

Which sectors and occupations use more immigrant labour and what characterises them? A quantitative analysis

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Abstract

In this paper we use the Labour Force Survey to examine the sectors and occupations in the UK labour market that make greater use of migrant labour and their characteristics. Particular focus is given to characteristics that might indicate 'reliance' on migrant labour, such as whether high immigrant sectors and occupations are characterised by lower wages, wage growth or lower levels of training of existing workers. Whether such factors are associated with high levels of migrant use in certain sectors is of policy interest, for example in the Migration Advisory Committee's consideration of whether it is sensible for certain occupations to be included on the shortage occupation list within the UK's Points Based System. We find the concept of reliance to be problematic when applied in practice: those classified as 'reliant' vary considerably according to the definition used. We tentatively suggest that it is unlikely that the differential characteristics of immigrants and natives are a major reason for differential use of immigrants among sectors and occupations. We also find no strong or straightforward relationships between aggregate characteristics of labour markets in sectors or occupations and their use of immigrant labour.

¹ This analysis was conducted in-house by the Migration Advisory Committee Secretariat as part of the committee's research programme. An earlier output from this analysis was published as a chapter in Anderson, B. and Ruhs, M. (2010) *Who needs migrant workers? Labour shortages, immigration, and public policy*. Oxford University Press. We owe thanks to Prof. Jonathan Wadsworth for his input.

Background

Since the end of the recession of the early 1990s, immigration to the UK has increased. Inflows of long-term migrants² have exceeded outflows since 1994, and the stock of working-age immigrants (defined as foreign-born) has correspondingly risen from around 7.5 per cent of the population in 1993 to 13 per cent in 2008. At the same time, there has been increasing focus in both public policy debates and the research literature on the role that immigrants play in the labour market. Empirical evidence from the UK to date suggests that, at an aggregate level, immigration has not resulted in significant undercutting of wages or displacement of native workers (see, for example, Dustmann *et al.*, 2008a; Reed and Latorre, 2009). But there is some evidence of small negative effects at the lower end of the wage distribution (Dustmann *et al.*, 2008b) and in certain lower skill occupations (Nickell and Saleheen, 2008). Such studies have sought to unpick the impact of the influx of immigrants on the UK labour market over the last 20 years. But less statistical attention has been given to exactly where immigrants are found in the labour market, and what distinguishes those parts of the labour market that have made greater use of migrant labour from those that have made less use.

In this context the Migration Advisory Committee (MAC) was tasked by the UK Government to advise “where skilled shortages exists that can sensibly be filled by migration”. This advice determines a list of ‘shortage occupations’ into which it is easier for employers to recruit an immigrant from outside the European Economic Area (EEA). The Committee set out a framework comprising three tests: skilled, shortage and sensible (Migration Advisory Committee, 2008). Occupations are assessed under each of the tests through a combination of economic analysis and consultations with employers, unions and other organisations. The first two tests, those of skill level and labour

² Defined in the International Passenger Survey as foreign-born intending to change their usual place for residence for 1 year or more.

shortage, though complex issues in themselves, may be conceptualised independently of immigration. But the question of “sensible” requires the MAC to take account of the wider impacts of facilitating immigration for certain occupations. These impacts may include whether immigration is associated with downward pressure on wages in a given sector or occupation, or if it coincides with fewer incentives to train native workers. In this context it is useful to examine what characterises the sectors and occupations that have made more use of immigration in the past and, more specifically, whether immigration is associated with any of these incentives.

Concepts

To address policy issues described above, this paper examines the pattern of immigrant employment across the UK labour market by industry sector and occupation units. We suggest two potential sets of reasons as to why this differentiation might occur, which sets the framework for the analysis in this paper.

First, the differential distribution of immigrants may simply be the result of the composition of the migrant workforce vis-à-vis the native workforce, reflecting the extent to which certain sectors and occupations require characteristics that are more common in migrants than they are in natives, or vice-versa. For example, if immigrants are twice as likely to possess the skills or qualifications needed to be engineers than natives, then the proportion of immigrants employed in engineering occupations may rise as the immigrant labour force grows and vacancies arise and are filled. Similarly, if migrants predominantly enter the labour market at a certain skill level, they may be more represented in industries and occupations requiring a greater share of labour at that skill level. Such a compositional effect might be expected to be particularly significant in the short run. Immigrants may also differ from natives in their expectations in the labour market. They may accept lower wages in comparison to similarly skilled natives. One suggested reason for

this is if immigrants' reservation wages are set in relation to purchasing power in their home country rather than in the UK, as a result of migrants' intention to return home or remit some of their wages. Employers may also have a preference for migrant labour: Anderson *et al.* (2006) find that subjective factors such as "work ethic" are often cited by employers as reasons for employing immigrants.

Second, the availability of immigrant labour may potentially have dynamic impacts on the labour market. A basic model sees wages in a given sector fall in response to increasing labour supply. But once skill levels of immigrants and natives are accounted for, the wage response may be expected to vary across the skill gradient. If immigrants are a substitute for natives in a given sector, wages may not rise as quickly as they might otherwise have done. Likewise, incentives to invest in training or capital equipment may be reduced. Alternatively, immigrants may bring skills that are complementary to natives in a given sector, leading to increased productivity and higher wages.

A common notion is that certain sectors or occupations are 'reliant' on immigrant labour. The concept of 'reliance' is not straightforward, but may be thought of as comprising two elements. The first is that an occupation or sector exhibits a high use of migrants in comparison to other sectors (or increasing use in comparison to earlier time periods). But reliance means more than simply high use of immigrants. The second element is that high use is somehow built-in – i.e. there are factors that act to continue or increase immigrant use into the future. This could be because certain factors outside employers control make it difficult to reduce the use of immigrant labour. Alternatively, the use of immigrants may alter labour markets (for example by increasing labour productivity) in such way that it becomes uneconomical for any single employer in a competitive market to reduce their use of migrants. Reduced pay (or pay growth) could potentially be one such labour

market adjustment, and reduced investment in training (a part of the labour cost) may potentially be another.

We limit the scope of this analysis in that, although our analysis is informed by economic theory, at this stage we do not attempt to construct or test an explicit economic model. Rather, we take a more descriptive approach, to examine whether that data show any associations between factors we expect to play a role use of migrant labour. This provides an assessment of the extent to which such characteristics may be associated with industry and occupational use of immigrant labour, but does not at this stage attempt to establish causal relationships or test micro-level theory. Table 1 sets out the variables that we considered to be potentially associated with immigrant use.

Table 1: Variables tested for associations with migrant use by occupation and sector

| Variables | Reasons for inclusion |
|--|--|
| Skill level | Theory and some empirical evidence suggests that the impact of immigration on labour market will vary by skill level. |
| Gender / age distribution | Demographic composition of the sector or occupation varies. |
| Region | Immigration and industrial structure vary geographically |
| Pay | Economic theory suggests an impact on pay, depending on the degree to which immigrants are substitutes for natives. |
| Job-related training | Fewer incentives to train manifested in lower than average levels of training, could be associated with higher immigrant use. |
| Employee turnover | Higher immigrant use may be associated with high employee turnover. |
| Incidence of part-time working & self-employment | Differences in working patterns in occupations and industry sectors may affect the way factors such as pay and shortages affect immigrant use. |

Some other factors such as the use of agencies and the measures of labour shortage may also be added to this list. We limit the analysis in this paper to characteristics where suitable and relatively unproblematic proxies are easily available in the Labour Force Survey (LFS). The LFS is a survey of people rather than establishments so any firm-level factors are also omitted.

Method

We use three 4-quarter cross sections of data from the Labour Force Survey (LFS) to estimate the extent of migrant use by occupation and industry sector in 1994, 2002 and 2008. Two measures of immigrant use were employed. The first was the share of immigrants in the stock of workers employed in an occupation or industry sector. The second was the change in those shares between each of the cross sections. Immigrants may be defined in LFS data by country of birth, nationality and by year of arrival in the UK. The analysis primarily defined immigrants as those not born in the UK, but we also tested some of the findings for those born outside the EEA.³

The occupation and industry sector in which an individual works is recorded in the data according to official classifications. The Standard Industrial Classification, SIC 92, spans LFS data between 1994 and 2008. The Standard Occupational Classification, SOC 2000, was introduced in the LFS in 2002, so we look at changes in immigrant shares by occupation between 2002 and 2008 only. For estimates of migrant shares, we defined industry sectors at the division (or 2-digit) level and occupations at the minor group (or 3-digit) level. The industry sector breakdown therefore comprises approximately 67 categories (some are not used in earlier years) and the occupation 81 categories. Both classifications offer more detailed breakdowns, but these more aggregated levels permit acceptable standard errors around point estimates of immigrant use.⁴

The three cross sections were chosen to capture periods with different economic and immigration circumstances (Table 2). Changes in shares were calculated by comparing shares in each cross section; analysis of industry sector and occupation characteristics was repeated for each cross section.

³ In addition to being a subset of particular interest for immigration policy this definition excludes the large inflow of migrants from the so-called “A8” countries: the eight central and eastern European countries that joined the EU in 2004.

⁴ Standard errors are within +/- 3 percentage points of the share.

The different circumstances in each cross section present problems when attempting to identify characteristics associated with immigrant use, as different economic and immigration contexts may alter the role that such characteristics could have in sectors and occupations.

Table 2: Summary of UK economic and immigration context 1994, 2002 and 2008

| | Economic context | Immigration context |
|------|---|--|
| 1994 | Emerging from recession; unemployment falling | Low stocks, small net inflows |
| 2002 | Stable economic growth; low unemployment | Increasing stocks and high net inflows |
| 2008 | Economy entering recession, unemployment increasing | High but stabilised stocks and net inflows |

In line with our conceptual approach, the analysis was conducted in two parts. First, we examined whether the differences in the composition of migrant and native workforces, with respect to certain characteristics, might be a potential explanation for why more migrants are found in some industry sectors and occupations than others. A probit regression was used to examine whether these compositional characteristics explain immigrant use. In other words, we tested whether controlling for these characteristics altered the probability of finding an immigrant in either high or low immigrant utilisation industry sectors or occupation (defined as top 10 and bottom 10 sectors/occupation in terms of immigrant use).

The second part of the analysis aggregated the controls to the industry sector and occupation level. We examined bi-variate relationships between the independent variables of interest and immigrant use. Linear regressions at the industry sector and occupation level across all three cross sections were then used to further examine these relationships.

Results

Identifying high use sectors and occupations

Table 3 shows the industry sectors with the highest shares of immigrant labour in each time period. Six of the industry sectors in the top 10 are consistent across all three cross sections: mining of metal ores; clothing and fur manufacture; hotels and restaurants; private households; air transport and computer related activities.

Table 3: Top 10 industry sectors by share of non-UK born for the periods: 1994, 2002 and 2008

| Rank | 1994 | 2002 | 2008 |
|------|---|---|---|
| 1 | 13: mining of metal ores (43%) | 13: mining of metal ores (39%) | 18: clothing, fur manufacture (28%) |
| 2 | 18: clothing, fur manufacture (21%) | 18: clothing, fur manufacture (19%) | 13: mining of metal ores (25%) |
| 3 | 62: air transport (17%) | 55: hotels, restaurants (16%) | 55: hotels, restaurants (23%) |
| 4 | 55: hotels, restaurants (15%) | 72: computer, related activities (15%) | 37: recycling (22%) |
| 5 | 95: private households with employees (14%) | 73: research, development (14%) | 95: private households with employees (21%) |
| 6 | 16: tobacco products manufacture (12%) | 95: private households with employees (13%) | 15: food, beverage manufacture (21%) |
| 7 | 34: motor veh, trailer, etc manufact. (10%) | 62: air transport (11%) | 72: computer, related activities (19%) |
| 8 | 72: computer, related activities (10%) | 11: oil, gas extractn etc. (10%) | 62: air transport (18%) |
| 9 | 32: radio, tv, communication (10%) | 74: other business activities (10%) | 63: other transport, travel (17%) |
| 10 | 85: health, social work (9%) | 85: health, social work (10%) | 73: research, development (15%) |

Note: Industry sectors defined at '2-digit' or division level in the Standard Industrial Classification (SIC) 92.

Table 4 repeats this for occupations, although we do not report migrant shares for 1994 as the LFS occupation data are not coded to SOC 2000 for that year.

Most occupations that show high shares in 2002 also show high shares in 2008. With the exception of food preparation trades, the top migrant shares in

2002 are all in higher skill occupations. But by 2008 a number of lower skill occupations such as elementary process and plant occupations, process operatives and elementary cleaning were ranked among the top migrant share occupations.

Table 4: Top 10 occupations by share of non-UK born, 2002 and 2008

| Rank | 2002 | 2008 |
|------|--|--|
| 1 | 221: health professionals (25%) | 913: elementary process plant (29%) |
| 2 | 232: research professionals (21%) | 221: health professionals (28%) |
| 3 | 543: food preparation trades (17%) | 543: food preparation trades (26%) |
| 4 | 122: managers in hospitality (16%) | 811: process operatives (25%) |
| 5 | 341: artistic and literary (16%) | 232: research professionals (21%) |
| 6 | 211: science professionals (15%) | 122: managers in hospitality (20%) |
| 7 | 213: info & communication technology (14%) | 213: info & communication technology (20%) |
| 8 | 321: health associate profs. (14%) | 211: science professionals (20%) |
| 9 | 322: therapists (14%) | 923: elementary cleaning (18%) |
| 10 | 111: corporate managers & senior (13%) | 321: health associate profs. (18%) |

Note: Occupations are defined at the '3-digit' minor group level in the Standard Occupational Classification (SOC) 2000

Next, we turn to our second measure of immigrant use: change in immigrant shares over time. Table 5 shows the top 10 sectors and occupations in terms of absolute change in migrant shares. This measure of immigrant use produces quite different results. At the sector level, the results are quite mixed and there is no clear pattern. Some occupations with relatively low initial shares have gained a considerable number of migrants between each time period. Other occupations with high shares have remained broadly stable. It is notable that the occupations that have increased their migrant shares the most over the period are largely (though not entirely) the lower-skilled occupations.

Table 5: Top 10 sectors and occupations by change in share of non-UK born, 1994 - 2008

| Rank | Industry 1994-2002 | Industry 2002-2008 | Occupation 2002-2008 |
|------|---|--|--|
| 1 | 23: coke, petrol prods, nuclear fuel (6.9%) | 37: recycling (21.8%) | 913: elementary process plant (17.9%) |
| 2 | 73: research, development (5.7%) | 15: food, beverage manufacture (13.3%) | 811: process operatives (16.5%) |
| 3 | 72: computer, related activities (4.6%) | 14: other mining, quarrying (9.4%) | 914: elementary goods storage (9.8%) |
| 4 | 11: oil, gas extractn etc (3.5%) | 18: clothing, fur manufacture (8.7%) | 923: elementary cleaning (9.6%) |
| 5 | 21: pulp, paper, paper prods manufact. (3.2%) | 95: private households with employees (8.2%) | 351: transport associate profs. (8.4%) |
| 6 | 33: medical, precision, optical (2.7%) | 63: other transport, travel (7.7%) | 543: food preparation trades (8.4%) |
| 7 | 65: financl intermediaries (2.5%) | 55: hotels, restaurants (7.3%) | 911: elementary agricultural (8.3%) |
| 8 | 51: wsale, commiss. Trade (2.5%) | 19: leather, leather goods manufact. (7.1%) | 813: assemblers and routine opera (7.6%) |
| 9 | 41: water collection, supply (2.4%) | 29: mach, eqt manufacture (7%) | 822: mobile machine drivers (7.4%) |
| 10 | 66: insurance, pensions (2.3%) | 62:air transport (6.8%) | 922: elementary personal service (7.2%) |

Explaining differences in immigrant use

First, we tested whether the differential composition of the immigrants and native workforce could explain the high and low shares of immigrants observed in the top and in the bottom share sectors respectively. The regression reported changes to the likelihood of finding an immigrant in a high/low immigrant share sector when controlling for age, gender, region, full-time/part-time working, self-employment, occupation (which encapsulates some measure of skills) and wage. By separating the top and bottom sectors, we allow for different effects at each end of the distribution. Results are given in Table 6.

Table 6. Summary of probit estimates of the chances of immigrants working in high and low immigrant share sectors, 2008

| | | | | | |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| High immigrant share industry | 0.115* (0.004) | 0.106* (0.004) | 0.113* (0.004) | 0.125* (0.006) | 0.108* (0.006) |
| Low immigrant share industry | -0.069* (0.006) | -0.067* (0.007) | -0.067* (0.007) | -0.067* (0.007) | -0.046* (0.004) |
| Control variables | | | | | |
| Occupation | No | Yes | Yes | Yes | Yes |
| Part-Time | No | No | Yes | Yes | Yes |
| Self-Employed | No | No | Yes | Yes | Yes |
| Pay | No | No | No | Yes | Yes |
| Age | No | No | No | No | Yes |
| Region | No | No | No | No | Yes |
| Gender | No | No | No | No | Yes |

Notes: coefficients are marginal effects and they measure the percentage point difference (divided by 100) of an immigrant working in the given sector relative to the mean. Robust standard errors in brackets. * denotes statistically significantly different from zero at 95% confidence level. Sample size: 205,497.

Source: LFS.

The coefficients describe the relative probability of finding an immigrant working (defined as non-UK born) in the high immigrant share industries and low immigrant share industries. The coefficients for the high immigrant share industries therefore show a higher probability than low share industries. If the independent variables are associated with some of the variation in immigrant utilisation, we would expect the reported coefficients to decrease for high immigrant share sectors and increase for low immigrant share sectors as more control variables are added. However, we find that when these controls for variables are added, the probability of finding an immigrant in a given sector does not alter very much. This implies little association between these individual characteristics and industry-level immigrant shares, by this measure. The exercise was repeated using change in immigrant shares, and for non-EEA immigrants, yielding similar results.

Next, we tested whether any aggregate factors at the sector level explained use of immigrants. When aggregating to the sector level, the number of data points is reduced so we look across the whole sector and occupation

classification rather than at the top and bottom sectors and occupations in terms of immigrant use. The independent variables of interest were plotted against our measures of immigrant use to see whether there were any relationships.

First, we looked at skill levels (see row I, Appendix 2). No clear bi-variate relationship between skill level and immigrant shares is observed at the sector level. The same is true for each cross section and when change in immigrant shares is our dependant variable. In 2002 (not plotted), across occupations migrant shares appear to be relatively well correlated with skill levels. However, in 2008 high immigrant shares (and changes in shares) are observed in both occupations with relatively high skill levels and those with relatively low skill levels, with no clear relationship. Occupations with intermediate skill levels have generally lower immigrant shares (and changes in shares).

For industry sectors, there appears to be no clear relationship between pay (rows III and IV, Appendix 2) and immigrant shares. Looking across occupations there is also no clear relationship between pay and migrant use in 2002. But in 2008, pay shows a similar if slightly less clear pattern to the measure of skill. High immigrant shares (and changes in shares) are observed in both relatively high paying and relatively low paying occupations in 2008, but not for occupations with intermediate pay levels.

Our measure of employee turnover (row II, Appendix 2) shows little relationship with immigrant use by occupation or industry sector. Training (row VI, Appendix 2) also shows little relationship with our measures of immigrant use by sector or occupation in any of the cross sections. One notable result among the other control dummies was that some of the very high immigrant share industry sectors are also heavily based in London and South East England. On closer inspection these included very specialised sectors such as extra-territorial organisations (e.g. diplomatic missions) and

air transport. Excluding these, little pattern is clear among industry sectors and occupations.

An OLS linear regression was performed with these independent variables together with other controls listed earlier (Appendix 3) using both measures of immigrant use: migrant shares and change in migrant shares. Overall, the models explained only a small proportion of variation in immigrant use. For industry sectors, using data across all three cross sections, only two of the independent variables yielded relatively large and significant coefficients: median hourly pay, and the skill level dummy (proportion of graduates in sector) which was related to immigrant shares. But although pay and skill level are relatively well correlated, their coefficients are opposite. This was also true when looking at change in shares. Excluding either variable from the model does not impact on the overall fit very much. The share in the public sector was also a relatively strong positive predictor of immigrant shares (but not change in shares). Some of the region dummies reported relatively large coefficients, but these were not significant.

For occupations, the independent variables explained more of the variation when 'immigrant use' was defined as change in migrant shares, than when defined as migrant shares. However, the results are more mixed. Higher levels of labour turnover show the largest coefficient, and lower levels of job-related training were also weakly associated with immigrant use. Pay is only strong explanatory variable for migrant shares, rather than change in shares.

Discussion

The descriptive analysis of immigrant shares showed that a considerable number of industry sectors and occupations maintained similar rankings in terms of their use of immigrants over the last 15 years or so. For some sectors, such as hotels and restaurants, and occupations, such as food preparation

trades, this relatively stable picture may simply be a function of the size of their workforce. But the same is true for some of the smaller sectors such as clothing manufacturing and private households, as well as for occupations such as research professionals. Many smaller sectors such as coal products and fishing have also remained at the bottom of the ranking in terms of immigrant shares. The consistency of the top and bottom ranking occupations in terms of migrant shares is perhaps not surprising, but it is important to recognise it is not simply a static picture: between each of our cross sections nearly all industry sectors and occupations have increased their use of immigrants in proportion to the size of their workforces. Some of the sectors and occupations that increased their shares between 1994 and 2002, and between 2002 and 2008, were those with a previously low immigrant usage. The magnitude of the changes over the periods in question is such that taking changes in shares as a measure of immigrant use gives a very different picture from the migrant share in any given year. The sectors that are considered 'high' users of immigrant labour depend to a considerable extent on the definition of immigrant use that is employed.

The analysis of the characteristics of sectors and occupations that make more or less use of immigrants has not yielded conclusive results for the characteristics we considered. The results do not support the conclusion that the different composition of workforces (in terms of factors such as occupational use, pay, part-time working, regions or gender) in industry sectors is a major explanation for their differential use of migrants. This may partly be due to the fact that many immigrants covered by the definition have been in the UK for a significant period of time, meaning the compositional differences between migrants and natives are not large. Looking at recent immigrants could yet yield some interesting results, although larger cross sections would be required to achieve sufficient numbers of recent immigrants in the sample. It also does not rule out the possibility that other 'softer' factors that we cannot measure such as employer preferences may

play a role in explaining greater use of immigrants in some sectors or occupations.

Aggregate-level analysis revealed some weak associations in terms of occupations, but less so in terms of sectors. Both skill levels and average pay appeared to be positively related to measures of immigrant use in the earlier cross sections. It is plausible that both simply reflect a pattern of higher immigrant use in higher-skill sectors determined by some other factor such as self-selection or selection through immigration policy. When looking at occupations, these factors are also important, probably because of the skill gradient built into the occupational classification. However, in 2008 a number of lower skill, lower pay occupations had increased their use of immigrant labour, with the result that little overall pattern is clear. Some of the highest increases in immigrant shares between 2002 and 2008 are observed in elementary process and plant occupations and process operatives. These are also occupations into which a large number of A8 nationals have registered to work since 2004 (Home Office, 2009). One possible reason for the change could be the influx of A8 immigrants in 2004, but this hypothesis is not supported as a similar pattern is also found in 2008 when looking at shares of non-EEA immigrants only. The regional distribution of sectors also appears to play some role in explaining use of immigrants in different industry sectors.

This analysis is only tentative and could be improved upon in a variety of ways. Analysis of first differences and allowing for compositional factors and aggregate sector or occupation level factors within one model may be worthwhile. Further theoretical work would be needed to test these characteristics within an explicit economic model.

Conclusions

The pattern of immigrant use has remained similar in some industry sectors and occupations in the UK labour market, particularly those with high numbers of immigrants in their workforce, but has changed considerably in others. Consequently, measures of change in immigrant use give a very different picture from that given by the absolute share that immigrants account for in the workforce.

Turning to the explanatory variables tested, we do not find that the different characteristics of migrants and natives distinguish the sectors and occupations that make high use of migrants from other parts of the labour market. Other factors we have not considered here, particularly at firm-level, may play a role and it is also plausible that the employment of immigrants is also the result of idiosyncratic or ephemeral factors. At an aggregate level, the different skill requirements of sectors and occupations (and associated pay levels) explains some of the variation in immigrant use by sector. But there may also be different effects operating at both high-pay/high skill and low-pay/low skill ends of the labour market. Our initial hypotheses that occupational or sectoral usage of immigrant labour may be associated with lower pay or levels of training do not appear to be corroborated by the data.

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Appendix 1: Migrant shares and changes in migrant shares, by industry and occupation, 1994, 2002 and 2008

| Industry | Share of non-UK born | | | Change in share | |
|--------------------------------------|----------------------|-------|-------|-----------------|-----------|
| | 1994 | 2002 | 2008 | 1994-2002 | 2002-2008 |
| 01:agriculture,hunting,etc | 0.022 | 0.039 | 0.065 | 0.017 | 0.026 |
| 02:forestry,logging etc | 0.036 | 0.029 | 0.013 | -0.007 | -0.016 |
| 05:fishing,fish farms, hatcheries | 0.014 | 0.006 | 0.055 | -0.008 | 0.049 |
| 10:coal,lignite mining, | 0.015 | 0.018 | 0.051 | 0.003 | 0.033 |
| 11:oil,gas extractn etc | 0.069 | 0.104 | 0.116 | 0.035 | 0.012 |
| 13: mining of metal ores | 0.434 | 0.391 | 0.250 | -0.043 | -0.141 |
| 14:other mining,quarrying | 0.030 | 0.047 | 0.141 | 0.017 | 0.094 |
| 15:food,beverage manufacture | 0.065 | 0.081 | 0.214 | 0.016 | 0.133 |
| 16:tobacco products manufacture | 0.125 | 0.001 | 0.038 | -0.124 | 0.037 |
| 17:textile manufacture | 0.086 | 0.086 | 0.152 | 0.000 | 0.066 |
| 18:clothing,fur manufacture | 0.207 | 0.193 | 0.280 | -0.014 | 0.087 |
| 19:leather,leather goods manufact. | 0.088 | 0.074 | 0.145 | -0.014 | 0.071 |
| 20:wood,straw,cork,wood prods(no | 0.038 | 0.024 | 0.077 | -0.014 | 0.053 |
| 21:pulp,paper,paper prods manufact. | 0.050 | 0.082 | 0.090 | 0.032 | 0.008 |
| 22:printing,publishing,recorded | 0.060 | 0.066 | 0.085 | 0.006 | 0.019 |
| 23:coke,petrol prods, nuclear fuel | 0.020 | 0.089 | 0.099 | 0.069 | 0.010 |
| 24:chemicals,chemical products m | 0.058 | 0.066 | 0.117 | 0.008 | 0.051 |
| 25:rubber,plastic products manufact. | 0.059 | 0.061 | 0.126 | 0.002 | 0.065 |
| 26:other non-metallic products m | 0.024 | 0.032 | 0.064 | 0.008 | 0.032 |
| 27:basic metals manufacture | 0.047 | 0.035 | 0.050 | -0.012 | 0.015 |
| 28:fabric-metal prod | 0.050 | 0.038 | 0.075 | -0.012 | 0.037 |
| 29:mach,eqt manufacture | 0.050 | 0.050 | 0.120 | 0.000 | 0.070 |
| 30:office machinery, computers | 0.088 | 0.078 | 0.114 | -0.010 | 0.036 |
| 31:elec machinery ,equipment | 0.065 | 0.064 | 0.125 | -0.001 | 0.061 |
| 32:radio, tv, communication | 0.099 | 0.084 | 0.101 | -0.015 | 0.017 |
| 33:medical,precision,optical | 0.042 | 0.069 | 0.111 | 0.027 | 0.042 |
| 34:motor veh,trailer,etc manufact. | 0.102 | 0.078 | 0.109 | -0.024 | 0.031 |
| 35:other transport eqt manufact. | 0.043 | 0.050 | 0.072 | 0.007 | 0.022 |
| 36:furniture etc manufacture | 0.057 | 0.064 | 0.104 | 0.007 | 0.040 |
| 37:recycling | 0.079 | 0.001 | 0.219 | -0.078 | 0.218 |
| 40:elec,gas,steam etc supply | 0.030 | 0.053 | 0.074 | 0.023 | 0.021 |
| 41:water collection, supply | 0.026 | 0.050 | 0.066 | 0.024 | 0.016 |
| 45:construction | 0.047 | 0.045 | 0.079 | -0.002 | 0.034 |
| 50:sales of motor vehicles, fuel | 0.039 | 0.059 | 0.061 | 0.020 | 0.002 |
| 51:wsale,commiss. Trade | 0.062 | 0.087 | 0.123 | 0.025 | 0.036 |
| 52:retail trade (not motor vehicle) | 0.067 | 0.074 | 0.105 | 0.007 | 0.031 |
| 55:hotels,restaurants | 0.148 | 0.157 | 0.230 | 0.009 | 0.073 |
| 60:transport by land, pipeline | 0.076 | 0.098 | 0.146 | 0.022 | 0.048 |
| 61:water transport | 0.068 | 0.091 | 0.142 | 0.023 | 0.051 |
| 62:air transport | 0.166 | 0.110 | 0.178 | -0.056 | 0.068 |
| 63:other transport, travel | 0.090 | 0.090 | 0.167 | 0.000 | 0.077 |
| 64:post,telecommunications | 0.058 | 0.080 | 0.105 | 0.022 | 0.025 |
| 65:financel intermediaries | 0.072 | 0.097 | 0.137 | 0.025 | 0.040 |
| 66:insurance,pensions | 0.050 | 0.073 | 0.091 | 0.023 | 0.018 |
| 67:other financial (not insurance | 0.055 | 0.061 | 0.104 | 0.006 | 0.043 |
| 70:real estate activities | 0.061 | 0.083 | 0.116 | 0.022 | 0.033 |
| 71:personal,hhld,mach,eqt rental | 0.063 | 0.064 | 0.070 | 0.001 | 0.006 |
| 72:computer,related activities | 0.101 | 0.147 | 0.192 | 0.046 | 0.045 |

| Industry | Share of non-UK born | | | Change in share | |
|--------------------------------------|----------------------|-------|-------|-----------------|-----------|
| | 1994 | 2002 | 2008 | 1994-2002 | 2002-2008 |
| 73:research,development | 0.082 | 0.139 | 0.154 | 0.057 | 0.015 |
| 74:other business activities | 0.084 | 0.102 | 0.145 | 0.018 | 0.043 |
| 75:public admin, defence | 0.055 | 0.060 | 0.076 | 0.005 | 0.016 |
| 80:education | 0.075 | 0.080 | 0.094 | 0.005 | 0.014 |
| 85:health,social work | 0.093 | 0.101 | 0.141 | 0.008 | 0.040 |
| 90:sanitation,sewage,refuse disposal | 0.042 | 0.040 | 0.071 | -0.002 | 0.031 |
| 91:membership organizations | 0.071 | 0.088 | 0.105 | 0.017 | 0.017 |
| 92:recreational,cultural,sporting | 0.081 | 0.083 | 0.093 | 0.002 | 0.010 |
| 93:other service activities | 0.066 | 0.069 | 0.096 | 0.003 | 0.027 |
| 95:private households with employees | 0.138 | 0.132 | 0.214 | -0.006 | 0.082 |

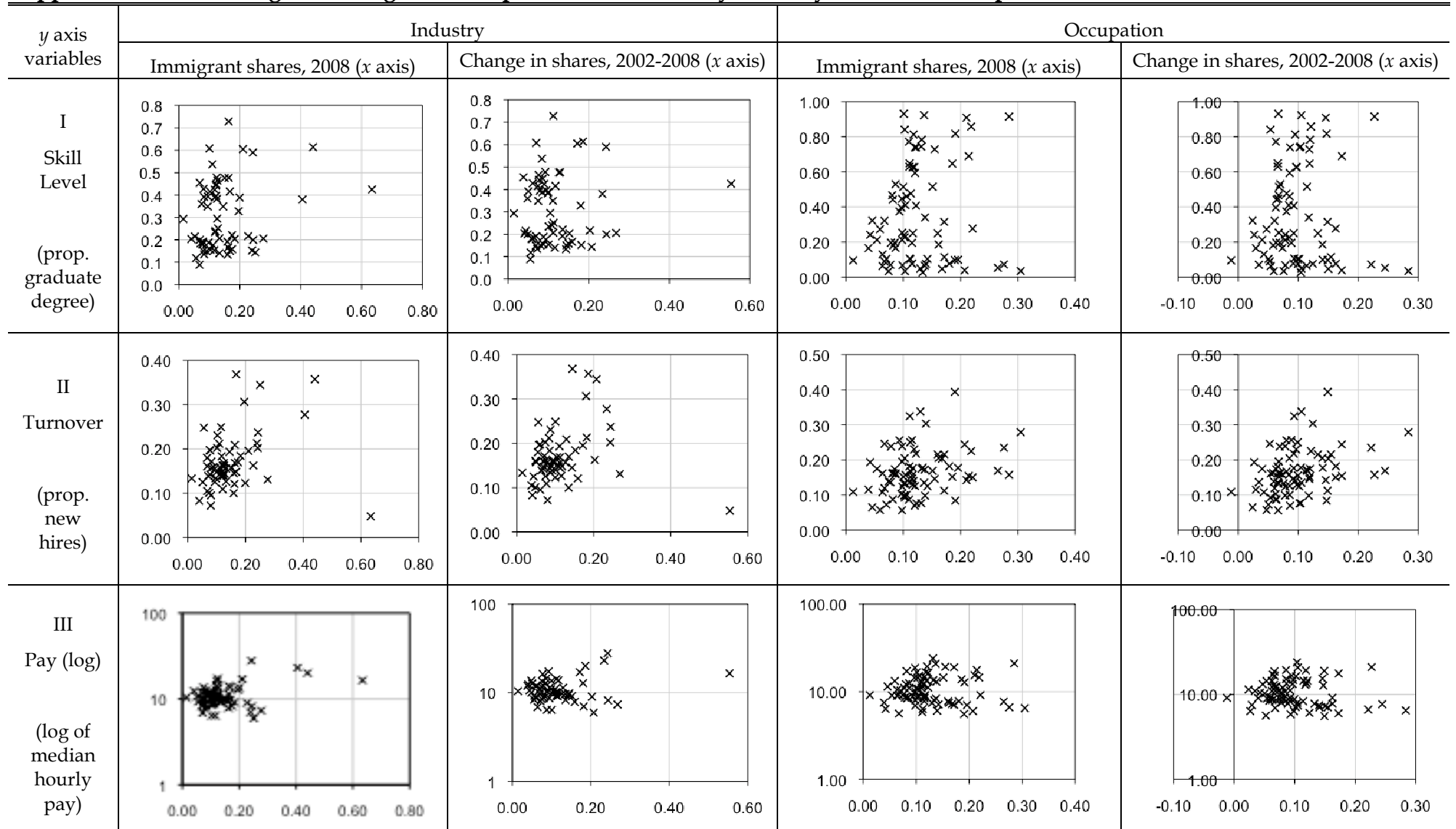
Source: Labour Force Survey, 1994, 2002 and 2008 4-quarter datasets

| Occupation (SOC 2000 Minor Group) | Share of non-UK born | | Change in share 2002-2008 |
|---|----------------------|-------|---------------------------|
| | 2002 | 2008 | 2008 |
| 111 corporate managers & senior | 0.128 | 0.11 | -0.018 |
| 112 production managers | 0.049 | 0.077 | 0.028 |
| 113 functional managers | 0.097 | 0.106 | 0.009 |
| 114 quality and customer care | 0.075 | 0.096 | 0.021 |
| 115 financial and office | 0.082 | 0.084 | 0.002 |
| 116 managers in distrib, storage | 0.079 | 0.09 | 0.011 |
| 117 protective service officers | 0.104 | 0.094 | -0.01 |
| 118 health and social services | 0.09 | 0.117 | 0.027 |
| 121 managers in farming | 0.038 | 0.041 | 0.003 |
| 122 managers in hospitality | 0.163 | 0.202 | 0.039 |
| 123 managers in other services | 0.103 | 0.126 | 0.023 |
| 211 science professionals | 0.147 | 0.195 | 0.048 |
| 212 engineering professionals | 0.081 | 0.107 | 0.026 |
| 213 info & communication technol | 0.142 | 0.197 | 0.055 |
| 221 health professionals | 0.251 | 0.278 | 0.027 |
| 231 teaching professionals | 0.087 | 0.094 | 0.007 |
| 232 research professionals | 0.205 | 0.213 | 0.008 |
| 241 legal professionals | 0.128 | 0.123 | -0.005 |
| 242 business & statistical profs. | 0.128 | 0.137 | 0.009 |
| 243 architects, town planners | 0.076 | 0.109 | 0.033 |
| 244 public service professionals | 0.113 | 0.115 | 0.002 |
| 245 librarians and related profs | 0.08 | 0.104 | 0.024 |
| 311 science and engineering tech | 0.059 | 0.096 | 0.037 |
| 312 draughtspersons & building inspectors | 0.076 | 0.099 | 0.023 |
| 313 it service delivery | 0.113 | 0.105 | -0.008 |
| 321 health associate profs. | 0.142 | 0.182 | 0.04 |
| 322 therapists | 0.135 | 0.091 | -0.044 |
| 323 social welfare assoc profs. | 0.096 | 0.091 | -0.005 |
| 331 protective service | 0.06 | 0.057 | -0.003 |
| 341 artistic and literary | 0.156 | 0.176 | 0.02 |
| 342 design associate profs. | 0.095 | 0.105 | 0.01 |
| 343 media associate profs. | 0.118 | 0.105 | -0.013 |

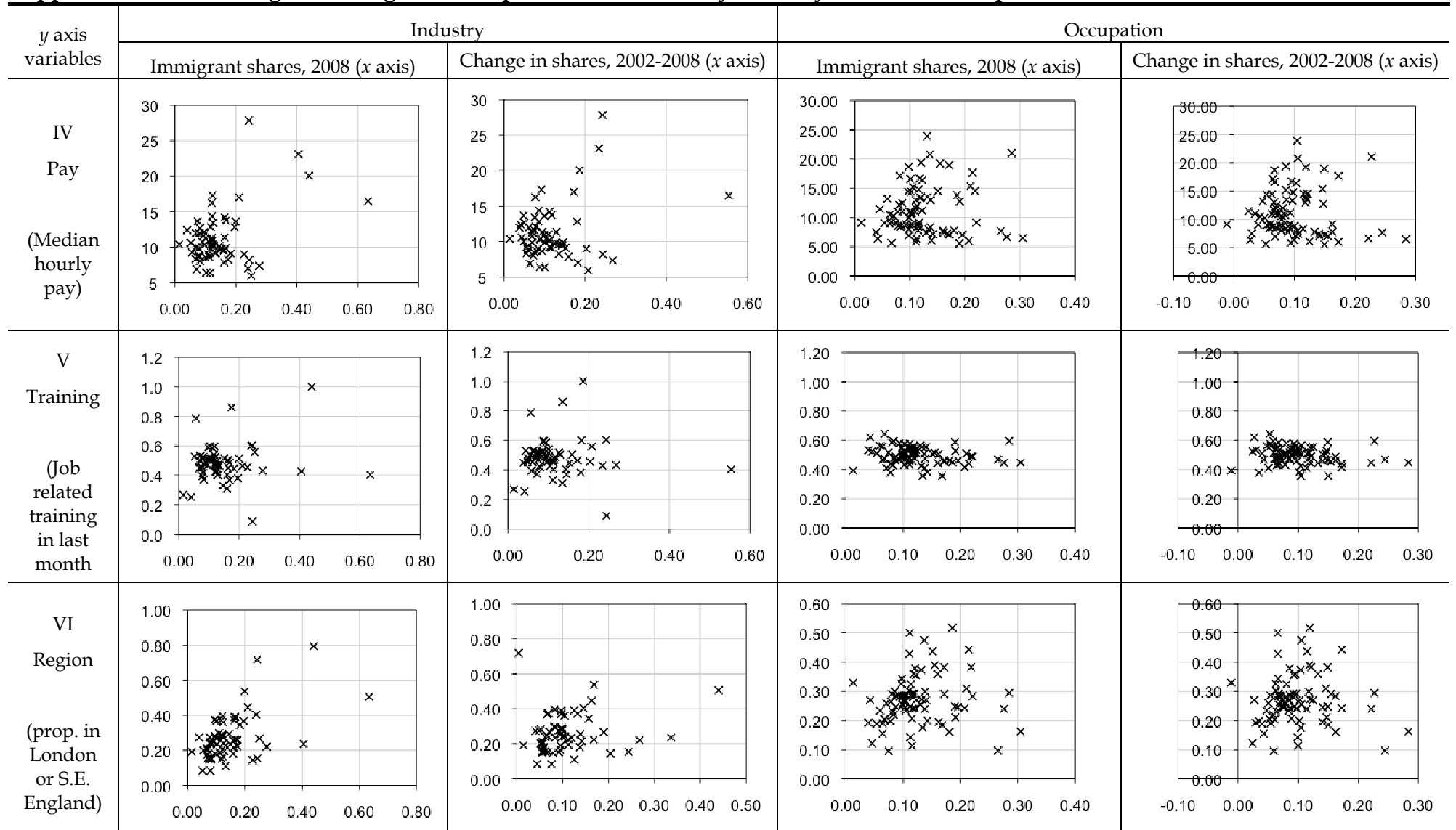
| Occupation (SOC 2000 Minor Group) | Share of non-UK born | | Change in share 2002-2008 |
|--------------------------------------|----------------------|-------|---------------------------|
| | 2002 | 2008 | |
| 344 sports and fitness | 0.051 | 0.094 | 0.043 |
| 351 transport associate profs. | 0.082 | 0.166 | 0.084 |
| 352 legal associate profs. | 0.056 | 0.064 | 0.008 |
| 353 business & finance associate | 0.089 | 0.126 | 0.037 |
| 354 sales & related assoc profs. | 0.071 | 0.108 | 0.037 |
| 355 conservation associate profs | 0.068 | 0.111 | 0.043 |
| 356 public service and other ass | 0.066 | 0.08 | 0.014 |
| 411 administrative: government | 0.048 | 0.063 | 0.015 |
| 412 administrative: finance | 0.081 | 0.104 | 0.023 |
| 413 administrative: records | 0.06 | 0.096 | 0.036 |
| 414 administrative: communication | 0.047 | 0.06 | 0.013 |
| 415 administrative: general | 0.065 | 0.089 | 0.024 |
| 421 secretarial and related | 0.063 | 0.08 | 0.017 |
| 511 agricultural trades | 0.026 | 0.035 | 0.009 |
| 521 metal forming, welding, repair | 0.037 | 0.072 | 0.035 |
| 522 metal machining, fitting | 0.048 | 0.061 | 0.013 |
| 523 vehicle trades | 0.052 | 0.061 | 0.009 |
| 524 electrical trades | 0.046 | 0.078 | 0.032 |
| 531 construction trades | 0.038 | 0.085 | 0.047 |
| 532 building trades | 0.046 | 0.088 | 0.042 |
| 541 textiles and garment trades | 0.09 | 0.126 | 0.036 |
| 542 printing trades | 0.043 | 0.064 | 0.021 |
| 543 food preparation trades | 0.171 | 0.255 | 0.084 |
| 549 skilled trades n.e.c | 0.06 | 0.082 | 0.022 |
| 611 healthcare & related | 0.079 | 0.151 | 0.072 |
| 612 childcare & related | 0.069 | 0.09 | 0.021 |
| 613 animal care services | 0.022 | 0.038 | 0.016 |
| 621 leisure & travel service | 0.097 | 0.147 | 0.05 |
| 622 hairdressers and related | 0.057 | 0.061 | 0.004 |
| 623 housekeeping | 0.111 | 0.168 | 0.057 |
| 629 personal services | 0.041 | 0.013 | -0.028 |
| 711 sales assistants and retail | 0.068 | 0.1 | 0.032 |
| 712 sales related | 0.061 | 0.074 | 0.013 |
| 721 customer service | 0.063 | 0.106 | 0.043 |
| 811 process operatives | 0.085 | 0.25 | 0.165 |
| 812 plant and machine operatives | 0.059 | 0.109 | 0.05 |
| 813 assemblers and routine opera | 0.094 | 0.17 | 0.076 |
| 814 construction operatives | 0.056 | 0.065 | 0.009 |
| 821 transport drivers and operatives | 0.08 | 0.124 | 0.044 |
| 822 mobile machine drivers | 0.047 | 0.121 | 0.074 |
| 911 elementary agricultural | 0.024 | 0.107 | 0.083 |
| 912 elementary construction | 0.045 | 0.115 | 0.07 |
| 913 elementary process plant | 0.114 | 0.293 | 0.179 |
| 914 elementary goods storage | 0.061 | 0.159 | 0.098 |
| 921 elementary administration | 0.07 | 0.098 | 0.028 |
| 922 elementary personal service | 0.097 | 0.169 | 0.072 |
| 923 elementary cleaning | 0.088 | 0.184 | 0.096 |
| 924 elementary security | 0.12 | 0.153 | 0.033 |
| 925 elementary sales | 0.065 | 0.127 | 0.062 |

Source: Labour Force Survey, 2002 and 2008 4-quarter datasets

Appendix 2: Plots of migrant use against independent variables, by industry sector and occupation



Appendix 2: Plots of migrant use against independent variables, by industry sector and occupation



Appendix 3: Explaining immigrant use at the aggregate level: results of OLS regression

| Dependant variable | Industry | | | Occupation | | |
|----------------------|----------|--------------------------|----------------------|------------|--------------------------|---------------------|
| | | Share non-UK born | Δ share non-UK born | | Share non-UK born | Δ share non-UK born |
| Period(s) | | 1994; 2002; 2008 | 1994-2002; 2002-2008 | | 2002; 2008 | 2002-2008 |
| r ² | | 0.282 | 0.291 | | 0.106 | 0.268 |
| | Mean | Standardised Coefficient | | Mean | Standardised Coefficient | |
| Skill level (1) | 0.194 | -0.291* | -0.280* | 0.330 | -0.028 | 0.189 |
| Full-time hourly pay | 10.55 | 0.690* | 0.303* | 11.21 | 0.442* | 0.190 |
| Job-related training | 0.391 | -0.072 | -0.025 | 0.503 | -0.181* | -0.156* |
| Labour turnover (2) | 0.173 | 0.085 | 0.164* | 0.175 | 0.295* | 0.596* |
| Gender (female) (3) | 0.338 | 0.018 | 0.167 | 0.396 | 0.004 | -0.083 |
| Part-Time (3) | 0.159 | 0.011 | -0.203 | 0.204 | 0.098 | -0.069 |
| Self-Employed (3) | 0.105 | 0.182* | 0.066 | 0.138 | 0.238 | -0.125 |
| Public sector (3) | 0.121 | 0.270* | 0.310 | 0.236 | 0.051 | 0.020 |
| Age dummies (4) | | YES | YES | | YES | YES |
| Region dummies (4) | | YES | YES | | YES | YES |

* Indicates significance at 95% level, $p < 0.05$

- (1) Various skill level dummies were investigated: we use the proportion with bachelor's degrees or higher
- (2) Labour turnover measure is the proportion of the workforce hired within last 12 months.
- (3) Binary controls included as shares i.e. proportion female of total, proportion part-time of total
- (4) Age and region dummies were also included, but none were significant in the model