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Irene Mosca
Robert E. Wright

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Irene Mosca
Trinity College Dublin

Robert E. Wright
University of Strathclyde
and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

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This paper examines empirically the relationship between under-employment and migration amongst five cohorts of graduates of Scottish higher education institutions with micro-data collected by the *Higher Education Statistical Agency*. The data indicate that there is a strong positive relationship between migration and graduate employment – those graduates who move after graduation from Scotland to the rest of the UK or abroad have a much higher rate of graduate employment. Versions of probit regression are used to estimate migration and graduate employment equations in order to explore the nature of this relationship further. These equations confirm that there is a strong positive relationship between the probability of migrating and the probability of being in graduate employment even after other factors are controlled for. Instrumental variables estimation is used to examine the causal nature of the relationship by attempting to deal with the potential endogeneity of migration decisions. Overall the analysis is consistent with the hypotheses that a sizeable fraction of higher education graduates are leaving Scotland for employment reasons. In turn this finding suggests the over-education/under-employment nexus is a serious problem in Scotland.

JEL Classification: I23, J24, J61, R23

Keywords: Scotland, under-employment, over-education, higher education graduates

Corresponding author:

Robert E. Wright
Department of Economics
William Duncan Building
University of Strathclyde
130 Rottenrow
Glasgow, G4 0GE
Scotland, United Kingdom
E-mail: r.e.wright@strath.ac.uk

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Chasing Graduate Jobs?

(1)Introduction

Over the last 25 years, there has been a large increase in the number of young Scots participating in higher education. This rising trend is illustrated in Figure 1, which shows the "age participation index (API)" for the academic years 1983/84 to 2009/10. This measure is an estimate of the percentage of 17 year olds who will participate in higher education for the first time before their 21st birthday. In the academic year 1983/1984, the API was 18.9%. By 2001/02, it had surpassed 50%—the much championed target set by the Labour Government elected in 1997. However, since this peak, the API has declined. Although it increased in 2009/10 to 44.3% (undoubtedly driven by the unfavourable labour market conditions caused by the global recession), this is about the same rate as in the late 1990s (Scottish Government, 2010a). Nevertheless, participation in higher education is higher in Scotland compared to the other countries in the UK. For example, England still has a considerable way to go to meet the 50% target.

<<<< Figure 1 About here >>>>

As Figure 2 suggests, the trend of longer-term increasing participation has contributed to a steady long-term increase in the number of Scottish-domiciled students studying in Scotland. The other factor main contributing to this trend has been a sharp increase (particularly over the past decade) in the number of European Union and overseas students(see Faggian, Li and Wright, 2009). There has also been a slight increase in the number of students domiciled in England, Northern Ireland and Wales studying in Scotland It is important to note that in Scotland it is possible to study for higher education qualifications at certain colleges as well as the more traditional "higher education institutions" (HEIs), which are mainly the universities.About 80%

of HE students are attending HEIs, with most studying for degrees. On the other hand, the majority of those attending colleges are studying for qualifications below degree level (Scottish Government, 2010b). This difference is important to remember because the analysis carried out below is restricted to those studying at HEIs. In the period 1994/95 to 2009/10, the number of higher education students studying in Scotland increased from around 208 thousand to nearly 290 thousand—an increase of nearly 40%.

<<<< Figure 2 About here >>>>

It is often argued by politicians and in the mediathat the increase in the number of higher education graduates has created an "over-education" problem in Scotland. It is believed that the higher education sector is generating "too many" graduates for the economy to absorb, which causes two undesirable outcomes. The first is that it creates "under-employment". There is no universally agreed definition of what constitutes "under-employment". However, with respect to higher education, it generally refers to a situation when graduates are employed in jobs that do not require the skillsthey obtained through their study to perform the required work. An obvious example of an under-employedgraduateis an individual with a medical degree who is a taxi driver.The second is that is that it increases out-migration. It is believed that over-education through under-employment is "forcing" graduates to migrate to other regions of the UK or abroad in order to find employment that better matches the skills they obtained through higher education.

It is not unreasonable to hypothesise that there is a positive relationship between under-employment and migration. However, we are aware of no empirical studies that have examined the link between under-employment and migration amongst higher education graduates (beyond the descriptive studies for Scotland of Mosca and Wright, 2010a, 2011a). This is surprising given

that there are large but separate literatures concerned with under-employment and migration behaviour.If there is disequilibrium in the labour market, with the supply of graduate labour exceeding the demand for graduate labour, then one would might expect to find that Scottish graduates who migrate to other regions of the UK or abroad have (on average) higher rates of graduate employment compared to those who remain in Scotland.

With this in mind, this paper examines empirically the relationship between under-employment and migration amongst five cohorts of graduates of Scottish higher education institutions with micro-data collected by the *Higher Education Statistical Agency*. The data indicate that there is a strong positive relationship between migration and graduate employment—those graduates who move after graduation from Scotland to the rest of the UK or abroad have a much higher rate of graduate employment.Versions of probit regression are used to estimate migration and graduate employment equations in order to explore the nature of this relationship further. These equations confirm that there is a strong positive relationship between the probability of migrating and the probability of being in graduate employment even after other factors are controlled for. Instrumental variablesestimation is used to examine the causal nature of the relationship by attempting to deal with the potential endogeneity of migration decisions. Overall the analysis is consistent with the hypotheses that a sizeable fraction of higher education graduates are leaving Scotland for employment reasons. In turn this finding suggests the over-education/under-employment nexus is a serious problem in Scotland.

(2)Background Issues

There is a relatively large empirical literature concerned with the migration behaviour of higher education graduates (see for example, Bratti et al., 2004; Da Vanzo, 1976; Evans, 1990;

Faggian, Li and Wright, 2009; Faggian, McCann and Sheppard, 2006a, 2006b 2007a, 2007b; Faggian and McCann, 2006a, 2006b, 2009; Greenwood and Gormely, 1971; Mosca and Wright, 2010b,). Central to much of this research is the role played byhuman capital with higher levels of human capital being associated with a higher probability of migrating. Factors that have been shown to be consistently important are subject studied (or subjects studied), class of degree (grades) and quality of higher education institution attended (e.g. ranking). However, migration decisions also appear to depend on certain non-human capital characteristics such as ethnicity, age and gender. Finally, in a standard Harris–Todaro manner, regional-level employment and wage rates in both origin and destination regions affect migration decisions. There is alsoa tendency for graduates to migrate to regions with higher relative wage rates, higher relative employment rates and lower relative unemployment rates.

There is also a relatively large empirical literature concerned with measuring under-employment, even though there is no uniformly agreed definition of what constitutes "under-employment". The dominant empirical approach is to fit Mincer-type earnings equations that include self-assessed measures that attempt to capture the extent to which the respondent is using the skills obtained through higher education (McGuinness, 2006). With this approach, under-employment is measured in terms of earnings loss e.g. earnings are X-per cent lower because of under-employment.See Battu, Belfield and Sloane (1999, 2000),Battu, Sloane and Seaman (1999), Chevalier (2003), Dolton and Silles (2000) and Dolton and Vignoles (2000) for applications of this approach to UK data. Most of these studies find evidence of significant under-employment in the UK. One problem with this approach is that the self-assessed measures are likely characterised by a considerable amount of measurement error. We believe that this

partly explains why the estimates of under-employment following this approach vary widelyeven in the same country in the same period of time(see Groot and Haassen van den Brink, 2000).

With respect to the link between under-employment and migration, an observed positive statistical relationship is consistent with the view that under-employment and migration are related. However, a statistical relationship between the two is not indicative of a causal relationship. There are other reasons why a graduate might be in non-graduate employment beyond the simple reason of not being able to find a graduate-job. For example, individuals who intend to study for post-graduate qualifications, often take time out before starting. For such individuals, a graduate-job with a career path may be undesirable simply because it would be short-lived. In addition, an individual who has migrated, and found graduate-job employment, may have also found graduate-job employment if they had not migrated. It may be case that such individuals migrated because they found a better job-match and/or they had a desire to work outside their country of study. More generally, being in a non-graduate job does not necessarily mean “wanting a graduate-job and being unable to find one”.

The crux of the problem is that migration decisions are potentially endogenous in employment decisions. This issue iscomplicated further because human capital factors affect both the probability of migrating and the probability of being in graduate employment in a similar manner (as is demonstrated below). This is not surprising since the theoretical underpinnings of both are similar, with an assessment of life-time earnings gains being central to both decision-making processes. A convincing analysis of the causal relationship between migration and graduate employment requires an exogenous source of variation in migration outcome since migration decisions cannot be assumed to be random. Individuals make decisions about whether to migrate, and these decisions are related to a series of observed and unobserved

characteristics. Depending on how these decisions are made, the positive correlation between migration and graduate employment may over-state or under-state the "true" impact of migration on the probability of obtaining graduate employment.

(3)Data

In this section, micro-data compiled by the *Higher Education Statistical Agency* (HESA) is used to estimate a set of migration and graduate employment equations. The analysis is restricted to Scotland-domiciled graduates who were awarded under-graduate qualifications from Scottish higher education institutions. “Scotland-domiciled graduates” are individuals who completed their secondary schooling in Scotland. This is an important group from a policy point of view in the sense that they are not required to pay tuition fees which sets them apart from graduates of HEIs in other countries of the UK. Most importantly (as is documented below) the migration rate of this group is approaching ten per cent.

For this analysis, information is merged from twodata-sets for five graduation cohorts covering the academic years 2002/03 to 2006/07. Therefore, the empirical focus is in the five-year period immediately before the most recent global recession. It is clear that the labour market for graduates has been adversely affected by the recession. Because of this, it seems ill-advised to mix data from a period of economic downturn with what in the UK was a period of sustained economic expansion. Needless to say, future analyses that combine data “before” and “after” the recession will be able to explore additional hypotheses relating to under-employment than considered here.

The first data-set is called *Students in Higher Education Institutions*(see HESA, 2010a). This primarily consists of information provided by the HEI at which the individual studied. As is

discussed in more detail below, variables constructed from this information include:gender, mode of study (full-time vs. part-time), ethnicity, disability status, award classification, subject(s) studied, type of institution attended and age at graduation. The second data-set is the *Destinations of Leavers from Higher Education Institutions* (see HESA, 2010b).This data is collected through a questionnaire administered approximately six months after the student has graduated. Detailed information about employment, further study and geographic location is collected. It is worth noting that *Destinations of Leavers* data is only collected for UK-domiciled graduates and not for European Union or Overseas graduates even if they stayed in the UK to work after graduation. However, data is also collected for UK-domiciled graduates who have moved abroad (see Mosca and Wright, 2010b).

In this merged data-set, there are three post codes of interest. The first is the post code corresponding the individual's so-called "place of domicile". This is the postcode of the graduate's permanent or home address prior to study. For the vast majority of graduates this will also indicate the geographic region (e.g. Council Area), where they completed their secondary schooling. The secondis the post code of the higher education institution attended. The third is the post code of the place of employment six months after graduation" (i.e. the address of their employer or business address of those self-employed). With this information it is possible to define two types of movers that are central to our analysis, remembering that the sample is composed of Scotland-domiciled graduates who studied at Scottish HEIs. The first are graduates who "moved to study" i.e. moved from one region of Scotland to another region in Scotland to attend a particular HEI. The second are graduates who are observed six months working outside of Scotland, either somewhere in the rest of the UK or abroad.

As mentioned above, we believe that there are serious limitations with using the earning equations approach to measure under-employment. Therefore, we define under-employment as being employed in what can be termed a "non-graduate job". The specific definition that we use is based on pioneering research carried out by Elias and Purcell (2004). They examined each of the 353 unit groups of the 2000 Standard Occupational Classification (SOC) and classified each unit into the type of skills needed to do the required work. They arrived at a five category job-type classification:

(1) *Traditional graduate*: the established professions, for which, historically, the normal route has been via an undergraduate degree programme (e.g. solicitors and doctors);

(2) *Modern graduate*: the newer professions, particularly in management, IT and creative vocational areas, which graduates have been entering since educational expansion in the 1960s (e.g. computer programmers and journalists);

(3) *New graduate*: areas of employment, many in new or expanding occupations, where the route into the professional area has recently changed such that it is now via an undergraduate degree programme (e.g. physiotherapists and sale managers);

(4) *Niche graduate*: occupations where the majority of incumbents are not graduates, but within which there are stable or growing specialist *niches* which require higher education skills and knowledge (e.g. nurses and hotel managers); and

(5) *Non graduate*:occupations for which a graduate level education is inappropriate (e.g. school secretaries and bar staff).

It is clear that categories (1), (2) and (3) are "graduate-jobs". In these occupations, the skills obtained through higher education are needed for both entry into the profession and to carry out the required job tasks. It is also clear that (5) are "non-graduate jobs" (e.g. the bartender with the marketing degree). However, it is not at all clear with respect to (4). Essentially these are jobs that traditionally did not need higher education with the skills needed to carry out the tasks of employment gained mainly through on-the-job training. One can also think of these jobs as being those that hire both individuals with and without higher education. In the analysis below, we assume that a graduate is in a non-graduate job only if their occupation is included in category (5). It is important to stress that this is a very stringent definition of non-graduate employment, consisting largely of what may be termed "dead-end jobs" such as taxi driver, waitress/waiter, secretary, receptionist, construction labourer and security guard. There is little disagreement that jobs that fall into this category do not require higher education to execute the required tasks. If it is the case, that a large share of the occupations in category (4) are in reality non-graduate jobs, then the estimates of under-employment presented below are likely to be lower bounds with the actual level being higher. In other words, we are making the task that we set out for ourselves more difficult to demonstrate.

(4) Descriptive Statistics

The sample consists of 65,477 graduates who are employed six months after graduation. This represents about 73.0% of the total number of graduates in these five cohorts (N=89,752). With respect to the total number of graduates, 15.9% were engaged in further study, 4.8 per cent

were unemployed, and 5.6% were “not in the labour force”. Note that a small number of cases (N=523) had to be excluded because of missing post code information.

As Table 1 shows, 67.6% of those in employment were in graduate-jobs six months after graduation. This implies an under-employment rate of about one-in-three. We believe that this is a sizeable share and conclude that under-employment is a problem amongst Scottish under-graduate graduates, at least six months after graduation. It is often argued that under-employment (however defined) measured only six months after graduation is a meaningless statistic. Proponents of this view argue that it takes much longer for graduates to establish themselves in the labour market and find graduate-jobs. This suggests that more can be learned about under-employment by considering employment circumstances further along the career path.

<<<< Table 1 About Here >>>>

We disagree with this assessment for two reasons. The first is that there is too much systematic variation in the probability of being in a graduate job six months after graduation. In a statistical sense, this probability is consistently related to observable characteristics and is not random (as is demonstrated below). The second is that the 2002/03 cohort of graduates included in our analysis was re-interviewed 42 months after graduation (i.e. in the winter of 2006/07). Analysis of this data using the same definition of graduate/non-graduate jobs used in this paper yields a graduate employment rate of about 80 per cent (see Mosca and Wright, 2010a, 2011a,, 2011b). In other words, ever after 3½ years after graduation, under-employment is still one-in-five. This suggests at least to us that under-employment is not short-term but persistent labour market state in Scotland.

We will term those employed graduates living outside of Scotland six months after graduation as “movers”. As Table 1 shows, 8.0% of the sample were movers.Of this share,5.6%

were“national movers” (i.e. moved within the UK to England, Northern Ireland or Wales) and 2.4% were “international movers”(i.e. moved outside of the UK.) In other words of those who moved, about 70 per cent were national movers and 30% were international movers.There is a large differential with respect to graduate employment six months after graduation between movers and non-movers. The graduate employment rate for movers is higher than for non-movers.81.4% of movers and 66.4% of non-movers are employed in graduate-jobs six months after graduation. This implies a graduate employment rate that is almost 25% higher for movers. The graduate-job rate for national movers is even higher at 84.4%, with the rate for international movers being lower at 74.4%. It is clear that for whatever reasons those who move have much higher rates of graduate employment.

(4) Regression Estimates

In order to explore the relationship between graduate employment and migration in more detail, migration and employment equations are estimates. The variables included in these regressions equations are simiar to those conisdered by Faggian, Li and Wright (2009). The explanatory factors considered are: gender, mode of study, disability status, ethnicity, award classification, subject studied, type of insititution attended, age at graduation and graduation cohort. The variables, along with descriptive statistics, are defined in Table 1. All the variables included in the regression equations are dummy variables—the excluded categories are given in Table 1.

Most of these variables are straightforward in terms of their measurement. However, it is worth commenting briefly on several further. Both ethnicity and disability status are self-reported measures. Most Scottish higher education institutions use an internationally atypical

system (which varies across institutions) to indicate how well a student has done in their study. Most degrees are awarded subject to a classification banding with "1st class" being the highest level of attainment and "Third class and below" being a much lower level of attainment. Qualifications are also awarded that do not use this banding system, which are included in our"Other classification" category.

Compared to the rest of the UK, Scotland awards a much large share of what are termed "joint degrees", which is a combination of usually two subjects e.g. economics and finance or economics and english or economics and mathematics". Most degrees awarded in England, Northern Ireland and Wales are single subject degrees e.g. economics only. After considerable experimentation, the "subject studied" was broken down into six categories (see Table 1). There are categories for studying sciences, social sciences and arts and humanities, as a single subject or jointly with each of these three subjects. The category "interdisciplinary" subject studied included qualifications that are a mix of subjects across the sciences, social sciences and arts and humanities. "Science-led" subjects studied are joint qualifications that include one science subject, while "Social Science-led" subjects studied are joint qualifications that include one social science subject.

"Russell Group" institutions are a lobbying group of large, research-led universities and include the Universities of Oxford and Cambridge, University College London, Imperial College London and the University of Manchester (for the other members see: www.russellgroup.ac.uk). "Pre-1992" institutions are universities established before 1992. "Post-1992" institutions are mainly former polytechnics and colleges of higher education that were awarded university status after 1992. A "specialist" institution is a higher education institution that is usually small in size with only a limited range of subjects (or a single subject such as music or art).

Table 2 reports the estimates of the migration equations. Column (1) are probit estimates where the dependent variable is dummy coded 1 if the graduate was employed outside of Scotland six months after graduation and 0 if they were employed in Scotland (i.e. they had moved to England, Northern Ireland or Wales or abroad).These estimates suggest that the probability of moving is higher for men, for those who studied full-time, for those with a self-reported disability, and for those who report a non-white ethnicity. There is clear gradient with respect to award classification. More specifically those who received their qualifications with a 1st class classification have a high probability of moving. On the other hand, those who received their qualification with a 3rd class of below classification have a lower probability of moving. Those who received a qualification that uses a different award classification system have a much lower probability of moving. There are differences across subjects studied. Those who received Social-science-led and Interdisciplinary qualifications have a higher probability of moving compared to those who received Arts and Humanities qualifications. Those who received Science qualifications have a higher probability of moving compared to those who earned Arts and Humanities qualifications. Type of institution attended is also important with those who studied at a Russell Group university have a higher probability of moving. Those who studied at a Post-1992 university or a Specialist institution have a lower probability of moving. The impact of age at graduation is non-linear. Those who graduated before the age of 25 or after the age of 30 have a lower probability of moving. Finally, the probability of moving declined slightly across the period covered by this data, as suggested by the more negative coefficients for the more recent graduation cohorts.

The estimates suggest that migration is a selective process. Almost all the variables are statistically significant at conventional threshold levels. However, it is not clear how “big” these

effects are in a substantive sense. One way to illustrate the magnitude of these effects is to use the estimates to "predict" the probability of moving based on a set of specific characteristics and compare this to the average probability. As was discussed above, the "average" probability of moving is 8.0%. The estimates indicate that the predicted probability is 24.7% for a white, non-disabled, male, who studied full-time and graduated below the age of 25 with a 1st class science qualification from a Russell Group university. For this hypothetical individual, the propensity to migrate is more than three times the average.

<<<< Table 2 About Here >>>>

Table 2 also reports estimates of a multi-nomial probit that distinguishes between national and international movers. Column (2) shows the coefficients for national movers and Column (3) shows the cofficients for international movers. Most of the effects are in the same direction as suggested by the movers/non-movers probit [Column (1)], but the magnitudes of these effects are generally not the same for the two types of movers. For example, while males compared to females have a higher probability of moving, the effect of gender is larger on the probability of movinginternationally compared to moving nationally. As a general remark, however, the effects of these factors are more pronounced on the probability of moving nationally. A comparison of the absolute values of the coefficients in Columns (2) and (3) reveal that the largest values are usually associated with moving nationally. This difference can be illustrated with reference to the hypothetical individual considered above. As shown in Table 1, the "average" probability of moving nationally is 5.6% while the probability of moving internationally is 2.4%. The estimates indicate that the predicted probability of moving nationally is 19.1% for a white, non-disabled, male, who studied full-time and graduated below the age of 25 with a 1st class science qualification from a Russell Group university. For an individual with

the same characteristics, the predicted probability of moving internationally is 5.4%. In other words, for this hypothetical individual, the propensity to migrate nationally is nearly three and half times the average while the propensity to migrate internationally is only slightly above two times the average.

<<<< Table 2 About Here >>>>

Table 3 reports the estimates of the graduate-job equations.Columns (1)–(3) are standard probit regression equations where the dependent variable is a dummy variable coded ”1” if the graduate is employed in a graduate-job and coded ”0” if employed in a non-graduate job six months after graduation based on the Elias-Purcell definition of graduate employment. Column (1) is a specification that does not include any migration variables—the variables are the same as those included in the migration equations. The estimates suggest that men compared to women have a lower probablity of being in graduate employment. Those who studied full-time and have a self-reported disability also have a lower probablity of being in graduate employment. Somewhat surprisingly, theethnicity variable is not statistically signficant.Inidividuals who received their qualifications with a 1st class classification have a higher probability of being in graduate employment. The “other classification” category is associated with a lower probability of graduate employment. Those who studied sciences have a higher probability of being in graduate employment. It is interesting to note that those who studied social sciences or interdisciplinary subjects have a lower probability of being in graduate employment compared to those who studied arts and humanities subjects. There is no difference between the probability of being in graduate employment between those who studied Pre-1992 universities and Russell Group universities. The probability is lower for those who studied at Post-1992 universities and specialist institutions. An older age at graduation is associated with a higher probability of

graduate employment. Finally, the probability of graduate employment in higher in the two most recent graduation cohorts.

<<<< Table 3 About Here >>>>

Again the magnitude of these effects can be illustrated by "predicting" the probability of being in a graduate-jobbased on a set of specific characteristics and comparing this value to the average. As shown in Table 1, the "average" probability of being in a graduate-job is 67.6%. The estimates given in Column (1) in Table 3 indicate that the predicted probability of being in a graduate-job is 82.5% for a white, non-disabled, male, who studied full-time and graduated below the age of 25 with a 1st class science qualification from a Russell Group university. This is around 22 per cent higher than the average.

The remaining regression equations summarised in Table 3 include migration variables in the specification. Column (2) shows the estimates that include a mover/non-mover dummy while Column (3) shows the estimates that include two dummy variables that distinguish national and international movers. It is interesting to note that the estimates of the other included variables change little after these migration variables are included. The estimates indicate that the probability of being in a graduate-job is much higher for those who have moved. Based on the estimates given in Column (2), and setting the othervariables at their sample means, the predicted probability of being in graduate-employment for movers is 82.5%.Based on the estimates given in Column (3), the predicted probability of being in graduate-employment for national movers is 84.1% and 79.0% for international movers. These values are much higher than the predicted probability for non-movers of 66.2%.There is little doubt that there is a strong positive correlation between the probability of being in graduate employment and the probability of moving even after other variables are controlled for in a statistical manner.

These regressions provide no information about the causal relationship between the two. It is assumed that migration decisions are exogenous with respect to employment decisions. For reasons discussed above, this seems unlikely. In order to explore the potential endogeneity of migration a bi-variate probit model is used to implement an instrumental variables (IV) estimation strategy (see Greene, 2011). The problem can be thought of as a two equation system consisting of a binary employment (graduate-job) equation and a binary migration equation. In order to identify the employment equation, a variable that has high explanatory power must be included in the migration equation but not included in the employment equation (the so-called "identifying instrument"). At the same time, this variable should also have no explanatory power if it was included in the employment equation.

Given human capital factors are central to both migration and employment decisions, choosing an approporiate identifying instrument is a non-trivial task. The approach followed here uses "state dependence" to create the identifying instrument. It is often noted that individuals who have experienced an event in the past are more likely to experience the event in the future than are individuals who have not experienced the event (see Heckman, 1981). There is a considerable amount of state dependence in migration behavior with individuals who have moved in the past having a higher probability of moving in the future, even after other factors correlated with migration behaviour are held constant.

Faggian, McCann and Sheppard (2007a)find that graduates who have already migrated to enter higher education are more likely to migrate after graduation to enter employment. They argue that those exhibiting a previous willingness to migrate are individuals for whom mobility imposes lower psychological and other costs. This suggests that graduates who "moved tostudy" should have a higher probability of moving after they graduate, suggesting a form of state

dependence amongst graduates relating to migration behaviour. We believe that using this state dependence can be used to address the casual nature of the relationship between migration and graduate employment.

For administrative purpose, Scotland has been divided up into 32 Council Areas, which are basically local governments. In order to create a "moved to study" variable, these council areas were grouped into six larger regions based around the country's five main population centres and a residual "remote region". The regions are(1)Aberdeen-Grampian; (2) Edinburgh-Lothian-Fyffe; (3) Glasgow-Strathclyde region; (4) Falkirk-Stirling-Central Scotland; (5) Dundee-Tayside; and (6) North-South remote areas.We believe that this breakdown is meaningful since these regions all contain higher education institutions and are combinations of local labour markets, travel-to-work areas, housing markets and health boards (see Leishman et al., 2008).Based on these regions, a dummy variable was created coded "1" if the graduate's region of domicile was not the same as their region where the HEI they studied was located. It was coded "0" if the regions were the same. This "moved-to-study" dummy was used as the identifying instrument (i.e. included in the migration equation but not the graduate-job equation).

Based on this definition, about 39.3% of graduates had moved to study. Including this moved to study dummy in the migration equations discussed above,leads to a sizeable and statistically significant improvement in goodness-of-fit. However, including the moved to study dummy in the graduate-job equation leads to only a small improvement in goodness-of-fit. In fact, there is very little difference in the graduate-job rate between those who moved to study andthose who did not. The graduate-job rate for those who did not move to study is slightly higher at 67.9% compared to 67.2%for those who did move to study, although this difference is

not statistically significant. Based on this information, we conclude that moved-to-study is a good instrument.

Column (4) in Table 3 reports the bi-variate probit estimates that attempt to treat migration status as endogenous. From Column (2) the point estimate of the mover variable is 0.569 with a Z-statistic of 26.3, suggesting a highly significant effect. From Column (4) the point estimate of the "instrumented"mover variable is in fact larger at 0.751 but the Z-statistic is smaller at 6.3, but still statistically significant below the 1% threshold level. If we assume that the move-to-study instrument is valid, this finding is consistent with the view that graduates are moving away from Scotland in order to find jobs more suited to their skills. In other words, this finding is consistent with the view that under-employment is a key factor in explaining the sizeable out-migration flow of Scottish-domiciled higher education graduates.

(5) Concluding Comments

The analysis carried out in this paper has documented a strong positive statistical relationship between the probability of migrating and the probability of having a graduate-job. That is, graduates of Scottish higher education institutions, who completed their secondary schooling in Scotland, are more likely to be in graduate employment six months after graduation if they leave Scotland. The difference in the graduate-job rate between those who stay and those who leave is large. It remains large even after statistical methods are used to control for other factors that likely influence the relationship. In addition, the analysis does not provide evidence contrary to the view that the relationship is casual. That is, this paper provides evidence in support of the contention that over-education and under-employment is a problem in Scotland, with a large number of graduates leaving because they cannot find jobs that utilise the skills they obtained through higher education.

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Figure 1
Higher Education Age Participation Index
Scotland, 1983/84 to 2009/10

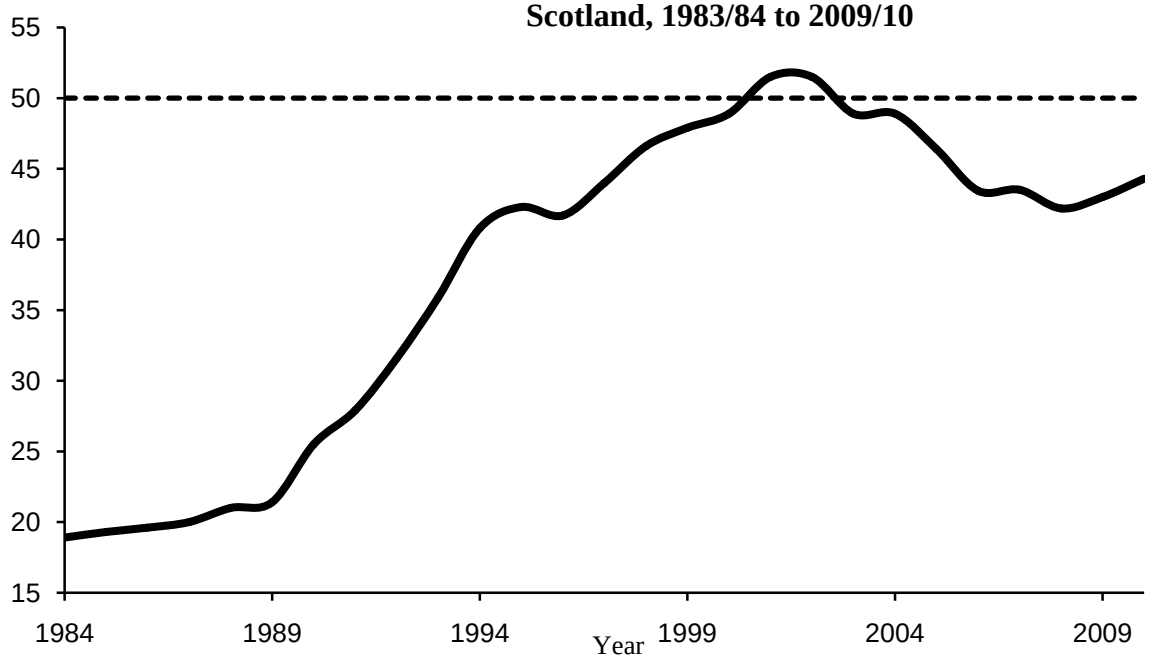
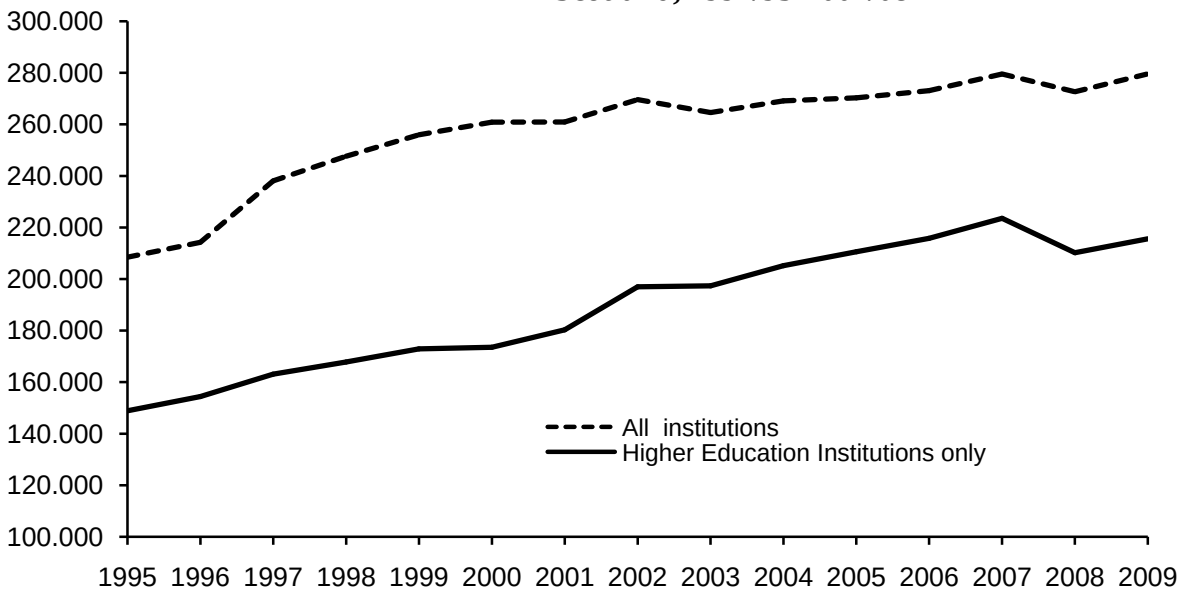


Figure 2
Number of Higher Education Students
Scotland, 1994/95-2007/08



Source: Higher Education Statistical Agency/Scottish Government

Table 1
Descriptive of Regression Variables

Variable	Definition	%
Employment:		
GradJob	Employed in a graduate-job 6 months after graduation =1; Otherwise=0	67.6
Migration:		
Mover	Employed outside of Scotland six months after graduation=1; Otherwise=0	8.0
National mover	Employed in England, Northern Ireland or Wales six months after graduation=1; Otherwise=0	5.6
International mover	Employed outside the UK six months after graduation=1; Otherwise=0	2.4
Gender:		
Male	Gender: Male=1; Female=0	36.7
Mode of Study:		
Full-time	Studied on full-time basis=1; Studied on a part-time basis=0	84.0
Disability Status:		
Disabled	Disability status: Disabled=1; Otherwise=0	5.6
Ethnicity:		
Ethnicity non-white	Ethnicity: Non-white=1; Otherwise=0	2.8
Award Classification:		
1st class	Qualification obtained with "First class honours"=1; Otherwise=0	6.6
2.1 class	Qualification obtained with "Second class, upper division honours" =1; Otherwise=0	26.7
2.2 class	Qualification obtained with "Second class, lower division honours" (reference category)	16.9
3rd class and below	Qualification obtained with "Third class honours" or below=1; Otherwise=0	36.6
Other classification	Qualification obtained with "Other" classification =1; Otherwise=0	13.3
Subject Studied:		
Science	Studied science subject(s)=1; Otherwise=0	51.5
Science-led	Joint qualification with science subject=1; Otherwise=0	2.2

Social Science	Studied social science subject(s)=1 Otherwise=0	23.7
Social Science-led	Joint qualification with social science subject=1; Otherwise=0	1.8
Arts and Humanities	Studied arts and humanities subject(s) (reference category)	17.7
Interdisciplinary	Interdisciplinary programme=1; Otherwise=0	3.0
Type of Institution Attended:		
Russell Group university	Institution is a member of the "Russell Group" =1; Otherwise=0 (see text)	16.6
Pre-1992 university	Institution was a university prior to 1992 (reference category)	37.1
Post-1992 university	Institution became a university after 1992=1; Otherwise=0	41.0
Specialist institution	A specialist HEI institution=1; Otherwise=0	5.3
Age at Graduation:		
Age at graduation < 25	Age at graduation less than 25 years (reference category)	65.7
Age at graduation 25-29	Age at graduation greater than 24 but less than 30 years=1; Otherwise=0	10.1
Age at graduation 30+	Age at graduation greater than 30 years=1; Otherwise=0	24.2
Graduation Cohort:		
2002/03 cohort	2002/03 graduate cohort (reference category)	20.1
2003/04 cohort	2003/04 graduate cohort=1; 0therwise=0	20.4
2004/05 cohort	2004/05 graduate cohort=1; 0therwise=0	16.6
2005/06 cohort	2005/06 graduate cohort=1; 0therwise=0	21.8
2006/07 cohort	2006/07 graduate cohort=1; 0therwise=0	21.2
Notes: Sample size is 65,477		

Table 2
Probit and Multi-nomial Probit Regression Estimates of the Probability of Moving Six Months after Graduation
Scotland-domiciled students studying in Scotland
Undergraduate Graduates, 2002/03-2006/07 HEI Graduate Cohorts

	(1)	(2)	(3)
Estimator?	Probit	Multi-nomial Probit	
Variables:	Mover	National mover	International Mover
Male	0.138	0.148	0.278
	[9.1]	[6.3]	[9.0]
Full-time	0.150	0.241	0.084
	[4.8]	[5.0]	[1.2]
Disabled	0.074	0.104	0.098
	[2.4]	[2.2]	[1.5]
Non-white ethnicity	0.128	0.252	-0.070
	[3.1]	[4.2]	[0.7]
1st class	0.397	0.616	0.337
	[13.5]	[13.7]	[5.7]
2.1 class	0.166	0.236	0.191
	[7.6]	[6.9]	[4.5]
3rd class and below	-0.052	-0.042	-0.129
	[2.3]	[1.2]	[2.8]
Other classification	-0.221	-0.262	-0.425
	[6.6]	[5.2]	[5.3]
Science	0.128	0.372	-0.260
	[6.1]	[11.1]	[6.3]
Science-led	0.128	0.316	-0.088
	[2.7]	[4.3]	[0.9]
Social Science	0.005	0.060	-0.067
	[0.2]	[1.6]	[1.5]
Social Science-led	0.357	0.258	0.660
	[7.7]	[3.2]	[8.7]
Interdisciplinary	0.368	0.620	0.280

	[7.3]	[7.9]	[2.8]
Russell group university	0.107	0.108	0.193
	[5.5]	[3.6]	[5.2]
Post-1992 university	-0.268	-0.332	-0.436
	[14.8]	[11.9]	[11.0]
Specialist institution	-0.189	-0.173	-0.468
	[4.7]	[2.9]	[4.8]
Age at graduation 25-29	0.046	0.079	0.011
	[1.8]	[2.1]	[0.2]
Age at graduation 30+	-0.341	-0.437	-0.536
	[13.1]	[11.0]	[8.9]
2003/04 cohort	0.001	0.027	-0.059
	[1.8]	[2.1]	[0.2]
2004/05 cohort	-0.045	-0.051	-0.074
	[1.9]	[1.4]	[1.5]
2005/06 cohort	-0.054	-0.077	-0.053
	[2.3]	[2.2]	[1.1]
2006/07 cohort	-0.070	-0.124	-0.019
	[3.0]	[3.4]	[0.4]
Constant	-1.571	-2.593	-2.560
Log likelihood	-17,186.5	-20,142.3	
Pseudo R^2	0.06	--	
N	65,477		
Notes: (1) Ratio of coefficient to its standard error in parentheses			

Table 3
Probit and Bi-variate Probit Regression Estimates of the Probability of Being in a Graduate Job Six Months After Graduation
Scotland-domiciled students studying in Scotland
2002/03-2006/07 HEI Graduate Cohorts

	(1)	(2)	(3)	(4)
Estimator?	Probit	Probit	Probit	Bivariate probit
Migration endogenous?	NA	No	No	Yes
Male	-0.128	-0.138	-0.137	-0.141
	[11.5]	[12.3]	[12.3]	[12.4]
Full-time	-0.280	-0.285	-0.286	-0.287
	[14.0]	[14.3]	[14.3]	[14.4]
Disabled	-0.106	-0.113	-0.113	-0.114
	[4.7]	[5.0]	[5.0]	[5.0]
Non-white ethnicity	-0.028	-0.037	-0.039	-0.040
	[0.9]	[1.1]	[1.2]	[1.3]
1st class	0.517	0.482	0.480	0.467
	[20.4]	[18.9]	[18.8]	[17.1]
2.1 class	0.144	0.130	0.129	0.124
	[9.1]	[8.2]	[8.2]	[7.7]
3rd class and below	0.111	0.114	0.113	0.115
	[7.0]	[7.1]	[7.1]	[7.2]
Other classification	-0.163	-0.155	-0.156	-0.152
	[7.9]	[7.5]	[7.5]	[7.3]
Science	0.459	0.452	0.450	0.448
	[30.3]	[29.8]	[29.6]	[28.8]
Science-led	-0.014	-0.027	-0.029	-0.032
	[0.4]	[0.7]	[0.8]	[0.9]
Social Science	-0.187	-0.191	-0.192	-0.192
	[11.5]	[11.7]	[11.7]	[11.8]
Social Science-led	-0.257	-0.303	-0.295	-0.316
	[6.7]	[7.8]	[7.6]	[7.9]
Interdisciplinary	-0.370	-0.392	-0.393	-0.399
	[10.4]	[11.0]	[11.0]	[11.1]
Russell group university	-0.025	-0.037	-0.036	-0.041
	[1.6]	[2.4]	[2.3]	[2.6]
Post-1992 university	-0.093	-0.074	-0.075	-0.068

	[7.3]	[5.8]	[5.9]	[5.0]
Specialist institution	-0.261	-0.250	-0.251	-0.245
	[10.3]	[9.9]	[9.9]	[9.6]
Age at graduation 25-29	0.406	0.407	0.406	0.405
	[21.4]	[21.3]	[21.3]	[21.2]
Age at graduation 30+	0.671	0.690	0.690	0.696
	[40.2]	[41.2]	[41.2]	[40.8]
2003/04 cohort	-0.037	-0.038	-0.038	-0.038
	[2.2]	[2.3]	[2.3]	[2.3]
2004/05 cohort	0.021	0.025	0.025	0.026
	[1.2]	[1.4]	[1.4]	[1.5]
2005/06 cohort	0.128	0.133	0.133	0.134
	[7.7]	[8.0]	[8.0]	[8.1]
2006/07 cohort	0.117	0.124	0.124	0.125
	[7.1]	[7.4]	[7.4]	[7.5]
Mover	--	0.569	--	0.751
	--	[26.3]	--	[6.3]
National mover	--	--	0.641	--
	--	--	[24.2]	--
International mover	--	--	0.427	--
	--	--	[11.9]	--
Constant	0.341	0.307	0.308	0.295
	[11.8]	[10.5]	[10.6]	[9.8]
Log likelihood	-37,375.3	-37,007.1	-36,995.1	-54,106.7
Pseudo R^2	0.09	0.10	0.10	--
N	65,477			

Notes:
(1) Ratio of coefficient to its standard error in parentheses