart from the case of E-S under the Dickey-Fuller test. A multivariate augmented Dickey-Fuller panel unit root test[8] indicates that the null hypothesis, of all twelve relative emigration series being non-stationary and I(1), should be rejected at the 5% significance level.

The respective unemployment series for the four component countries of the UK all seem to exhibit non-stationarity, according to the Phillips-Perron and augmented (transformed) Dickey-Fuller tests. Differencing of the series yields stationarity – except perhaps in the case of Scotland, for which the Phillips-Perron test still suggests non-stationarity at the 5% significance level. Non-stationarity of unemployment series for individual countries is not surprising, since Camarero and Tamarit (2004) reported a similar finding in the context of previous tests on data for individual EU countries. They noted that this favours the hypothesis of hysteresis. However, when panel data on unemployment are analysed, a joint hypothesis of hysteresis across countries is usually rejected. Our limited panel, of the four UK countries, provides a not especially surprising exception to this rule – since the null, of the four time series all being I(1) processes, cannot be rejected.

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[6] This involves a standard regression of the first difference of the variable against the first lag of its level (with an intercept), with the standard errors being corrected for serial correlation in the manner indicated by Newey and West (1987). The correction varies according to the chosen value of the lag truncation parameter.

[7] Due to the rather small number of observations for each source-destination pairing, the results for this test are sometimes sensitive to the number of lags included. For greater comparability with the number of observations used for the Phillips-Perron test, we sometimes performed a check by reducing the number of lags.

[8] See, for example, Sarno and Taylor (1998).

As expected, the real income per head series (all using a single income deflator) for the four countries of the UK are all non-stationary according to our two tests. It is unsurprising that most of the evidence on the differenced real income per head that we use in our regression analysis favours stationarity (at the 1% significance level for Northern Ireland and Scotland, and at the 5% level for England and Wales). A panel unit root test indicates rejection of the null, of the four time series for differenced real income per head each being I(1). While this is consistent with stationarity, there are other possible explanations for rejection of such a specific null.

Our four full-time undergraduate student number (relative to regional population) series are all clearly indicated as non-stationary by both our tests. The evidence shows that the data for England and for Wales need to be differenced twice to become stationary, whereas first differences are stationary for Northern Ireland and for Scotland (at least at the 5% significance level). A panel unit root test of the student number variable in levels gives the consistent result of clear failure to reject the null that the four time series are non-stationary. When student numbers are differenced (once), the results are less clear cut – and depend on how many lags are included in the underlying autoregression.

The four real house price series (which use the income deflator) are also all shown by our two tests to be non-stationary. The evidence also suggests that, for all cases except Scotland, house prices need to be differenced twice to be clearly stationary. The first difference of Scottish house prices is stationary under the Phillips-Perron test at the 5% significance level, and under the Dickey-Fuller test at the 1% level. For Wales, the first difference of house prices is stationary according to the Dickey-Fuller test at the 5% significance level (but not quite according to the Phillips-Perron test). The panel data unit root test demonstrates all four time series in levels to be I(1), but the results for differenced house prices vary according to lag order.

Looking at the usual characteristics of the variables in our dataset, there would be potential concerns about running a time-series regression of an I(1) variable on a pair of I(1) variables, a pair of first differences of I(1) variables, another I(1) variable and an I(2) variable. This would also make it difficult to investigate possible co-integration. Obviously, our dataset actually involves a panel, which complicates the picture further regarding the identification of any co-integrating relationships.