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Martina Bisello
University of Pisa

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Non-technical summary

Net immigration inflows into the UK have increased sharply since 1997, reaching their maximum in 2005 with the EU enlargement to Central and Eastern European Countries and falling afterwards. Despite immigration to Britain in the past has not been predominantly concentrated at the bottom of the skill distribution, major changes occurred from the late-1990s. Today there is evidence that immigrants are indeed over-represented both in the very high-skilled and very low-skilled occupations.

One major concern for immigrant-receiving countries are the effects that foreign-born supply has on local labour market. Previous literature considers traditional labour market outcomes such as wages, employment, unemployment and participation rate. Here we adopt a different perspective which consists in empirically testing the effect of immigration on the task specialisation of natives, by making use of an existing theoretical model in the literature. In this paper we ask whether in the United Kingdom less-educated native workers - who are assumed to have a comparative advantage relative to immigrants in communication as opposed to manual tasks - are induced to specialise in communication-intensive jobs in response to immigration inflows of similarly educated workers.

Using national survey data from 1997 through 2006 to measure employment shares and the task content of occupations, we find evidence that in the United Kingdom less-educated natives responded to increasing immigration by shifting their task supply and providing more communication relative to manual tasks. These findings are consistent with previous literature for the United States and other European Countries. We also show that this effect vary across demographic groups, being higher among men, young people and workers with primary education (or less) relatively to women, old people and workers with secondary education respectively.

How does immigration affect natives' task-specialisation? Evidence from the United Kingdom.

Martina Bisello*

Abstract

In this paper we empirically test the predictions of Peri and Sparber (2009) model of comparative advantage in tasks performance to evaluate whether in the United Kingdom immigration affected the way natives specialise in the task they perform on the job. Using Labour Force Survey and UK Skills Survey data from 1997 through 2006, we find that less-educated natives responded to immigration inflows of similarly educated workers by increasing their supply of communication tasks, relative to manual tasks. We also show that this effect varies across demographic groups, being higher among men, young people and workers with primary education (or less).

Keywords: Immigration, Task Specialisation, United Kingdom
JEL Classifications: F22, J61, J24

*Department of Economics and Management, University of Pisa, Via C. Ridolfi, 10 - 56124 Pisa (PI), Italy. Email: martina.bisello@for.unipi.it. The author would like to thank Joanne Lindley, Simonetta Longhi, Nicola Meccheri, Andrea Salvatori, participants to the ISER Work Research Group meeting (Colchester, November 2013) and the Joint Empirical Social Science (JESS) seminar (Colchester, December 2013) for their valuable comments and suggestions. The author would also like to thank the Institute for Social and Economic Research for hosting her as visiting researcher and the UK Data Archive for making the data available. The usual disclaimer applies.

1 Introduction

Net immigration inflows into the UK have increased sharply since 1997, reaching their maximum in 2005 with the EU enlargement to Central and Eastern European Countries and falling afterwards (Dustmann et al., 2008; Wadsworth, 2012). Figure 1 shows that since the mid-1990s the percentage of immigrants in the UK's working age population has been rising from around 8.5 to almost 13 percent in 2006. Unlike the US or some continental European countries (e.g. Italy or Spain), immigration to Britain in the past has not been predominantly concentrated at the bottom of the skill distribution. Many immigrants are indeed highly-qualified and find a job in high-paying occupations, as it is the case for health professionals. Yet, major changes in the distribution of immigrants from the mid-1990s happened at the lower end of the occupational classification (Nickell and Saleheen, 2009).

Today immigrants are indeed over-represented both in the very high-skilled and very low-skilled occupations (Wadsworth, 2012). This is shown by Figure 2 which compares the occupational distribution of immigrants between 1997 and 2006. As one would note, there was a relatively more marked increase in the presence of immigrants at the bottom of the occupational classification, particularly in operatives, service and sale workers and elementary occupations[1]. The increasing presence of immigrants in low-paying occupations is even more marked when considering only recent immigrants (i.e. those with at most five years of residence in the UK) (see Figure 3)[2].

By resorting to a counterfactual exercise, Oesch and Rodriguez Menés (2011) confirm that the job expansion in low-paid jobs that Britain experienced from the late 1990s was mainly determined by surges of immigration. These changes could be reasonably explained both by downgrading of immigrants upon arrival, who end up competing with lower educated native workers because of language or cultural barriers (Dustmann et al., 2008), and recent high inflows of low skilled immigrants due to the EU enlargment in 2004 (Nickell and Saleheen, 2009).

[1]For the sake of completeness, Figure 2 includes also the ISCO-88 category "Skilled agricultural and fishery workers", although employment in this occupation occurs only in small numbers compared to the yearly average across all occupations.

[2]Our analysis follows Nickell and Saleheen (2009) who look at immigration across occupations distinguishing between all and new immigrants.

One major concern for immigrant-receiving countries are the effects that foreign-born supply has on local labour market. Previous literature considers traditional labour market outcomes such as wages, employment, unemployment and participation rate. Here we adopt a different perspective introduced by Peri and Sparber (2009) who investigate the effect of immigration on the task specialisation of natives. This paper aims at evaluating whether natives, who are assumed to have a comparative advantage relative to immigrants in communication as opposed to manual tasks, are induced to specialise in communication-intensive jobs in response to immigration inflows. In light of the above described developments of immigration patterns in Britain, we focus on the bottom end of the occupational skill distribution by looking at the impact of less-skilled foreign-born workers on similarly educated natives. In this paper not only do we contribute to the literature on migration in the UK by applying a novel task-based approach, but we also make a methodological progress with respect to previous studies on immigration and task-specialisation in European countries by measuring the task content of occupations from national survey data, instead of relying on US sources. Our main empirical findings show that in the UK natives respond to increasing immigration by shifting their task supply and providing more communication relative to manual tasks. By instrumenting the share of foreign-born workers, we show that the positive effect on the relative task supply is plausibly causal. Results obtained for the UK are consistent with previous literature for the US, Spain and Europe.

The rest of the paper is organized as follows. Section 2 presents an overview of the relevant literature. Section 3 outlines the theoretical model of comparative advantages in task performance developed by Peri and Sparber (2009), on which we draw heavily. Section 4 discusses the empirical specification and the identification strategy. Section 5 describes the data used and the construction of our main variables. Section 6 reports results from the empirical analysis. Finally, in Section 7 we assess how the effects of immigration on natives' task specialisation vary across demographic groups and we perform a sensitivity analysis by utilising alternative task variables. Section 8 concludes.

2 Related Literature

There is a recent but growing literature on the benefits and costs of immigration inflows in the UK. Some papers use a spatial correlation, or inter-area, approach which consists in slicing the labour market by area within a country and then relying on regional variations to identify the effects of immigration on labour market outcomes (e.g Dustmann et al., 2005); others follow the so-called national approach which implies that the national labor market is divided by skill group (education-age cells) (e.g Manacorda et al., 2012). This second strategy was proposed to overcome the problem that labour markets are not closed economies and natives are free to move in or out. However, this approach depends on the assumption that immigrants and natives are perfect substitutes within pre-defined skill categories, which does not hold if immigrants considerably downgrade after arrival, as shown by Dustmann et al. (2013) in their analysis for Britain[3].

Overall, this literature finds that immigration had no appreciable effect on the average wages and employment of native-born workers (see Wadsworth, 2012, for a review)[4]. Dustmann et al. (2005) find no strong evidence that immigration has overall effects on aggregate employment, participation, unemployment and wages at the regional level. Lemos and Portes (2008) contribute to the UK migration literature by looking at the effects of the 2004 EU enlargement. They find modest effects of migration from Central and Eastern European Countries on regional labour markets, with no significant fall in wages nor rise in claimant unemployment. Nickell and Saleheen (2009) refine previous studies incorporating the occupational dimension into a regional analysis of immigration in Britain. They find a small negative impact of immigration on average occupational wages in the semi/unskilled services sector.

As emphasized by Ottaviano and Peri (2006, 2008), the effects of immigration significantly depend on the degree of substitution between natives and foreign-born workers with similar observable characteristics. If immigrants and natives

[3]Dustmann et al. (2013) introduce a novel approach analyzing the impact of immigration along the distribution of native wages, rather than on wages of different skill groups, without imposing any ex-ante restriction on where immigrants compete with natives.

[4]This evidence is consistent with findings for the US (see Borjas, 2003; Borjas and Katz, 2007; Card, 2001, 2005; Card and Lewis, 2007).

within the same educational group do not possess the same skills, they specialise in different tasks and therefore different occupations. Ottaviano and Peri (2006, 2008) explain the minimal impact of immigration on local labour markets in light of the fact that natives and immigrants do not compete for the same job. Peri and Sparber (2009) advance this literature by focusing on workers with little educational attainment (i.e. those without a college education) in the US. Less-educated immigrants and natives are imperfect substitutes in production: the former have a comparative advantage in occupations requiring simple physical ("manual") tasks, mainly because of limited language proficiency, lack of specific human capital skills and imperfect knowledge of the local labour markets; the latter have an advantage in occupations which require the use of interactive and communication ("complex") tasks. The authors provide empirical evidence that less educated immigrants tend to specialise in physical demanding jobs and at the same time that natives respond to immigration by increasing their supply of complex tasks.

To the best of our knowledge, there are only two studies which explore these findings outside the US. Amuedo-Dorantes and de la Rica (2011), by looking at Spanish data and adding in the gender dimension to the empirical specification of Peri and Sparber (2009), show that both native men (women) relocate to jobs with a higher interactive or communication content in response to an increase in male (female) immigration. D'Amuri and Peri (2012) analyze the impact of immigration on 15 European countries and explore its variation in light of the differences in labour markets' institutional characteristics. Again, they establish that higher immigration pushes natives to occupations with higher skill contents, and that this process is stronger in countries with low levels of employment protection legislation. The purpose of this article is to fill the gap in evidence for Britain.

3 Theoretical Model

In this section we outline the Peri and Sparber (2009) model of comparative advantages in task performance. In our analysis we entirely follow its predictions and empirical specification.

Assume that an open economy produces a final good Y using intermediate inputs Y_L and Y_H, which are produced by less and high-educated workers respec-

tively. Given that the focus is on workers with little educational attainment, Peri and Sparber (2009) simply assume that Y_H is produced according to a linear technology equal to the total supply of highly-educated workers, that is $Y_H = H$. On the contrary, Y_L requires the combination of two different type of tasks, manual (M) and communication (C), according to the following CES function:

$$Y_L = \left[\beta_L M^{\frac{\theta_L - 1}{\theta_L}} + (1 - \beta_L) C^{\frac{\theta_L - 1}{\theta_L}}\right]^{\frac{\theta_L}{\theta_L - 1}} \tag{1}$$

where $\beta_L \in (0, 1)$ captures the relative productivity of manual skills and $\theta_L \in (0, \infty)$ measures the elasticity of substitution between M and C.

Manual tasks, such as carrying heavy objects, or using hands/tools on the workplace, are those requiring physical skills. Communication tasks (for instance making speeches or presentations, and writing documents) require instead good language skills. Under the assumption of perfect competition, profit maximisation yields to the following relative demand function for communication versus manual tasks:

$$\frac{C}{M} = \left(\frac{1 - \beta_L}{\beta_L}\right)^{\theta_L} \left(\frac{w_C}{w_M}\right)^{-\theta_L} \tag{2}$$

The relative task demand in equation (2) is directly related to the worker's relative efficiency in performing different tasks and the relative task compensation.

"Domestic" native-born workers (D) and "foreign-born" immigrant workers (F) differ from each other in terms of relative task productivity. Each less-educated worker allocate one unit of time to perform μ_j units of manual tasks, ζ_j units of communication tasks, or some partition of the two. The assumption that natives have a comparative advantage in communication tasks implies that $(\zeta_D/\mu_D) > (\zeta_F/\mu_F)$.

The equilibrium relative supply of communication versus manual tasks for natives and immigrants is derived from labour income maximisation of a representative individual who allocate her/his time between the two types of tasks[5]:

[5]We skip some derivations for simplicity. A more detailed exposition can be found in the original paper.

$$\frac{c_j}{m_j} = \left(\frac{w_C}{w_M}\right)^{\frac{\delta}{1-\delta}} \left(\frac{\zeta_j}{\mu_j}\right)^{\frac{1}{1-\delta}} \tag{3}$$

where $\delta \in (0,1)$ captures the decreasing returns from performing a single task. Equation (3) describes the individual relative task supply of communication versus manual tasks for natives (j=D) and immigrants (j=F)[6]. The relative supply depends positively on relative task compensation, (w_C/w_M), and on worker's relative efficiency in performing tasks, (ζ_j/μ_j). The relative task supply C/M in the whole economy, obtained by aggregating individual task supply in (3), is a weighted average of the relative supply by natives and immigrants of both tasks:

$$\frac{C}{M} = \frac{C_F + C_D}{M_F + M_D} = \varphi(f)\frac{C_F}{M_F} + (1-\varphi(f))\frac{C_D}{M_D} \tag{4}$$

The weight $\varphi(f)$ represents the share of manual tasks provided by immigrants, which is simply a monotonic transformation of the foreign-born share of less-educated workers $f = L_F/(L_F + L_D)$. This weighting procedure allows to account for different optimal task provisions between immigrants and natives. The equilibrium relative compensation of tasks w_C^*/w_M^* is then easily obtained by substituting (3) for natives and immigrants in (4) and then by equating the relative supply to the relative demand in (2):

$$\frac{w_C^*}{w_M^*} = \left(\frac{1-\beta_L}{\beta_L}\right)^{\frac{(1-\delta)\theta_L}{(1-\delta)\theta_L+\delta}} \left[\frac{\zeta}{\mu}\left(f, \frac{\zeta_F}{\mu_F}\right)\right]^{\frac{-1}{(1-\delta)\theta_L+\delta}} \tag{5}$$
$$\underset{-}{} \quad \underset{+}{}$$

where the function $\frac{\zeta}{\mu}\left(f, \frac{\zeta_F}{\mu_F}\right)$ is the average relative communication ability. More precisely, $\frac{\zeta}{\mu}\left(f, \frac{\zeta_F}{\mu_F}\right) = \left[\varphi(f)(\zeta_F/\mu_F)^{\frac{1}{(1-\delta)}} + (1-\varphi(f))(\zeta_D/\mu_D)^{\frac{1}{(1-\delta)}}\right]^{(1-\delta)}$.

The expression for the optimal provision of communication to manual tasks by natives is derived by substituting the equilibrium wage into the aggregate task supply for natives:

[6]In the original notation, j represents not only the type of worker (native or immigrant) but also her/his occupation. Indeed, it is on the basis of their relative effectiveness in performing different tasks that workers select the occupation.

$$\frac{C_D^*}{M_D^*} = \left(\frac{1-\beta_L}{\beta_L}\right)^{\frac{\delta\theta_L}{(1-\delta)\theta_L+\delta}} \left(\frac{\zeta_D}{\mu_D}\right)^{\frac{1}{(1-\delta)}} \left[\frac{\zeta}{\mu}\left(f, \frac{\zeta_F}{\mu_F}\right)\right]^{\frac{-1}{(1-\delta)\theta_L+\delta}\frac{\delta}{1-\delta}} \quad (6)$$
$$\underset{-}{} \quad \underset{+}{}$$

From equation (5) one can see how an increase in the share of immigrants (f) has a negative effect on the average relative communication ability $\frac{\zeta}{\mu}\left(f, \frac{\zeta_F}{\mu_F}\right)$. This, in turn, implies an increase in the return to communication relative to manual tasks and, ultimately, a rise in the relative supply of communication tasks by natives. Hence, the hypothesis that we empirically test is that less-educated natives respond to immigration inflows of similarly educated workers by increasing their provision of communication tasks.

4 Empirical implementation

By taking the logarithmic derivative of the optimal provision of communication to manual tasks in equation (6), one can derive an empirically implementable specification:

$$\ln\left(\frac{C_D}{M_D}\right)_{rt} = \alpha_r + \tau_t + \gamma f_{rt} + \varepsilon_{rt} \quad (7)$$

where $\ln\left(C_D/M_D\right)_{rt}$ is the (log) average ratio of communication versus manual task supply at the region(r)-year(t) level, our spatial unit of analysis[7]. Region fixed-effects α_r, which account for region-specific unobserved characteristics of the population, capture the term $(1/(1-\delta))$ x $\ln(\zeta_D/\mu_D)$ from (6). Time fixed-effects τ_t account for common time-varying technological parameters (i.e. nation-wide shocks) and capture the term $(\delta\theta_L/((1-\delta)\theta_L+\delta))$ x $\ln((1-\beta_L)/\beta_L)$ from (6). The term $(f)_{rt}$ represents the share of low-educated foreign-born workers at the region-year cell. Its coefficient $\gamma \equiv -(1/((1-\delta)\theta_L+\delta))(\delta/(1-\delta))$ x $(\partial\ln(\zeta/\mu)/\partial f)$ is our main parameter of interest. Following the predictions of the theoretical model presented in Section 3, we will empirically test the hypothesis that $\gamma > 0$, i.e. that less-educated native workers increase their relative supply of communication versus manual tasks in response to inflows of similarly skilled immigrants.

[7]In this paper we follow the so-called spatial correlation approach, as opposed to the national approach (see Section 2 for details).

The measurement of the effect of immigration on local labour markets requires some identification assumptions which are widely discussed in the literature. The first one is that natives should not out-migrate from their region as a consequence of immigration flows, since this would disperse the effect of immigration across the national economy and undermine the ability to identify it. The second assumption in the OLS estimates is that, after controlling for the fixed effects and demographic characteristics, the variation of the share of less-educated foreign-born is exogenous and is not driven by unobserved employment opportunities. An additional related issue is potential measurement error in the share of low-educated foreign born workers at the regional level which could cause attenuation bias in OLS estimates. In what follows we discuss all these problems.

4.1 Natives' inter-regional mobility

Whether the out-migration of natives affects the measurement of immigration's impact on local labour markets outcomes remains still disputed and previous studies for the US present conflicting results. While Wright et al. (1997), Card and DiNardo (2000) and Card (2001) find little or no evidence of an adverse effect of immigration on native internal mobility, Frey (1995) and Borjas (2003) consider out-migration a relevant issue.

As far as Britain is concerned, Hatton and Tani (2005) recently examined the relationship between immigration and interregional mobility. Their analysis, which covers the period from 1982 to 2000, shows that there is a negative correlation between net migration rate from abroad and inter-regional net migration rates. This relationship is however significant only for the southern regions. Moreover, their study is based on population and not labour force flows and it does not investigate the differential impact by education levels. Using Labor Force Survey data, Gregg et al. (2004) show little evidence of any significant trend in regional mobility during the period 1979 to 2000. They also find that mobility is more limited amongst low educated people. Additionally, Wadsworth (2012) find a very week correlation between UK-born mobility and immigrant inflows at the level of local areas between 2004 and 2008. We can therefore argue that the assumption that labour markets are regional in scope is a reasonable one.

4.2 Endogenous allocation of immigrants and measurement error

A more relevant identification issue is the potential endogeneity of the share of foreign-born workers. There are a number of possible omitted variables that influence the allocation of immigrants across the regions of the receiving country. Indeed, it is likely that immigrants are not randomly allocated across local labour markets and might be attracted to areas with a particular occupation according to expected employment opportunities. Our concern is that unobserved labor demand conditions at the regional level could have simultaneously affected immigrant choices and the relative supply of communication tasks by less-educated natives. Moreover, potential measurement error of the share of low-educated foreign born workers at the region-year level could lead to attenuation bias in OLS estimates.

In order to address both endogeneity and measurement error, we construct an instrumental variable for the share of low-educated foreign-born workers. We follow a traditional approach in the literature, based on the Card (2001) shift-share instrument, which consists of exploiting past immigrant concentrations to remove the effect of unobserved demand shocks that might affect location choices[8]. Past concentrations are indeed an important determinant of immigrants' location decisions, especially for low educated workers. Because of information networks and other personal preferences, immigrants are attracted in those areas where groups with the same cultural and linguistic background are located. Under the assumption that historical settlements are uncorrelated with current economic shocks within each cell, we can obtain an exogenous measure for the share of immigrants.

Similarly to D'Amuri and Peri (2012) we combine Labour Force Survey data, the main dataset used in this paper and described in Section 5, with two external sources. From the 1991 national Census[9], we calculate the population levels of immigrants by region and continent of origin (a) (Asia, Africa, North America, South America, Europe, and Oceania). We then multiply these initial (1991) values for the national growth rates of each area of origin immigrant group, constructed from

[8] Alternative identification strategies take advantage of natural experiments or government policies (see Dustmann et al., 2008, for a short review).

[9] We downloaded Individual SARs (Sample of Anonymized Records) for Great Britain and Northern Ireland. Further information can be found at: http://www.ccsr.ac.uk/sars.

yearly immigration flows available in the Ortega-Peri database[10]. These imputed number of less-educated immigrants for each area of origin are then aggregated at the region-year level. Our instrument is then obtained dividing the total number of imputed immigrants by the total population in the cell (total natives plus total imputed immigrants).

More formally we have that:

$$f\_imputed_{rt} = \frac{\sum_{a=1}^{6}(imm_{ar,1991}) * (1 + g_{a,1991-t})}{natives_{r,t} + \sum_{a=1}^{6}(imm_{ar,1991}) * (1 + g_{a,1991-t})} \tag{8}$$

where $(1 + g_{a,1991-t})$ is the overall growth rate of immigrants by area of origin between 1991 and year t. This instrumental variable not only has the advantage of exploiting the area of origin of immigrants, but it also uses a larger Census sample to adress potential measurement error.

5 Data and descriptive statistics

Our main data source is the UK Labour Force Survey (LFS) for the years 1997-2006 [11]. We exclude the years of the Great Recession due to data limitation in the construction of our instrument. The LFS is a continuous household survey of the employment circumstances of the UK population. It contains hundreds of variables which cover many features of the UK labour market and related topics. The LFS has been running on a biannual basis from 1973 and 1983; it then became annual in 1984. Data were made available quarterly from Spring 1992, increasing almost fourfold the sample size. Each LFS' quarter about 60,000 households are interviewed. We append the four quarterly datasets in a given year into one, retaining only respondents who were interviewed for the first time at each quarter[12].

We restrict our analysis to native and immigrant workers (i.e. employees and self-employed), aged between 16 and 65. While the LFS does not collect data on

[10]We thank Francesc Ortega and Giovanni Peri for making the data publicly available at http://economics.ucdavis.edu/people/gperi/site/papers/copy_of_ortega_peri_bilateral_migration_2012.zip

[11]Neither the New Annual Survey Panel Dataset (NESPD) nor the Annual Survey of Hours and Earnings (ASHE) contain information on the place of birth. So we deem that the LFS is the best available source at present.

[12]We use the variable *thiswv* to ensure that each household is only included once each year.

immigration status, it does include questions on country of birth and nationality. We define immigrants those individuals who are foreign-born. Because we want to focus primarily on the impact that less-educated immigrants have on natives' task-specialisation, we exclude from our analysis highly educated workers. We exploit information on the age at which respondents left full-time education to define educational achievements. It is indeed well known that the measure based on the highest qualification achieved classifies foreign qualifications into the general category of "other qualification", irrespective of the level of the qualification held (see Manacorda et al., 2012, for more details). Individuals who left-full time education at age 21 or later are classified as highly educated. Among less-educated workers, we distinguish individuals with a secondary education (left full-time education at ages 17-20) from those without it (never had full-time education or left it before 17). Individuals still in education are entirely excluded from the sample.

Area studies by Peri and Sparber (2009) and Amuedo-Dorantes and de la Rica (2011) interpret as labour markets US states and Spanish provinces respectively. For the UK, we chose 13 regions as our econometric unit of analysis. The LFS codes 20 regions[13] but we reduce the number to 13 by aggregating some of them in order to reflect the Census 1991 classification: North, Yorks and Humber, East Midlands, East Anglia, Inner London, Outer London, Rest of South East, South West, West Midlands, North West, Wales, Scotland and Northern Ireland.

Table 1 presents some descriptive statistics of the sample. Natives and immigrants with little educational attainments are quite similar in terms of human capital characteristics. The most significative difference is in terms of educational attainments, with a higher percentage of immigrants having a secondary education compared to natives, as similarly found by Amuedo-Dorantes and de la Rica (2011) for Spain. As far as the regional distribution is concerned, Figure 4 shows that in 2006 Inner and Outer London were the areas with the highest concentration of foreign-born workers, followed by the Rest of South East and East Anglia.

[13]Tyne and Wear, Rest of Northern Region, South Yorkshire, West Yorkshire, Rest of Yorkshire and Humberside, East Midlands, East Anglia, Inner London, Outer London, Rest of the South East, South West, West Midlands, Rest of West Midlands, Greater Manchester, Merseyside, Rest of North West, Wales, Central Clydeside, Scotland and Northern Ireland.

5.1 Task-intensity variables

In order to investigate the effects of immigrants on natives' task specialisation, we need information on the activities performed by workers on the job. We derive our task intensity measures at the occupational level from an additional source, the UK Skills Surveys. Unlike previous studies on immigration and task-specialisation in European countries (see Amuedo-Dorantes and de la Rica, 2011; D'Amuri and Peri, 2012) we do not rely on the U.S. Department of Labor's O*Net abilities survey to derive data on job task requirements. Hence, we do not need to assume that the task composition of occupations is the same in the two countries.

The aim of the UK Skills Surveys is to provide an analysis of the level and distribution of skills being used in British workplaces. They are not carried out continuously each year and data are available only for 1997, 2001 and 2006. At each wave, information on job characteristics and working conditions are collected, including details on the tasks performed. The three cross-sections cover altogether 14,717 workers (2,467 in 1997, 4,470 in 2001 and 7,780 in 2006). We convert occupational codes from the Standard Occupation Classification (SOC90 and SOC2000) into the International Standard Classification of Occupations (ISCO-88) using crosswalks made available by the CAMSIS project[14]. This classification makes our results easily comparable with previous studies for European countries. We retain only those occupations at the 2-digit level which appear in all three waves and exclude those for which the data appeared unreliable: army (ISCO 1), legislators and senior officials (ISCO 11) and agricultural, fishery and related laborers (ISCO 92). Employment in these occupations occurred only in a very small number.

At each wave respondents are asked how much a particular activity is important for his/her job on a 5-point scale ranging from 1 ("not at all/does not apply) to 5 ("essential"). These variables in Likert scale are coverted into increasing cardinal scale from 0 ("not at all/does not apply) to 4 ("essential") and then normalised in order to range between 0 and 1. Among all the available ability scores, we only select those relevant for our analysis, which are used to derive measures of the "manual" and "communication" skills. We follow the existing literature as close

[14]Available at: http://www.camsis.stir.ac.uk/occunits/uksoc90toisco88v1.sps and http://www.camsis.stir.ac.uk/occunits/uksoc00toisco88v1.sps

as possible by selecting abilities from the UK Skills Surveys which resemble to those available in the O*Net dataset. We retain responses on "Skill or accuracy in using hands/fingers"(e.g. to assemble or repair), "Physical stamina"(e.g. to work on physical activities) and "Physical strength"(e.g. to carry, push or pull heavy objects) for the manual aspect, and on "Making speeches and presentations"and "Writing long documents with correct spelling and grammar" for the communication (oral and written) dimension[15]. Task measures are then collapsed at the ISCO-88 2-digit level for the pooled dataset, weighting each observation for the individual sampling weight. The final dataset is then merged with LFS data by occupation[16]. Finally, the manual and communication indicators are both derived as an average of the selected elements above mentioned. Table 2 reports their values, together with their ratio, in each occupation. As one would expect, the values of C/M are lowest among craft and trade workers, and in operative and elementary occupations. Managers and professionals score instead among the highest.

6 The effects of immigrants on natives' relative task performance

In this section we test whether less-skilled natives increase their relative supply of communication tasks as a response to immigration by estimating equation 7. However, we must first take into account the fact that there are personal characteristics which affect task supply at the individual (and regional) level and may be also correlated with immigration stock. Peri and Sparber (2009) avoid this potential spurious correlation by constructing manual and communication task supply which are "cleaned" of demographic effects. We apply their methodology by regressing natives' task supply at the individual level on gender (a female indicator), age, and education (a secondary education dummy)[17]. Next, we use the "cleaned" residuals to compute the manual and communication task supply measures used in

[15]Using O*Net data, Peri and Sparber (2009) consider the following skill sub-types: "Limb, hand, and finger dexterity", "Body coordination and flexibility" and "Strength" for the manual category, and "Oral" and "Written" skills for the communication index.

[16]SOC90 and SOC2000 codes in the LFS were also mapped into the ISCO-88 classification.

[17]Results would be qualitatively the same if we controlled for demographic characteristics at the region-year cell level in the final regression (see Amuedo-Dorantes and de la Rica, 2011).

equation 7. Table 3 reports results from these first-stage cleaning procedure. As it would be expected, the coefficient for the female indicator and age are negative for manual tasks and positive for communication tasks. Conversely, there is a positive effect of primary education (with respect to the base category, that is secondary education) on the supply of manual tasks.

We first estimate equation 7 by ordinary least squares (OLS), clustering standard errors by region. Column 1 of Table 4 presents the estimate of γ, which provides a direct test of the Peri and Sparber (2009) theoretical model. We find that an increase in the share of foreign-born workers has a positive and significant impact on natives' relative supply of communication and manual tasks. Results suggest that a one percentage-point increase in the foreign-born share of less-educated workers increases the relative supply of communication versus manual tasks among natives by 0.55 percent. We also test whether this positive effect is mostly related to an increase in the supply of communication skills (oral and written) or a decrease in native's supply of physical tasks. This is done by separately estimating equations 9 and 10:

$$\ln(C_D)_{rt} = \alpha_r + \tau_t + \gamma_c f_{rt} + \varepsilon_{rt} \tag{9}$$

$$\ln(M_D)_{rt} = \alpha_r + \tau_t + \gamma_m f_{rt} + \varepsilon_{rt} \tag{10}$$

The estimates of γ_c and γ_m in column 1 suggest that one percentage-point increase in the foreign-born share is associated with a significant 0.35 rise in natives' supply of communication tasks, but only a small decline of 0.15 in the manual task supply. As column 2 shows, taking into account variation in the employed population across regions by using weighted least squares (WLS) does not significantly alter our findings. The magnitude of our coefficients is consistent with the findings for the US. The estimates of γ, γ_c and γ_m reported in Peri and Sparber (2009) are respectively 0.34, 0.31 an -0.03. We also run the same regressions excluding Inner and Outer London where immigrants concentrations are substantially higher than the average. Columns 3 and 4 report OLS and WLS results. As one would note, our results are not driven by the exclusion of these outliers in the data. The OLS estimate of γ increases only to 0.60 from 0.55.

Table 5 reports results from IV estimates. As column 2 shows, the estimated IV impact is higher that OLS effects, suggesting a downward bias in the first specification. Indeed, the estimate of γ increases to 0.79, γ_c to 0.55 and γ_m to -0.07. Results obtained instrumenting the share of foreign-born workers suggest that the impact of immigration on natives' task-specialisation is plausibly causal. 2SLS estimates of γ in Peri and Sparber (2009) range from 0.37 to 0.51, making our coefficient from 1.5 to 2 times larger than the one estimated in the US. The first stage F-test shows that our instrument is highly correlated with the endogenous regressor f_{rt}. Amuedo-Dorantes and de la Rica (2011) also find a similar effect for all natives, although estimates diverge when men and women are separately considered (a point we return to in Section 7).

6.1 Recent and long-term immigrants

In the model by Peri and Sparber (2009), immigrants have a comparative advantage in performing manual, as oppose to communication, tasks because of language and cultural barriers. Among all foreign-born workers, we would therefore expect recent immigrants (defined as those with at most five years of residence in the UK) to have an even greater comparative advantage with respect to long-term immigrants. We would like to test in two separate regressions whether the effects of the share of recent immigrants on natives' specialisation are greater than those induced by long-term immigrants. However, similarly to Amuedo-Dorantes and de la Rica (2011), we find that the correlation between the share of recent and long-term immigrants is very high (i.e. 0.9). Therefore, high collinearity does not allow us to directly compare the effect of recent as opposed to long-term immigrants. Still, we can assess whether language and cultural barriers play a crucial role in our framework by testing if there are statistically significant differences in the ratio of communication to manual tasks across these two groups.

Table 6 displays the average relative supply of communication tasks for recent and long-term immigrants, and for natives and all immigrants as well. Natives and long-term immigrants score higher than all immigrants and recent-immigrants. We performed two-sample t test for every pair of groups. The corresponding two-tailed p-values are always lower than 0.01. We therefore conclude that the difference of

means in the ratio of communication and manual tasks between natives and all immigrants, and recent and long-term immigrants is significantly different from 0. These results confirm the intuition that language and cultural barriers are an important driver of task-specialisation, as found by Amuedo-Dorantes and de la Rica (2011) for Spain.

7 Extensions and Sensitivity analysis

7.1 Findings across demographic groups

We now take a closer look at the effects of an increase in foreign-born share on natives' relative task supplies by separately focusing on different demographic groups. As in Peri and Sparber (2009), we replicate the analysis by gender, age and educational attainment to assess whether there are significant differences in natives' response to immigration. Table 7 to 9 display the estimates from separate regressions for each specific group, using OLS, WLS and IV as methods of estimation.

IV estimates suggest that men respond to a percentage point increase in the foreign-born share by increasing their relative supply of communication vs manual tasks by 1.13 percent. Conversely, the effect on women's task specialisation is substantially lower and not stastistically significant. The impact of foreign-born workers on natives' relative task performance varies also by age, being higher among young workers (i.e. those aged less than 40, the sample average) relatively to old workers (the estimated γ being 1.03 and 0.45 respectively). Finally, differences arise also when natives are grouped by educational level. Indeed, workers with primary education (or less) shift their relative task supply more than workers with secondary education, but differences between coefficients are smaller. In line with Peri and Sparber (2009), these findings confirm the intuition that the impact of immigration is slightly higher among young natives because of greater occupational mobility, and among very low educated natives because they are more vulnerable to job competition.

7.2 O*Net task variables

Thus far we have shown that in the UK natives respond to increasing immigration by shifting their task supply and providing more communication relative to manual tasks. We rely on the UK Skills Surveys to measure the task content of occupations, instead of exploiting the more common O*Net dataset used in the literature. However, as we are aware that a perfect correspondence between task variables in the two datasets does not exist and that we only selected the measures of interest which resemble each other the most, we perform the same analysis using the O*Net data with the aim of comparing results. Table 10 reports the estimates obtained by deriving the manual and communication indices from exactly the same ability scores used in Peri and Sparber (2009), after a suitable conversion of occupational codes[18]. We note that all coefficients have the expected sign, confirming the findings presented in the previous section. OLS estimates of γ, γ_c and γ_m are almost identical to those obtained measuring the task content of occupations from the UK Skills Surveys. Some differences arise when instrumenting the share of foreign born workers. However, although the magnitude is 1.7 times lower, γ is still positive and statistically significant. These findings suggest that the arbitrary choice of variables to measure the task content of occupations, driven by the absence of a perfect matching between UK Skills Surveys and O*Net questionnaires, does not substantially alter our conclusions.

8 Summary and Conclusions

In this paper we assess the impact of immigration on local labour markets in the UK from a task-based perspective. We empirically test the predictions of Peri and Sparber (2009) model of comparative advantage in tasks performance to evaluate whether less-skilled natives responded to increasing immigration inflows of similarly educated workers by shifting their provision of task supplies. Using Labour Force Survey (LFS) and UK Skills Survey data from 1997 through 2006, we find that an increase in the foreign-born share has a significant positive effect on natives'

[18]US SOC1990 occupational codes in O*Net were matched to the ISCO-88 classification using the crosswalk available at: http://www.cf.ac.uk/socsi/CAMSIS/occunits/us90toisco88v2.sps. We thank Giovanni Peri and Chad Sparber for making the data available.

relative communication task supply. In order to cope with potential endogeneity of the share of immigrants, we construct a suitable instrumental variable based on past immigration concentrations. IV estimates suggest that natives increased their relative task supply by 0.79 percent for every percentage point increase in the foreign-born share. We also show that this effect vary across demographic groups, being higher among men, young people and workers with primary education (or less) relatively to women, old people and workers with secondary education respectively. We conclude that also in the UK, similarly to the US and Spain, less-educated native workers responded to immigration inflows of similarly educated workers by increasing their relative supply of communication tasks.

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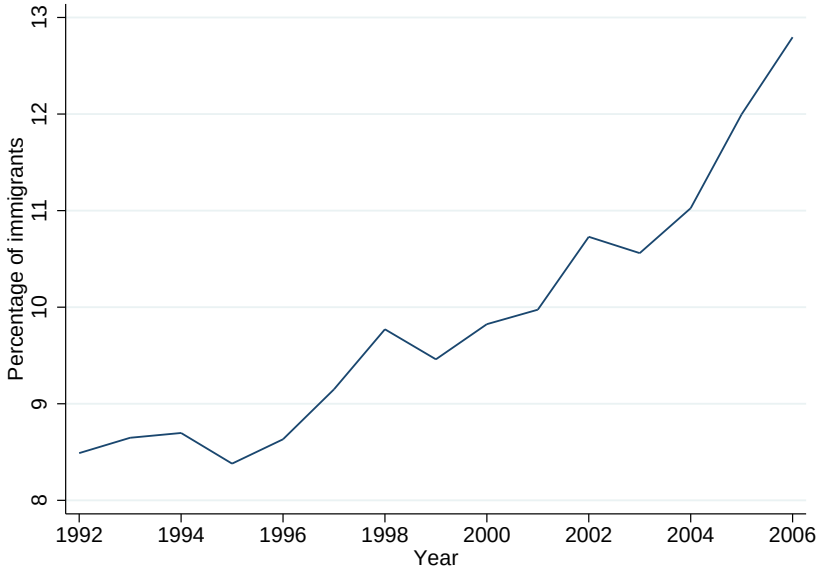
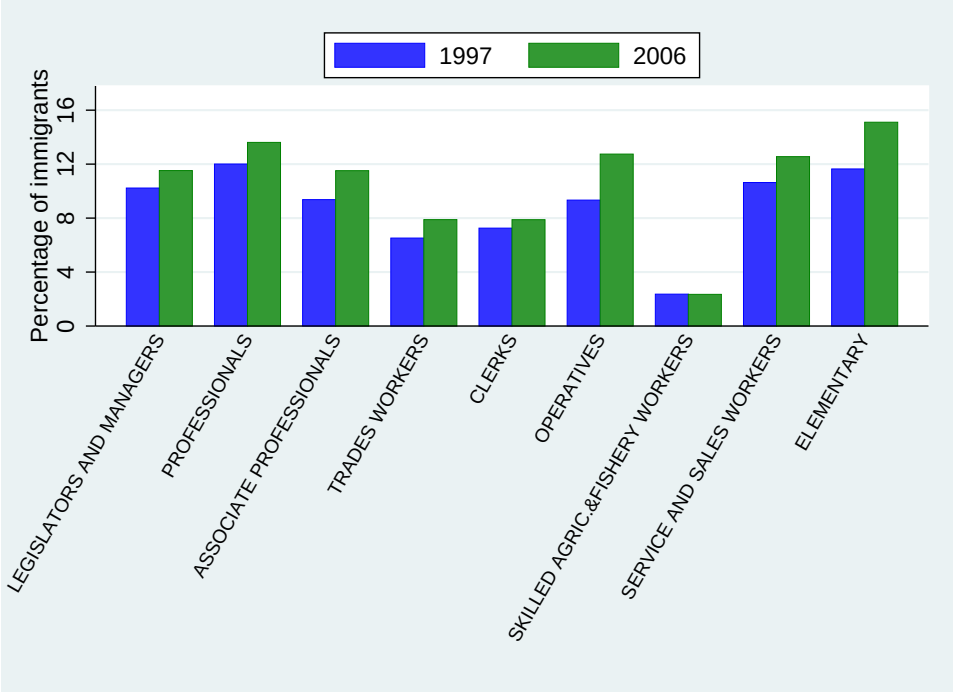
Figure 1: Percentage of immigrants in UK's working age population



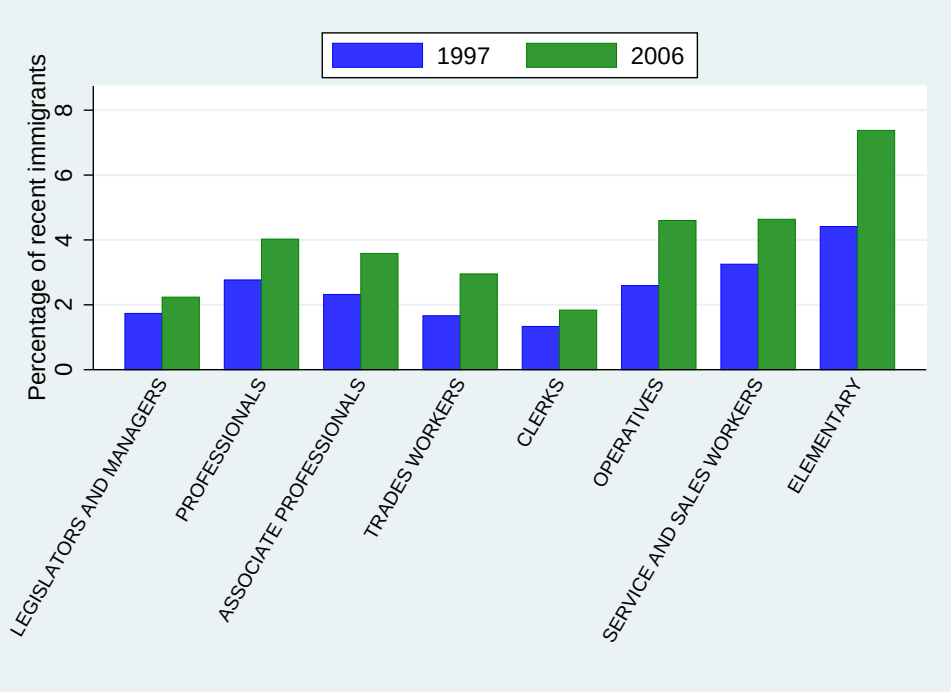
Notes: Percentage of foreign-born in working age population 16-65. *Source*: Labour Force Survey (LFS) and author's calculations.

Figure 2: Percentage of immigrants by occupation



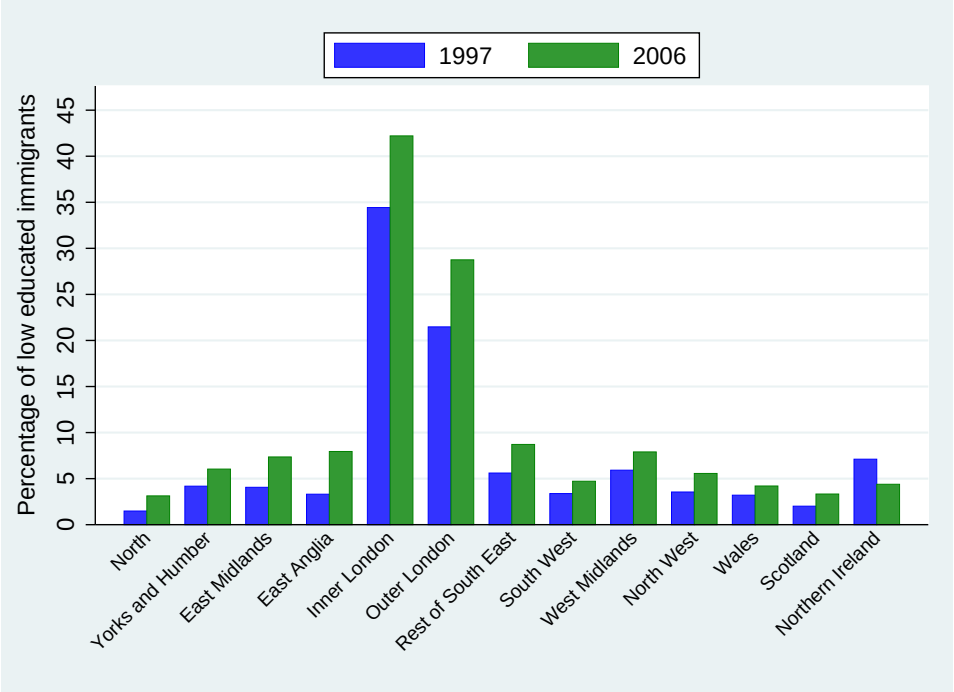
Notes: ISCO-88 occupations are ranked according to their initial 1997 mean hourly wage, from the highest (left) to the lowest (right). *Source*: Labour Force Survey (LFS) and author's calculations.

Figure 3: Percentage of recent immigrants by occupation



Notes: ISCO-88 occupations are ranked according to their initial 1997 mean hourly wage, from the highest (left) to the lowest (right). Recent immigrants are defined as those with at most five years of residence in the UK. *Source*: Labour Force Survey (LFS) and author's calculations.

Figure 4: Percentage of low educated immigrants by region, 1997 and 2006



Source: Labour Force Survey (LFS) and author's calculations.

Table 1: Descriptive statistics, less-educated workers (1997-2006)

Variables	**Natives**	**Immigrants**
Human capital characteristics		
Average age	40.3	40.1
Average years of education	16.4	17.6
Female (%)	46.2	46.0
Younger than 40 (%)	51.1	51.3
Secondary education (%)	30.9	55.2
Primary education (or less) (%)	69.1	44.8
Tot. obs.	350,409	24,655
Average obs. per region-year cell	2,695.45	189.65

Notes: Workers (employees and self-employed) aged 16-65. Secondary education: left full-time education between the ages of 17 and 20; primary education (or less): left full-time education before 16 years old (included) or never had full- time education. Full-time students are excluded. *Source*: Labour Force Survey (LFS).

Table 2: Task intensities by occupation

Occupations (ISCO-88 code)	M	C	C/M
12. Corporate managers	0.29	0.59	2.05
13. General managers	0.54	0.39	0.72
21. Physical, mathematical and engineering science professionals	0.27	0.54	2.00
22. Life science and health professionals	0.45	0.56	1.23
23. Teaching professionals	0.38	0.75	1.96
24. Other professionals	0.23	0.62	2.73
31. Physical and engineering science associate professionals	0.39	0.42	1.08
32. Life science and health associate professionals	0.62	0.50	0.81
33. Teaching associate professionals	0.34	0.60	1.79
34. Other associate professionals	0.30	0.54	1.84
41. Office clerks	0.28	0.36	1.26
42. Customer services clerks	0.31	0.29	0.92
51. Personal and protective services workers	0.56	0.33	0.59
52. Salespersons, models and demonstrators	0.53	0.21	0.40
61. Market-oriented skilled agricultural and fishery workers	0.81	0.25	0.31
71. Extraction and building trades workers	0.81	0.23	0.29
72. Metal, machinery etc trades workers	0.73	0.28	0.39
73. Precision, handicraft, printing etc trades workers	0.68	0.22	0.32
74. Other craft etc trades workers	0.71	0.20	0.28
81. Stationary-plant etc operators	0.70	0.21	0.30
82. Machine operators and assemblers	0.66	0.24	0.36
83. Drivers and mobile-plant operators	0.59	0.18	0.30
91. Sales and services elementary occupations	0.55	0.20	0.36
93. Labourers in mining, construction manufacturing and transport	0.70	0.21	0.30

Notes: Authors' calculations based on UK Skills Surveys 1997, 2001 and 2006, and LFS 1997-2009. Only working individuals between 16 and 65 with little educational attainment (secondary and primary or less education) are considered. The manual (M) and communication (C) indices are derived averaging task measures which capture respectively the intensity of physical activities and language (oral and written) skills.

Table 3: Task supplies "cleaned" of demographic effects

Variable	***M***	***C***
Female	-0.095***	0.015***
	(0.001)	(0.000)
Age	-0.001***	0.001***
	(0.000)	(0.000)
Primary educ.	0.097***	-0.093***
	(0.001)	(0.001)
Constant	0.509***	0.359***
	(0.001)	(0.001)
N	350,409	350,409

Notes: We use the "cleaned" residuals from the above regressions to compute the manual and communication task supply measures used in the empirical specification. *Source*: Labour Force Survey (LFS) and UK Skills Surveys.

Table 4: The impact of foreign-born workers on less-educated natives' relative task performance, OLS and WLS.

Explanatory variable: share of low-educated foreign-born workers				
Dependent variables	OLS	WLS	OLS w/o London	WLS w/o London
	(1)	(2)	(3)	(4)
$\ln(C_D/M_D)$	0.55***	0.47**	0.60***	0.49
	(0.11)	(0.18)	(0.18)	(0.33)
$\ln(C_D)$	0.35***	0.33***	0.36***	0.34*
	(0.05)	(0.09)	(0.10)	(0.17)
$\ln(M_D)$	-0.15*	-0.08	-0.23**	-0.14
	(0.08)	(0.11)	(0.08)	(0.15)
Region and year fixed effects	✓	✓	✓	✓
Observations	130	130	110	110

Notes: Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. Specifications (3) and (4) do not include Inner and Outer London. Significance levels * p< 0.1, ** p< 0.05, *** p< 0.001.

Table 5: The impact of foreign-born workers on less-educated natives' relative task performance, OLS and IV.

Explanatory variable: share of low-educated foreign-born workers		
Dependent variables	OLS	IV
	(1)	(2)
$\ln(C_D/M_D)$	0.55***	0.79***
	(0.11)	(0.13)
$\ln(C_D)$	0.35***	0.56***
	(0.05)	(0.08)
$\ln(M_D)$	-0.15*	-0.07
	(0.08)	(0.13)
Region and year fixed effects	✓	✓
First stage F-test (p-value)	.	35.2
		(0.00)
Observations	130	130

Notes: Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. The first stage F-test refers to the specification where $\ln(C_D/M_D)$ is used as a dependent variable. Significance levels * p< 0.1, ** p< 0.05, *** p< 0.001.

Table 6: Average relative task supply across group of less-educated workers.

Variable	Natives	All immigrants	Long-term immigrants	Recent immigrants
C/M	0.943	0.918	0.943	0.809
	(0.680)	(0.672)	(0.628)	(0.679)
N	350,409	24,655	20,066	4,166

Notes: Authors' calculations based on UK Skills Surveys 1997, 2001 and 2006, and LFS 1997-2009. Only working individuals between 16 and 65 with little educational attainment (secondary and primary or less education) are considered. Recent immigrants are those with at most 5 years of residence in the UK. Standard deviations in parenthesis.

Table 7: The impact of foreign-born workers on less-educated natives' relative task performance *by gender*.

Explanatory variable: share of low-educated foreign-born workers			
Dependent variables	OLS	WLS	IV
	(1)	(2)	(3)
$\ln(C_{men}/M_{men})$	0.75***	0.61**	1.13***
	(0.15)	(0.25)	(0.12)
$\ln(C_{women}/M_{women})$	0.24*	0.22	0.18
	(0.12)	(0.13)	(0.12)
Region and year fixed effects	✓	✓	✓
Observations	130	130	130

Notes: Each cell contains estimates from separate regressions and $\ln(C_D/M_D)$ is calculated for each specific demographic group. Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. Significance levels * p< 0.1, ** p< 0.05, *** p< 0.001.

Table 8: The impact of foreign-born workers on less-educated natives' relative task performance *by age*.

Explanatory variable: share of low-educated foreign-born workers			
Dependent variables	OLS	WLS	IV
	(1)	(2)	(3)
$\ln(C_{young}/M_{young})$	0.60***	0.46**	1.03***
	(0.13)	(0.20)	(0.17)
$\ln(C_{old}/M_{old})$	0.49***	0.44*	0.45***
	(0.13)	(0.22)	(0.17)
Region and year fixed effects	✓	✓	✓
Observations	130	130	130

Notes: Each cell contains estimates from separate regressions and $\ln(C_D/M_D)$ is calculated for each specific demographic group. We define young workers those aged between 16 and 40. Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. Significance levels * p< 0.1, ** p< 0.05, *** p< 0.001.

Table 9: The impact of foreign-born workers on less-educated natives' relative task performance *by educational level*.

Explanatory variable: share of low-educated foreign-born workers			
Dependent variables	OLS	WLS	IV
	(1)	(2)	(3)
$\ln(C_{primary}/M_{primary})$	0.74***	0.58**	0.96***
	(0.18)	(0.26)	(0.13)
$\ln(C_{secondary}/M_{secondary})$	0.40*	0.51**	0.89***
	(0.20)	(0.17)	(0.19)
Region and year fixed effects	✓	✓	✓
Observations	130	130	130

Notes: Each cell contains estimates from separate regressions and $\ln(C_D/M_D)$ is calculated for each specific demographic group. We define individuals with primary education (or less) those who left full-time education before 16 years old (included) or never had full-time education. Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. Significance levels * p< 0.1, ** p< 0.05, *** p< 0.001.

Table 10: The impact of foreign-born workers on less-educated natives' specialisation, using *O*Net task intensities*.

Explanatory variable: share of low-educated foreign-born workers			
Dependent variables	OLS	WLS	IV
	(1)	(2)	(3)
$\ln(C_D/M_D)$	0.48**	0.38	0.46**
	(0.16)	(0.22)	(0.15)
$\ln(C_D)$	0.30*	0.24	0.26**
	(0.11)	(0.13)	(0.09)
$\ln(M_D)$	-0.12*	-0.08	-0.05
	(0.06)	(0.08)	(0.08)
Region and year fixed effects	✓	✓	✓
First stage F-test (p-value)	.	.	35.2
			(0.00)
Observations	130	130	130

Notes: Standard errors robust to serial correlation and heteroskedasticity are reported in parentheses. Task intensities at the occupational level are derived from the O*Net dataset. The first stage F-test refers to the specification where $\ln(C_D/M_D)$ is used as a dependent variable.