

**“Impact of migration on UK  
consumer prices” (HOS/13/010)**

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## **Executive Summary**

### **Introduction**

- The report analyses the effect of immigration on prices of goods and services in the UK between 1997 and 2012. It differentiates between traded and non-traded goods, and between the pre- and the post-recession period.
- The study is based on regional item-specific CPI data, available from the ONS, and on immigration data from the UK Labour Force Survey.

### **Theoretical Framework**

- In a small open economy immigration will not have any impact on prices of tradable goods because they are set on the international market. However, it can affect prices of non-tradable goods and services, which are determined locally.
- Immigration may increase or reduce production costs of goods and services, depending on what factors are more intensively used in their production, and on what is the effect of immigration on the price of each factor. For non-tradable goods and services, if the market is sufficiently competitive, and in the absence of counterbalancing demand shifts, changes in production costs should translate in price changes.
- In the UK, previous studies have shown that immigration has contributed to lower wage growth at the bottom of the wage distribution. Thus, immigration may have contributed to reduce price growth for those goods and services that are produced with a low-wage labour intensive technology.

## **Empirical Framework**

- Our empirical strategy exploits the fact that immigrants' density is not uniform across the country. Thus we identify the effect of immigration on prices by correlating local (changes in) prices with local (changes in) immigration across government office regions.
- We adopt an estimation strategy that corrects for the endogenous sorting of immigrants across regions, i.e. for the fact that immigrants may choose to settle in regions where prices are growing faster or slower.
- The analysis differentiates between the effects on non-tradable goods and services, and on tradable goods. Additionally, it differentiates between goods and services produced in sectors that use intensively low-wage labour or not.

## **Results**

- On average, between 1997 and 2012 immigration did not have any significant effect on prices of non-tradable goods and services in the UK. However, it has modestly slowed their price growth until 2007, while having no effect in the post-crisis period.
- We find that immigration has negatively affected the price growth of the items produced in sectors that use intensively low-wage labour. In particular, we detect a negative impact of immigration on prices in the following sectors: floor or wall covering, take-away food, washing and dry cleaning, and hairdressing. However, immigration did not affect price growth in sectors that do not use intensively low wage labour.
- In low-wage sectors immigration has a negative effect on average over the years 1997-2012. However, the negative effect originates mostly from a stronger effect in pre-recession years, while in post-recession period we are not able to estimate any significant consequence.
- As expected, there is no significant effect of immigration on prices of tradable goods.

# 1 Introduction

The Migration Advisory Committee (MAC) has commissioned an independent research report to analyse the impact of migration on the prices faced by UK consumers. Immigration may affect the economies of receiving countries, and thus affect the welfare of their residents, in several ways. However, most research so far has neglected the role of immigration in affecting output prices. This report aims at providing fresh evidence on this specific issue, covering a wide range of products and services, and analysing all years between 1997 and 2012. Specifically, following the MAC request, the report will address the following research questions:

- 1) Have changes in the ratio of immigrants to natives had an impact on the prices of tradable goods? Of what magnitude?
- 2) Have changes in the ratio of immigrants to natives had an impact on the prices of non-tradable goods and services? Of what magnitude?
- 3) Does the impact of immigration on prices of non-tradable goods and services vary by sector? Are these sectors characterised by a high proportion of low-wage labour?

We will provide answers to these questions not only by providing estimates of the average effect of immigration on prices of tradable and non-tradable goods and services over the period 1997-2012, but also differentiating between the pre-recession and the post-recession (2008-2012) period.

The report is structured as follows: in section 2 we provide a critical review of the existing literature, where we specifically single out the contributions that have focused on the UK. Section 3 describes our econometric methodology, while in section 4 we discuss why, from a theoretical perspective, immigration may have an effect on output prices, and what this effect is expected to be. Section 5 presents the data used in the analysis and section 6 provides a descriptive picture of the size and the characteristics of immigration in the UK. We present the results of our analysis on non-tradable goods and services in section 7, and the results for the analysis on tradable goods in section 8. Section 9 concludes.

## 2 Previous literature

There is by now a substantial body of research on the effects of immigration on the host country labour market (see e.g. Altonji & Card (1991), Card (2001), Borjas (2003), Ottaviano and Peri (2012) for the US, and Dustmann et al. (2005), Lemos and Portes, (2008), Manacorda et al. (2012), Dustmann et al. (2013) for the UK; see also Dustmann et al. (2008) for a review). However, the evidence on the effects of immigration on other important economic outcomes is considerably scarcer. Some authors have studied the effects of immigration on industry mix and technology adoption (e.g. Hanson and Slaughter (2004), Gonzalez and Ortega (2011), Lewis (2011)), or on productivity (e.g. Peri, 2012) and innovation (e.g. Hunt and Gauthier-Loiselle, 2010).<sup>1</sup> Others have focused on the price of one specific item, namely housing.

### **Immigration and housing prices**

The first paper on this topic is a case study by Saiz of the effects of the 1980 Mariel boatlift (see Card, 1990) on rental prices in Miami between 1979 and 1981. Comparing the growth of house rents in Miami to those of three comparison metropolitan areas, he shows that price growth of rents in Miami experienced a rapid and largely persistent growth in the aftermath of the boatlift, and that such growth was particularly evident for low quality housing units occupied by low-income Hispanic residents. Conversely, immigration had a negative effect on house values. In a subsequent analysis, Saiz (2007) considers all U.S. metropolitan areas, and investigates the short and long run impact of immigration on housing prices and rents. He still finds a positive effect of immigration on housing rents, and he also shows that immigration led to an increase of the same magnitude in housing prices. In a separate study which again focuses on the U.S., Ottaviano and Peri (2007) find a similar result: a positive association between immigration and house prices of native individuals.

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<sup>1</sup> Dustmann and Frattini (2010) provide a review of the evidence of the effects of immigration on these and other outcomes.

As regards the impact of immigration on housing in other countries, Stillman and Mare (2008) study the effects of migration on housing markets in New Zealand. Their findings are only partly in line with those of the U.S. studies, as they find no evidence that the inflow of foreign-born immigrants to an area is positively related to local house prices. On the other hand, they document a strong positive relationship between inflows of New Zealanders previously living abroad into an area and the appreciation of local housing prices. Their results are however not robust to the choice of time period. Akbari and Ayede (2012), based on Canadian Census data for years 1996, 2001 and 2006, estimate that immigration to Canada had a statistically significant but small effect on housing prices, with prices of private dwellings rising by only about 0.1 percent if the share of immigrants in the total population rises by one percent. For European countries, Degen and Fischer (2009) find that in Switzerland, over the period 2001-2006 an immigration inflow equal to 1% of an area's population increased prices of single family homes by about 2.7%. The result is quite remarkable as it comes from a country that experienced modest immigration flows and housing price inflation. Accetturo et al. (2012) analyse the relationship between immigration and local housing prices in Italy, over the period 2003-2010. Their results show that immigration raises average housing prices at the city level: a 10 per cent increase in the stock of immigrants in a city raises the average price by 1.6 percentage points; however the same inflow reduces price growth in districts affected by the inflow by 2 percentage points vis-à-vis the city average. The negative dynamics in the housing market of immigrant-dense districts is driven by natives moving away: 10 additional immigrants who arrive in a district cause 6 natives to re-settle in other areas of the city. A recent paper by Gonzalez and Ortega (2013) focuses on Spain, and investigates the impact of the rapid rise in immigration to Spain between 2000 and 2010, which led to an average annual increase of 1.5 percent in the working age population, on housing prices as well as on the stock of housing units. They find that a migration-driven 1 percent increase in population leads to an increase in house

prices of 1 to 1.6 percent in the following year, and a 0.8 to 1 percent increase in the number of dwellings (due to new construction activity).

### UK Evidence

In contrast with most studies for other countries (with the partial exception of Accetturo et al. (2012) for Italy), Sá (2011) shows that immigration to England and Wales between 2003 and 2010 led to a decrease in housing prices. She uses the Special License access version of the UK Labour Force Survey and housing price data for 159 local authorities to demonstrate that an immigrant inflow equal to 1% of a local authority's initial population leads to a reduction of about 1.6% in house prices. These results are in part explained by native out-migration which tends to offset the increase in a local authority's housing demand brought about by immigration. Further, immigration is associated to a higher local fraction of natives in the bottom quartile of the national wage distribution, due to the negative effects of immigration on lower wages (see Dustmann et al. 2013), as well as to higher out-migration of natives at the top of the wage distribution. This would generate a negative income effect on housing demand and push down house prices in local areas where immigrants cluster. Sá also shows that the negative average effect of immigration on local housing prices is driven by local authorities where the share of immigrants with lower education is high. This is consistent with immigration having a positive income effect on housing demand in regions where immigrants have higher education and higher wages, counteracting the negative income effect generated by native out-mobility. Another important contribution of Sá (2011) is to show that an analysis at the Government Office Region level fails to find any significant effect of immigration on housing prices: this latter finding indicates that the effect of immigration on housing prices is highly localised, and fades away when the units of observation are broad regions (see also Borjas (2006) on this issue).



### **Immigration and prices of goods and services**

While studying the consequences of immigration on housing prices is certainly important because housing constitutes typically a large share of households' assets, and expenditure for housing is a fair share of total households' expenditure, it is hard to generalize these results to the effects of immigration on other types of goods and services, especially because housing supply is typically fixed in the short run. Despite this fact, and notwithstanding the importance of analysing the effects of immigration on a broader set of goods and services, there is so far very little evidence on the impact of immigration on output goods beyond housing. Moreover, the evidence is scattered and not systematic: the available studies differ not only in their geographic coverage, but also in the time horizon analysed and in the range of goods and services under consideration.

The pioneering paper in this literature is Lach's (2007) case study of the impact of the unexpected mass migration of Russian immigrants to Israel in 1990 on prices of traded goods. His identification strategy is based on cross-city monthly store-level prices variation, and allows him to estimate the immediate short run effect of immigration on prices. Against the predictions of a standard perfectly competitive model, he shows that a one percentage-point increase in the ratio of immigrants to natives decreases prices by 0.5 percentage points. Lach explains this result with the peculiar characteristics of the recently arrived Russian immigrants, who had higher price elasticity and lower search costs than the incumbent Israeli population, and thus led retailers to lower their mark-up. The effect in this case is therefore due to an increase in competition across stores brought about by immigrants. It is not clear, however, how generalizable are the results of this study. In fact, not only Lach considers only *tradable* goods, while *non-tradable* goods and services are excluded from his analysis, but also the migration episode considered is unique in at least two respects. First, it is a single episode of mass migration, where the Israeli population increased by about 4% within a year as a result of Russian immigration. Further, 81% of the immigrants who arrived in Israel during 1990 were *not* part of the labour force in that year; and among those in the

labour force, 53% were unemployed. Conversely, most countries – including the UK - are characterised by relatively small annual migration inflows, that are however persistent over time; in addition, new immigrants have usually relatively high labour market participation rates. The study of Cortes (2008) for the U.S. provides an analysis of the effects of a more common type of immigration, and focuses on non-tradable goods and services only. She exploits differences in the density of immigrants across cities for identification, and uses Census data for 1980, 1990 and 2000, thus looking at the longer term effects of immigration on prices. Her results show that a 1% increase in the share of low-skilled immigrants in the labour force reduces the prices of immigrant-intensive services such as housekeeping, babysitting, dry cleaning and gardening by 0.2%. This effect disappears as sectors that use progressively less intensively low skilled immigrant labour are considered. The negative effect exerted by immigration on prices would in this case work through the negative impact of unskilled immigration on the wages of low-skilled workers in the U.S., which are then passed on to the consumers in the form of lower prices of non-traded goods and services. In a recent paper, Zachariadis (2012) takes a decidedly different approach, and looks at the effect of immigration on international prices of both goods and services across 19 (mostly developed) countries for the period 1990 to 2006. His results are in line with those of the two studies for Israel and the US, in that he shows how immigration affects negatively the prices of both tradable and non-tradable goods. His estimates imply that a 10% increase in the share of immigrant workers in total employment decreases the prices of final products by as much as 3%.

### UK Evidence

The only study for the UK so far has been Frattini (2008) which uses regional RPI and CPI indices for over 300 items to investigate the effect of immigration on prices of goods and services between 1995 and 2006. Using regional CPI and RPI data for over 300 items and LFS data for measuring migration, he exploits variation in prices and immigrant inflows across the UK Government Office Regions over time to estimate the impact of migration on prices. His results show that immigration

contributed to reduce price growth of services in low-wage sectors such as restaurants, bars, and take-away food through its effects on labour supply. The effects are strongest in sectors that use more intensively low-wage workers: take-away food shops, bars and pubs, washing and dry cleaning and hair dressing and beauty parlours. For these sectors, his estimates imply that an increase of 1 percentage point in the immigrant-native ratio would lead to a 0.3% decrease in average prices in these sectors, an effect that is similar in size to those estimated by Cortes (2008) and Zachariadis (2012). Conversely, he does not detect any effect of immigration on prices of goods and services produced in sectors that are not intensive users of low-wage labour. These findings dovetail nicely with those of Dustmann et al. (2013), who show that immigration over the same period has contributed to keep down wages at the bottom of the distribution. Based also on that additional piece of evidence, Frattini argues therefore that the price effects are caused by pass-through effects of wage reductions for low-wage workers on prices. Further analysis shows instead no evidence of alternative channels through which immigration might reduce prices, such as an increase in competition among retailers brought about by immigrants starting up new businesses. Finally, his analysis also highlights a small and marginally significant effect on some low-value grocery items which may be due to an increase in demand that is not matched by an immediate increase in supply.

### **3 Methodology**

The aim of this report is to extend and update the evidence presented in Frattini (2008) with data until 2012, and to distinguish – as far as possible – between the pre- and post- crisis period. To ensure that our results are as comparable as possible with Frattini (2008), we will adopt a similar methodology. Specifically, we exploit the fact that immigrants' density is not uniform across the country, and identify the effect of immigration on prices by correlating local (changes in) prices with local (changes in) immigration.

Formally, and denoting regions with the index  $i$ , sectors (or groups of sectors) with the index  $j$  and years with the index  $t$ , our baseline empirical model can be written as:

$$\Delta \ln p_{it}^j = \beta^j \Delta m_{it} + \Delta X_{it} \gamma + \tau_t + \varepsilon_{it} \quad (1)$$

where  $\Delta \ln p$  is the average difference in log-CPI between year  $t$  and  $t-1$  across all items produced in sector  $j$ ,  $m$  is the ratio of immigrants to natives,  $X$  is a vector of region-specific control variables that we add in some specifications in an attempt to control for demand and size effects on prices and which includes regional native employment rate and the size of the native population, and  $\tau_t$  are time dummies that account for all time effects that are common across regions. Our key parameter of interest is  $\beta^j$ , which measures the association between immigration inflows and price growth in sector  $j$ . Specifically,  $\beta^j$  indicates the percentage change in average CPI brought about by a one percentage point increase in the immigrants/natives ratio.

The model is specified in first differences so that all time-invariant regional characteristics are differenced out. We are therefore not concerned by the fact that immigrants might settle in regions with permanently higher (or lower) price levels, as regional fixed effects are implicitly accounted for by first differencing. Even after differencing, however, it might still be the case that immigrants are attracted towards regions where prices are growing faster (or more slowly), and therefore OLS estimates might be biased due to reverse causality. The bias can be eliminated using an IV strategy. We follow what has by now become a tradition in the literature that exploits regional variations to study how immigration affects local outcomes, and rely on past immigration as a source of exogenous variation in immigrants' geographical distribution. A large literature (see e.g. Bartel (1989), Munshi (2003)) has shown that immigrants' networks are one of the main determinants of immigrants' location choices. Therefore, under the assumption that location choices of immigrants in the past are not correlated with current economic shocks, they provide a suitable instrument for current period immigrant inflows  $\Delta m_{it}$ .

In practice, we adopt a *shift-share* type of instrument, the so-called *supply push component* a la Card (2001). The basic idea behind this instrument is to allocate in every year the national inflow of immigrants from different countries of origin across UK regions according to their compatriots' regional distribution in a base year. The instrument is constructed in the following way: first, we divide immigrants into 11 areas of origin<sup>2</sup> and calculate  $M_{ct}$ , the number of immigrants from each area  $c$  who are in the UK in year  $t$ . We then define  $\lambda_{ic} = M_{ic}/M_c$  the fraction of immigrants from area  $c$  in region  $i$  in a base period, which we choose to be 1991. Information on the 1991 distribution of immigrants is taken from the 1991 Census, so that the sample is the whole population. Therefore the predicted number of immigrants from area  $c$  in region  $i$  in year  $t$  can be expressed as  $\lambda_{ic} M_{ct}$ . Summing over all origin groups one obtains a measure of the predicted total stock of immigrants in region  $i$  at time  $t$  which does not depend on local simultaneous demand shocks. We then normalise the variable dividing it by the number of natives in the region at time  $t-2$ . Finally, we construct the predicted inflow of immigrants in each region by taking the first differences of the variable so constructed, so that we have:

$$SP_{it} = \sum_c \frac{\lambda_{ic} M_{ct}}{Natives_{it-2}} - \sum_c \frac{\lambda_{ic} M_{ct-1}}{Natives_{it-3}} \quad (2)$$

We will use  $SP_{it}$  as our main instrument for  $\Delta m_{it}$ . However, to make sure that our results are not driven by the way the IV is constructed, we will also check the robustness of all our IV estimates to the use of an alternative, but related, instrumental variable. Specifically, following Dustmann et al. (2013) we also use the fourth lag of the regional share of immigrants *in level* ( $m_{it-4}$ ), as an instrument for the contemporaneous immigrant *flow* ( $\Delta m_{it}$ ).

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<sup>2</sup> EU 15, Other Western Europe, Eastern Europe, Americas, Africa, Indian Sub-Continent, Middle East, Remainder of Asia, Australasia, Other Countries.

Since one of the objectives of this analysis is to study the heterogeneity of the effects of immigration in the period before and after the recession, we will also estimate in all instances a modified version of (1), where we interact the immigrant inflow variable  $\Delta m_{it}$  with a dummy for the pre-recession years 1997-2007 (*pre*) and with a dummy for the post-recession years 2008-2012 (*post*). Our estimating equation in this case becomes thus:

$$\Delta \ln p_{it}^j = \beta_1^j \Delta m_{it} \times pre_t + \beta_2^j \Delta m_{it} \times post_t + \Delta X_{it} \gamma + \tau_t + \varepsilon_{it} \quad (3)$$

where  $\beta_1^j$  and  $\beta_2^j$  measure the percentage change in average CPI brought about by a one percentage point increase in the immigrants/natives ratio in the period before and after the recession, respectively.

As we discuss in section 4, we expect immigration to affect local prices of non-tradable goods and services, and those of tradable goods through different channels. For this reason, in our analysis we will estimate equations (1) and (3) separately for services and non tradable goods, on the one hand, and for tradable goods on the other hand. Further, we will differentiate between sectors according to their characteristics, and in particular we will contrast the results from estimates on sectors that make intensive use of low-wage labour to the results for and sectors that do not.

## 4 Theory background

How can immigration affect prices of goods and services in the host country? In a small open economy, if all goods are perfectly tradable, immigration will not have any impact on output prices because they are set on the international market. However, we may well expect immigration to affect prices of non-tradable goods and services.

On the one hand immigration will affect a country's factor endowment, thus potentially leading to changes in relative factor prices. Therefore immigration will increase or reduce production costs of goods and services, depending on what factors are more intensively used in their production, and

on what is the effect of immigration on the price of each factor. If the market is sufficiently competitive, and there are no counterbalancing demand shifts, we would expect changes in production costs to be translated in price changes. In the UK, Dustmann, Frattini and Preston (2013) show that between 1997 and 2005 immigration decreased native wage growth at the bottom of the wage distribution, while having no effect on wages between the 20th and 40th percentile, and increasing growth of wages around the median and higher up. Therefore, for those years, we would expect, a *ceteris paribus* reduction in the price of those goods and services that are produced with a low-wage labour intensive technology, and an increase in the price of those goods and services whose production technology is intensive in the use of above-median-wage workers.

On the other hand immigrants are consumers as well, therefore apart from affecting the supply side, immigration will also increase aggregate demand. If immigrants are similar to natives, this should lead to an increase in prices as long as supply does not immediately adjust. However demand from immigrants may not be the same as demand from natives. Lach (2007) argues for instance that Russian immigrants to Israel were characterized by lower search costs and higher price elasticity than natives. In this case immigration may force retailers to increase their competition and reduce their price mark-up. Yet, if immigrants' search costs are the same as those of natives or even higher (because, for example, they have a higher opportunity cost of time, or their limited knowledge of the host country's institutions and language makes it more costly to check prices in stores that are further from their residence or workplace) and supply does not readily accommodate changes in demand, then at least in the short run one of the consequences of immigration may be an increase in prices of those items that are relatively more demanded by immigrants.

Conversely, the price of tradable goods should not be susceptible to local conditions. Nevertheless, even if a good is perfectly tradable, part of the final retail price may arguably reflect handling costs which may indeed depend on local labour supply. Still it is reasonable to expect that handling costs do not make up a large fraction of total costs, hence on the supply side we do not expect sizeable

impacts of local factor endowments on prices of goods. However, on the demand side imperfect information and search costs guarantee the existence of price dispersion, as is documented in the empirical industrial organization literature (see e.g. Lach (2002), Sorensen (2000)). Therefore immigration might potentially have, at least in the short run, an impact on local prices of traded goods through changes in demand, even if the supply side is not affected.

## 5 Data Description

### Price Data

Our analysis is based on regional store-level price quotes that are provided by the ONS on a quarterly basis, for years 1997-2012. These are detailed item-specific prices at the regional level, which the ONS collects with the primary aim of constructing the national CPI, but that have recently been made freely accessible to users. The ONS samples prices of over 650 representative items in different locations and different types of stores on a particular Tuesday of each month (Index Day). Depending on the type of items involved, the sample may be stratified by region, shop type (multiples or independents), both, or neither (see ONS (2012)). The raw data are then progressively aggregated: initially all prices collected for one item in one stratum are combined into an “elementary aggregate”, then elementary aggregates for each item are aggregated into a single item index. Item indices are then grouped into categories called “sections”, which are progressively aggregated into “groups”, “broad groups”, and finally into the overall CPI or RPI. The ONS makes the individual store-level data freely available on the web<sup>3</sup>, and we make use of these for our analysis. Specifically, we use only price quotes of items that are stratified by region for each of the 12 UK Government Office Regions, and that satisfy the validation procedures put in place by the ONS (the validation process is described in detail in ONS 2012), and construct

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<sup>3</sup> All data are freely downloadable from: <http://www.ons.gov.uk/ons/guide-method/user-guidance/prices/cpi-and-rpi/cpi-and-rpi-item-indices-and-price-quotes/index.html>.



regional item-specific monthly CPI indices. We then compute the annual average CPI for each item and region, and chain annual indices over time, taking 2004 as base year for all items and regions (i.e. the CPI in 2004 is 100 for all items and regions by construction). Since some items display implausibly large price fluctuations, we trim our sample excluding items with very low or very high CPI, taking as thresholds percentile 0.5 and 99.5. We choose to use annual, rather than monthly, CPI indices for three reasons: first, we do not have monthly information on immigration; second, it is reasonable to believe that immigration takes some time to affect the price structure; finally, we prefer to have a price measure that is based on a higher number of observations, and thus less likely to suffer from measurement error: since we identify the effect of immigration on prices through variation over time within a region, measurement errors in the price levels would be magnified when measuring price changes, and this would lead to less precise estimates.

There are several cases where an item changes name and coding over time, or where some items are identified separately for some years and as one single item in others. In order to maximise the number of observations we try, wherever possible, to correct for these changes and to construct continuous price series for these items over time. It is of course possible that in some cases, the item's characteristics may have slightly changed over time. However, since such changes would be common to all regions in every year, they are not problematic for our analysis as they would be fully accounted for by the year dummies in the regression. Note that the same reasoning applies to items like, for instance, personal computers or mobile phones, that experience changes in quality over time: since within a year the item's quality is kept constant, and the only changes occur simultaneously across all regions between a year and the next, quality changes are accounted for by the inclusion of year dummies in the regression equations (1) and (3).

Our final sample comprises of 318 items, 239 tradables and 79 non tradables.

**Immigrant concentration and labour market data**

We use the UK Labour Force Survey (LFS) as the main source of information on immigrant concentration and on labour market and socio-economic characteristics. The LFS, established in 1973, is a sample survey of households living at private addresses in Great Britain, conducted by the ONS. Since 1992, the LFS has been a rotating quarterly panel. Each sampled address is interviewed for five consecutive times at three monthly intervals. The sample size is about 60,000 responding households in Great Britain every quarter, representing about 0.2% of the population. The LFS collects information on respondents' personal circumstances and their labour market status (including ethnicity, nationality, country of birth, and year of arrival in the UK if applicable) during a reference period of one to four weeks immediately prior to the interview. Since we are not interested in quarterly variations, and in order to increase the number of observations, we pool all quarters for every year. Throughout the paper, we define “immigrants” as “foreign born”.

**Sectoral wage structure**

We use the Annual Survey of Hours and Earnings (ASHE) to extract information on the concentration of low-wage labour in each sector. The ASHE (and its predecessor New Earnings Survey) is a cross-sectional dataset collected by the ONS with information about the levels, distribution and make-up of earnings and hours worked for employees. The sample size is about 160,000 employees in every year, a one per cent sample of employees in all industries and occupations from HM Revenues & Customs PAYE records. Information on wages is obtained directly from employers, so it provides a very reliable source of wage data. For each 4 digit SIC 1992-2003 sector we compute from the ASHE the proportion of workers earning an hourly wage<sup>4</sup>

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<sup>4</sup> Hourly wages are computed as the ratio of gross weekly earnings to total paid hours.

below the national 10<sup>th</sup> percentile, and use this measure to quantify the extent to which the production technology of each sector relies on low wage labour.

## 6 Key Facts on Immigration in the UK

The foreign born population in the UK has considerably increased between 1997 and 2012, the time span we focus on in our analysis. Table 1 shows that, while in 1997 there were about 314 thousand working age (16-65) immigrants in the UK, their number has almost doubled by 2012, reaching 611 thousand. This means that in 1997 immigrants represented 8.3% of the working age population, while by 2012 their share had increased to slightly less than 15%. Such a sustained inflow of working age individuals contributed to increase the British labour force. Immigrants are in fact actively participating in the labour market, as we demonstrate in Table 2, which reports the labour market participation rate (ratio of individuals in the labour force to the total working age population) and the unemployment rate (ratio of unemployed individuals to individuals in the labour force) of natives and immigrants in 1997, in 2012, and on average over the whole period. In the table we distinguish between “earlier” immigrants - who have been in the UK for two or more years - and “recent” immigrants - who have settled in the UK within the previous two years. This distinction is especially relevant because our empirical strategy (described in section 3) relies on annual changes in the stock of immigrants to identify the effect of immigration on prices, and therefore the population of interest for our analysis is that of recent immigrants. Most immigrants are active on the labour market in all years. The participation rate of recent and earlier immigrants has increased between 1997 and 2012 from 59% to 63% and from 69% to 74.5%, respectively. At the same time the participation rate of natives increased only slightly from 75.9% to 76.6% throughout the period. Immigrants tend to have a higher unemployment rate than natives. Over the whole period 1997-2012, the unemployment rate of natives was around 5.9%, while for earlier immigrants it was about 7.9% and it reached 11% for recent immigrants.

The UK immigrant population is therefore mostly participating in the labour market, although they tend to be employed in more unskilled and low-wage occupations than natives, especially in the first years after their arrival, as we show in Table 3.<sup>5</sup> Changes in the definition of the occupational categories do not allow intertemporal comparisons before 2000, but Table 3 reports the distribution of immigrant and native employees across the Standard Occupational Classification major groups (1 digit) for years 2001-20012 pooled, and the last column displays the average hourly wage for each group, discounted using the 2005 CPI.<sup>6</sup> The table shows, on the one hand, that the occupational distribution of earlier immigrants is relatively similar to that of natives, although earlier immigrants are slightly more concentrated at the top and less concentrated in the middle part of the distribution. On the other hand, recent immigrants are relatively more concentrated than natives among professionals (one of the highest paid occupational group) and in elementary occupations, the least paid occupational category: more than 27% of recent immigrants are employed in elementary occupations, while the corresponding share is 11% for natives and 13% for earlier immigrants. Finally, our identification strategy requires heterogeneity in regional immigrant inflows to estimate the impact of immigration on prices. We show in Table 4 that there is considerable variation in regional immigrant inflows both across regions and time. The foreign born population in the UK has historically been disproportionately concentrated in London, but more recent waves of migrants have a tendency to be more dispersed across the country. While less than 10% of natives lived in London in both 1997 and 2012, this share was more than four times higher for earlier immigrants in both years. Conversely, while in 1997 almost 50% of recent immigrants were concentrated in London, in the last year only 34.5% of the new arrivals settled in London. At the same time, the share of recent migrants living in the rest of South East, traditionally

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<sup>5</sup> This happens despite the fact that immigrants have considerably higher levels of education than natives, see Dustmann and Frattini (2013).

<sup>6</sup> I exclude self employed because no wage information is available.

another large recipient of migrants, decreased slightly from 13.5% to 11%, while it increased in nearly all other regions.

## 7 Results - Non-tradable goods and services

We start by estimating equation (1) on services and non-tradable goods only. Panel A of Table 5 reports the results when we consider jointly all years 1997-2012 and the dependent variable is the average annual changes in log-CPI of all services and non-tradable goods. Columns 1-2 show the OLS results, while IV results are reported in columns 3-4 - where the chosen instrument is the supply push component - and 5-6 - where the IV is the fourth lag of the immigrants-natives ratio, in levels. Odd columns report results from a regression where the only regressors are the change in the immigrants/native ratio and year dummies, while even columns show estimates from a richer specification where we also include changes in the regional employment rate and in the logarithm of the native population. We allow for serial correlation in the residuals within region and estimate Newey-West standard errors. The OLS estimates for  $\beta$  are negative, but small and not statistically significant at conventional levels in both specifications. However, as discussed in section 3, OLS estimates are possibly downward biased, as immigrants will likely settle in regions that are growing faster and that are therefore also likely to experience higher price growth. Indeed, the IV coefficients of columns 3-6 are all negative and larger in magnitude than the OLS estimates. However, they are imprecisely estimated and only the estimate in column 5 is statistically significant at 10%. We have so far looked at the average effect over the whole 1997-2012 period, a range of year which encompasses two different phases of the business cycle, the expansionary years of the late Nineties-early 2000s, and the recession years since 2008. Are the effects different in the pre-recession and post-recession years? We address this question in Panel B, where we estimate equation (3) and thus separately calculate the average effect for years 1997-2007 and for years 2008-2012. The results indicate that, indeed, the effects in the pre- and post- recession period

have been different. The estimated coefficient for years until 2007 is negative and stable across IV specifications at around 0.150, although not always precisely estimated; conversely, the estimates for years 2008 and onwards are an order of magnitude smaller and unstable across specifications, ranging between 0.031 and -0.042, and never statistically significant.

In terms of magnitude, the estimates of column 3 imply that an inflow of immigrants that increases the ratio of immigrants to natives by 1 percentage point would lead to a 0.15% decrease in the average price of services. Between 1997 and 2007 the average annual increase in the immigrants-natives ratio across all regions was 0.58 percentage points and the average annual price growth across all regions and services was about 4.4%, thus our estimates suggest that immigration pushed down growth in average price of services by about 0.087% per year, which amounts to only about 2% of total price growth. On the other hand, the immigrants-natives ratio increased by about 0.54 percentage points across all regions between 2008 and 2012, but such growth did not have any effect on the average price growth of services, which amounted to about 2.6% per year.

### **Low-wage sectors**

As we explain in section 4, we expect the effect of immigration on prices of services to be driven by the changes brought about by immigrants in labour costs. In order to test whether this explanation is realistic, we need to investigate the sectoral dimension of the data. We thus proceed in two steps. First, we match each of the items analysed to the 4-digit SIC92-03 sector where they are produced. We detail in Table 6 the sector each item has been matched to. It should be noted that, as there is no standard crosswalk from items to sectors, linking each item to a sector is not always straightforward, and some choices may be arbitrary. Sometimes even if a matching is possible the item ends up in residual classifications (e.g. “9305 -other service activities not elsewhere specified”) or two items are grouped in the same sector although they are very different (e.g. “child minders” and “playgroups” would both be classified in “8532 - social work without accommodation” despite being fundamentally different). Then, we gather sectoral information on

each sector's cost structure, which we display in Table 7. In the first two columns, which are based on NES/ASHE data for years 1996-2010 pooled<sup>7</sup>, we report for each sector the share of workers earning a wage below the national 10th percentile and the ratio of total employment costs to total costs for the purchase of goods, materials and services and net capital expenditure (from ABI for year 1995). Sectors where the share of workers below the 10th percentile is above 10% employ a share of low-wage workers above the national average. As the table shows, 19 out of the 29 sectors where non-tradable goods and services are produced use of "low wage" labour more intensively than the national average, and moreover 86% of the items fall in one of these "low wage" sectors (see Table 7).<sup>8</sup> Finally, column 4 indicates that in most sectors employment costs represent a sizeable fraction of total input costs.

A recent paper by Dustmann, Frattini and Preston (2013), has shown that between 1997 and 2005 immigration to the UK affected negatively wage growth at the bottom of the wage distribution, while having no effect on wages between the 20th and 40th percentile, and pushing up wages around the median and up to around the 90th percentile. Since most of the items we are analysing are produced in sectors that use intensively low-wage labour, the labour cost channel seems therefore a realistic explanation for our results.

In particular, a simple test for this hypothesis is to split the items in our samples in two different groups. The first group includes all the items produced in "low wage" sectors, and whose prices should therefore be reduced by immigration, while the second group includes all the other items, whose prices should not be negatively affected by immigration. We can then estimate equations (1) and (3) separately for each of the two groups.

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<sup>7</sup> We consider only years 1996-2010, rather than the whole time period 1996-2012, as the sector coding changed from Sic92-2003 to Sic07 after 2010. Similarly, we cannot focus on sector characteristics for years before our analysis as until 1995 sectors are classified according to Sic80.

<sup>8</sup> Note also that most of the sectors with a share of workers below the 10<sup>th</sup> percentile that is smaller than 10% are very imprecisely matched to an item – see Table 6.

In order to capture the sectors where the effect should be stronger, we define as “low wage” all sectors where more than 25% of the workers earn a wage below the 10th percentile. Results of regressions for this group are reported in Table 8, which has the same structure as Table 5, with Panel A reporting the estimated average effect over the whole period 1997-2012, and Panel B differentiating between the pre- and post-recession years. Focusing first on Panel A, we can see immediately how the estimates are uniformly larger in magnitude and more precisely measured than the estimates for all services. The IV estimates are stable across all specifications and robust to the choice of instruments, ranging from -0.286 in column 3, with only year dummies as control variables and the supply push component as an instrument, to -0.374 in column 6, where all controls are included, and the fourth lag of the immigrants-natives ratio serves as instrument. The results reported in Panel B show that the effect is stronger, and more precisely estimated for the pre-recession years: the IV estimates for this period range between -0.350 and -0.469 and are always statistically significant at least at 5%. Conversely, the estimates for the post-recession period are between 1/3 and 2/3 the size of those for the years until 2007, and they are imprecisely estimated, so that they turn out not to be statistically significant at any conventional level. Note, however, that the lack of precision in the estimates may also be simply due to the smaller number of observations on which the estimates are based<sup>9</sup>, and that the point estimates hint at the possibility of a negative effect of immigration on prices in low wage sectors even in more recent years. In contrast to these results, all the coefficients from regressions on price of services from sectors with less than 25% of workers below the 10th wage percentile, reported in Table 9, are close to zero and never statistically significant in every specification and for both time periods.

The joint consideration of the results of Table 8 and Table 9 seems to indicate that the negative impact of immigration on services and non-traded goods originates from the negative effects on

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<sup>9</sup> The coefficient for the post-recession years is based on 60 observations (12 regions x 5 years) only.



prices of “low wage” sectors only, which is consistent with the wage-related explanation of the results proposed above.

### **An alternative strategy to analyse the role of the sectoral share of low wage workers**

An alternative way of analysing the extent to which the share of low wage workers in a sector drives the effect of immigration on prices is to consider jointly all sectors, and modify slightly equation (1) with the addition of an interaction term between the change in the immigrant native ratio ( $\Delta m_{it}$ ) and the sectoral share of workers earning a wage below the 10<sup>th</sup> percentile, from Table 7. In practice, this amounts to estimating an equation like:

$$\Delta \ln p_{sit} = \beta \Delta m_{it} + \gamma \Delta m_{it} \times lw_s + \Delta X_{it} \delta + \phi_s \times \tau_t + \varepsilon_{sit} \quad (4)$$

where  $lw_s$  indicates the share of workers earning a wage below the 10<sup>th</sup> percentile in sector  $s$  and  $\phi_s$  are 4-digit SIC92-03 sector dummies, so that the interaction term  $\phi_s \times \tau_t$  accounts for all factors affecting a sector uniformly across all regions in each year. We can then estimate equation (4) accounting for the endogeneity of  $\Delta m_{it} \times lw_s$  by interacting the same instruments we used before (the supply push component and the fourth lag of the immigrants/natives ratio) with  $lw_s$ . In this equation, the effect of immigration on prices is explicitly modelled as a function of the share of low wage workers in the sector, as it is measured by:  $f(lw) = \beta + \gamma \times lw$ .

In Figure 1 we plot  $f(lw)$ , as estimated by using as an IV the supply push component (Figure 1a) and using as an IV the fourth lag of the immigrant-native ratio (Figure 1b) on the whole time period 1997-2012. The figures show similar patterns, regardless of the chosen instrument: the effect of immigration on prices of services and non-tradable goods is negative and decreasing in the share of low wage workers in the sector, and it is only significant when the share of workers earning a wage below the 10<sup>th</sup> percentile is sufficiently high.

When we break down the effects in the pre- and post-recession period, however, the picture is slightly different, as we show in Figure 2. As before, Figure 2a reports estimates obtained using the

supply push component as an IV, whereas Figure 2b reports estimates when the IV is the fourth lag of the immigrant-native ratio. Results with both instruments are very similar, and show different types of effects for years 1997-2007 and for years 2008-2012. While for the pre-recession period the effect of immigration on prices of services is always negative, but stronger and statistically significant at 5% for sectors with a higher share of low wage workers, for the post-recession period the effect displays the same negative dependence on the sectoral share of workers below the 10<sup>th</sup> percentile, but it is never statistically significant.

Thus, the results obtained with this alternative strategy are fully consistent with those obtained in the previous section, and while on the one hand they offer further support to the plausibility of the role of labour costs in determining changes in prices of services, on the other hand they confirm that this effect has been at work only (or more strongly) in pre-recession years..

### **Sector-specific analysis**

In order to further analyse sectoral differences, I try to replicate the analysis separately for each four digit sector. Conducting the analysis at such a disaggregated level poses some problems. First, as noted above, matching of items to sectors is sometimes arbitrary or non-informative. Moreover in some cases only a very limited number of items, and in some case just one item, is matched to a sector, and therefore sectoral results are in fact the average of a few items, or the result of regressions on the single item included. Therefore, sector-specific results have to be interpreted with some caution, and have to be taken as purely indicative.

Table 10 shows results for the four sectors where the IV estimates are significant: floor or wall covering, take-away food, washing and dry cleaning, and hairdressing. Note that take-away food, washing and dry cleaning, and hairdressing are among the sectors with the highest shares of low-pay workers (as we have shown in Table 7). Moreover, among these three sectors, the strongest negative effects are estimated for hairdressing and washing and dry cleaning - the two sectors where the ratio of employment costs to other costs is highest. On the other hand, the share of

workers in floor or wall covering earning a wage below the 10<sup>th</sup> percentile is only 6.6%. It should be noted, however, that this is presumably a sector with a high proportion of self-employment and, since we have no information on wages of self-employed workers, the figure on the share of low wage workers in the sector might be imperfectly measured. Further, the coefficients for floor or wall covering are those that are least precisely estimated, especially with our preferred IV, the supply push component.

When we distinguish between the effect over the period 1997-2007 and 2008-2012 (in the second and third row of each panel in the table), we find that for floor or wall covering and take away food, immigration depressed price growth only in the pre-recession years, while the estimated coefficients in the post-recession years are smaller in magnitude and not statistically significant. The pattern is not as clear for hairdressing, with the results obtained with our preferred IV being smaller and not significant for years after 2007, while those obtained using the fourth lag of the immigrant-native ratio as an instrument show exactly the opposite pattern. Finally, in washing and dry cleaning the effect seems to have been present in both periods, with estimated coefficients in the pre- and post- recession years being roughly of the same magnitude.

Overall, the sectoral results broadly support the hypothesis that immigration kept down the growth in the average price of services through a reduction in the labour cost component of final price.

### **The role of EEA immigration**

One of the defining moments in the recent UK migration history has been the 2004 EU Eastern enlargement. In that occasion, the UK was one of the few countries (together with Ireland and Sweden) to allow citizens of the new member states unlimited access to its labour market. This choice has resulted in substantial immigration flows from the new member countries to the UK. It may therefore be interesting to see if, and how, the effect of immigration on UK prices has changed before and after 2002. To this end, we estimate a modified version of equation (3), where the

immigrants/natives ratio is interacted with three dummies: a dummy for years 1997-2003, a dummy for years 2004 and 2007, and a dummy for years 2008-2012.

Although the results should be taken with caution, since estimates for each time period are based on a small number of data points only, Table A1 in the Appendix reports results from these regressions. In Panel A we report regressions for all non-tradable goods and services. Interestingly, the IV estimates are only significant for the years 2004-2007, whereas we do not find any significant coefficient for the other time periods. For 2004-2007, the coefficient estimates range between -.273 and -.304. In Panel B and Panel C we display results of the same type of regressions where the dependent variables are, respectively, the average log CPI change for services and goods produced in low-wage sectors and for those produced in all other sectors. The results are in line with those of Panel A and of Table 8 and Table 9. We only find a significant effect of immigration in years 2004-2007, and exclusively for low-wage sectors.

It would be tempting to interpret these results as an indication that the rise in EU migration is the sole responsible of the effect on prices. However, this conclusion is not warranted and might be misleading. To investigate further this issue, we have conducted further analysis where we have differentiated between immigration from the European Economic Area (EEA)<sup>10</sup> and from countries outside the EEA. We should preliminarily note that this part of the analysis relies on weak instrumental variables, as shown by the results of the F-test for the significance of excluded instruments which we report at the bottom of Panel 4. All results have therefore to be critically interpreted. Table A2 reports results for all non-tradable goods and services, where in Panel A we pool all years 1997-2012, and in panel B we distinguish between the three time periods 1997-2003, 2004-2007 and 2008-2012. The results of table A2 bear no support to the hypothesis that European immigration is responsible for the effect of immigration on prices. The results of Panel A show no

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<sup>10</sup> EEA countries include the 27 EU member states and Iceland, Liechtenstein and Norway. We also include in this group Switzerland, whose citizens are treated on equal grounds as EEA citizens although it is not part of the EEA.

significant effect of neither EEA nor non-EEA immigration on average prices of non-tradable goods and services. Likewise, when we distinguish between the effect in different time periods, there is no indication that post-2004 EEA immigration has had any effect on prices. If anything, the estimates in columns (3) and (4) indicate a negative effect of non-EEA immigration for years 2004-2007. In Table A3 we display results for low-wage sectors, whereas Table A4 reports results for all other sectors. Again, the results are mixed. On the one hand, consistently with the results of Table 9, we do not find any sign of an effect of immigration from EEA or non-EEA countries on prices of services and non-tradable goods that do not use intensively low-wage labour (see Table A4). On the other hand, when we break down immigrants into EEA and non-EEA, we do not detect anymore a significant effect of either type of immigration on prices of items from low-wage sectors. Panel A of Table A3 shows a negative coefficient for EEA immigration, and coefficients very close to zero for non-EEA immigration. However, the estimates are statistically significant only for EEA immigrants in columns (5) and (6). When we differentiate between different time periods (in Panel B) we are unable to detect any significant coefficient, except for those reported in columns 3 and 4 for non-EEA immigrants in 2004-2007.

The results of this section are therefore inconclusive. When we break down our data along finer temporal dimensions or differentiate by areas of origin, the analysis has to rely on an extremely small number of data points, and becomes therefore much less robust. We find some indication that the effect of immigration on prices of low-wage services has been stronger in the period 2004-2007, but no suggestion that this is due to the rise in immigration from the new EU member countries.

## **8 Results - Tradable goods**

We have so far focused on non-tradable goods and services, and demonstrated that immigration tends to decrease their price growth. In this section we instead concentrate on tradable goods only.

As we have discussed before, supply conditions for tradable goods are largely set on the (inter)national market. Local factor endowments may only marginally influence supply through, for example, changes in transport or handling costs. However demand is largely determined locally, and especially in the short run changes in demand may lead to changes in prices, if they are not readily accommodated by supply changes.

Table 11 reports results from estimation of equations (1) (Panel A) and (3) (Panel B) on tradable goods. None of the estimated effects is statistically significant at any conventional level in any specification and for any time period. However, while the point estimates for the average effect over the whole time period are uniformly close to zero, although positive, the estimation of separate effects for the pre and post recession periods hints at two distinct patterns. In our preferred IV estimates of columns 3 and 4, the coefficient for years 1997-2007 is estimated to be positive, ranging between 0.112 and 0.134, while the corresponding estimates for the post recession period are negative but very close to zero, between -0.042 and -0.050. These results might be taken as an (admittedly weak) indication of some upward pressure on local prices of tradable goods put by immigration in years of economic expansion, which disappears after the start of the recession.

When considering tradable goods, the differentiation by sectors based on their intensity in the use of low wage labour as we did for services is meaningless, as we can rule out any supply side effects of immigration on prices of tradable goods<sup>11</sup>. However, we might hope to have further insights into the potential impact on prices of goods by looking separately at different types of goods. Proceeding along the lines of the analysis for services, we have grouped all tradable items into 4 digit SIC sectors, as reported in Table 12. We have then separately run regressions (1) and (3) for

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<sup>11</sup> Nevertheless, as a falsification test, we have replicated the same procedure we have followed for services and distinguished sectors where tradable goods are produced based on their use of low wage labour. As expected, we found no significant effect for either category. Results are available upon request.

each sector. The results show no sign of any significant effect of immigration on prices of tradable service in any sector.<sup>12</sup>

## 9 Conclusions

This report has analysed the effect of immigration on local output prices in the UK between 1997 and 2012, and distinguished between pre-recession (1997-2007) and post-recession (2008-2012) years. We have used annual changes in immigration and in price level in different regions to identify the effect of immigration on prices of goods and services. This identification strategy allows detecting the full impact of immigration on prices of non-tradable goods and services, for which both demand and supply are determined locally. However, it only allows identifying the changes in prices of tradable goods that are determined by shifts in local demand, as the supply of tradable goods is nationally (or internationally) determined

Our results have highlighted differences in the consequences of immigration in the pre- and post-recession period. Immigration had a negative and statistically significant causal effect on the average price growth of non-traded goods and services over the period 1997 - 2007. However, this effect disappeared in the post-recession years. The discrepancy between the results for the two periods leads to a negative but not statistically significant estimated effect on average over the whole period 1997-2012. Even for pre-recession years, however, the size of the estimated average effect is not large. We have also demonstrated that the small reduction in the average price growth of non-traded goods and services is only driven by a stronger effect on prices of services in sectors that use intensively low-wage labour. Indeed, we show that the size of the reduction in price growth brought about by immigration is an increasing function of the share of low-wage workers in the

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<sup>12</sup> A partial exception is a negative estimated effect for the sector “Manufacture of optical instruments and photographic equipment”. However, this estimate is not robust to the random exclusion of one item from the range of items considered in that sector.

sector. For the low-wage sectors, we have also detected an average negative effect for the whole period 1997-2012, while for post recession years the size of the effect is smaller and imprecisely measured, but follows the same pattern. These findings are consistent with those of Frattini (2008) for years 1995-2006. Based also on the results of studies on the wage consequences of immigration in the UK (like Dustmann et al., 2013) that immigration reduced wages at the bottom of the wage distribution, we interpret these results as evidence of a pass-through effect from production costs to prices. Differently from Frattini (2008), our analysis has not identified any statistically significant link between immigration and prices of tradable goods. Over the whole period 1997-2012 the effect on prices of tradable goods is estimated to be zero. For the pre-recession years, instead we estimate a positive coefficient (like Frattini 2008), but the estimates are very imprecise and far from being statistically significant.



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## Tables

**Table 1 - Working age immigrant population in the UK**

<i>Year</i>	<i>Stock of working age (16-65) immigrants</i>	<i>Share of immigrants in working age (16-65) population</i>
1997	313,956	8.32
1998	325,443	8.76
1999	339,141	9.01
2000	341,822	8.97
2001	361,446	9.47
2002	390,609	10.24
2003	405,066	10.45
2004	420,998	10.82
2005	435,580	11.26
2006	490,438	12.41
2007	510,480	12.89
2008	543,697	13.55
2009	568,307	14.11
2010	570,070	14.03
2011	602,906	14.77
2012	611,149	14.90

*Entries are the stock of working age (16-65) immigrants in the UK (column 1) and the share of working age immigrants in total working age population in the UK in each year. Immigrants are defined as foreign born.*

*Source: LFS, various years.*

**Table 2 - Labour market status of natives and immigrants**

	1997		2012		All years pooled	
	<i>Participation rate</i>	<i>Unemployment rate</i>	<i>Participation rate</i>	<i>Unemployment rate</i>	<i>Participation rate</i>	<i>Unemployment rate</i>
<i>Natives</i>	75.9	6.8	76.6	8.0	76.4	5.9
<i>Earlier immigrants</i>	68.9	10.1	74.5	8.9	71.3	7.9
<i>Recent immigrants</i>	59.1	12.5	62.7	14.5	66.1	11.0

*The table reports the participation and unemployment rate of natives, earlier and recent immigrants for years 1997, 2012, and for all years 1997-2012 pooled. Participation rate is defined as the ratio of individuals in the labour force to total working age population. Unemployment rate is defined as the ratio of unemployed individuals to total active population. "Earlier" immigrants are immigrants who have been in the UK for 2 or more years. "Recent" immigrants are immigrants who arrived in the UK within the previous two years.*

*Source: LFS, various years.*

**Table 3 - Occupational distribution of natives and immigrants**

<i>Occupation</i>	<i>Natives</i>	<i>Earlier Immigrants</i>	<i>Recent immigrants</i>	<i>Average hourly pay</i>
Managers and Senior Officials	15.0	15.1	8.8	16.42
Professional occupations	12.4	16.5	14.9	16.42
Associate Professional and Technical	14.4	15.2	12.5	12.45
Administrative and Secretarial	12.4	9.1	6.3	8.63
Skilled Trades Occupations	11.5	8.5	7.3	8.70
Personal Service Occupations	8.1	7.8	8.8	6.85
Sales and Customer Service Occupations	7.9	6.5	6.4	6.17
Process, Plant and Machine Operatives	7.2	8.0	8.0	7.87
Elementary Occupations	11.1	13.4	27.1	6.12

*The table reports the occupational distribution across SOC 2000 major groups (one digit) of natives, earlier and recent immigrants in years 2001-2012 pooled. "Earlier" immigrants are immigrants who have been in the UK for 2 or more years. "Recent" immigrants are immigrants who arrived in the UK within the previous two years. The last column reports average hourly wages for each occupational class, discounted using CPI 2005.*

*Source: LFS, 2000-2012*

**Table 4 - Regional distribution of natives and immigrants**

	<i>1997</i>			<i>2012</i>		
	<i>Natives</i>	<i>Earlier immigrants</i>	<i>Recent immigrants</i>	<i>Native</i>	<i>Earlier immigrants</i>	<i>Recent immigrants</i>
London	9.6	42.7	49.7	9.2	38.1	34.5
South East	13.6	11.8	13.5	13.7	12.7	11.0
South West	8.4	4.6	3.6	8.7	5.0	5.8
East Anglia	9.2	7.0	6.3	9.4	8.2	10.1
East Midlands	7.3	5.2	2.7	7.4	5.6	5.7
West Midlands	9.1	8.4	6.6	8.7	7.4	7.4
Yorks & Humbs	8.7	5.5	4.5	9.0	6.0	8.1
North West	12.0	7.4	4.5	11.8	7.1	6.5
North East	4.7	1.4	1.8	4.7	1.7	1.5
Wales	5.2	1.8	1.6	5.2	1.9	3.0
Scotland	9.4	3.3	3.8	9.1	4.9	4.8
Northern Ireland	3.0	1.1	1.3	3.1	1.5	1.8

*Entries are the regional distribution of natives, earlier and recent immigrants in 1995 and 2006. "Earlier" immigrants are immigrants who have been in the UK for 2 or more years. "Recent" immigrants are immigrants who arrived in the UK within the previous two years.*

*Source: LFS, 1997-2012.*

**Table 5 - All non-tradable goods and services**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
Imm./nat. ratio	-0.048 (0.031)	-0.001 (0.046)	-0.087 (0.064)	-0.088 (0.088)	-0.111* (0.064)	-0.119 (0.080)
Employment rate		0.042 (0.069)		0.046 (0.070)		0.047 (0.071)
Log native population		0.087 (0.063)		0.001 (0.098)		-0.03 (0.090)
F-test for excluded instruments			66.76	58.39	83.08	95.87
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects before and after the crisis</b>						
Imm./nat. ratio 1997-2007	-0.077* (0.041)	-0.03 (0.056)	-0.155* (0.083)	-0.158 (0.112)	-0.142** (0.066)	-0.150* (0.082)
Imm./nat. ratio 2008 -2012	-0.005 (0.048)	0.03 (0.056)	0.032 (0.098)	0.031 (0.105)	-0.036 (0.149)	-0.042 (0.146)
Employment rate		0.042 (0.069)		0.044 (0.071)		0.045 (0.070)
Log native population		0.08 (0.064)		-0.004 (0.099)		-0.024 (0.092)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the immigrant-native ratio is interacted with a dummy for years 1997-2007 and with a dummy for years 2008-2012.*

*Newey-West standard errors in parenthesis.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*

**Table 6 - Items-sector matching: services and non-tradable goods**

<b>Item</b>	<b>Sector</b>	
Electrician-Daytime Rate/Hour	4531	Installation of electrical wiring and fittings
Plumber-Daytime Hourly Rate	4533	Plumbing
Decorator-Daily Rate;Spec Hrs	4543	Floor or wall covering
Auto Car Wash Car Mech Repairs-Labour/Hour Car Service- Local Garage Car Service- Main Dealer	5020	Motor vehicles repair
Pc Repair Tv Repair Washing Machine Repair	5272	Repair elec hhld goods
Watch Repair-Clean And Service	5273	Repair watches,clocks etc
Burger In Bun-Eat In Lemonade/Cola Draught Restaurant - Sweet Course Restaurant Cup Of Coffee Restaurant Main Course 1 Restaurant-Main Course-Lunch	5530	Restaurants
Burger In Bun- Takeaway Chinese Takeaway Coffee -Take-Away Fish & Chips Takeaway Indian Takeaway Kebab- Takeaway Pasty/Savoury Pie – Takeaway Pizza Takeaway Or Delivered Sandwich-Take-Away Takeaway Coffee Latte Takeaway Soft Drink Tea -Take-Away	5535	Take-away
Bottle Of Mixer 125-200ml Bottle Of Wine 70-75cl Bottled Premium Lager 4.3-7.5% Cider-1/2pt Or 275-340ml Bot Cider-Per Pint Or 500-568ml Draught Bitter (Per Pint) Draught Stout Per Pint Lager - Pint 3.4-4.2% Liqueur Per Nip Specify Ml Potato Crisps-Individual Pack Premium Lager - Pint 4.3-7.5% Pub -Hot Meal Pub: Cold Filled Roll/Sandwich Spirit Based Drink 275ml	5540	Public houses, bars, clubs

*Table continues on next page*



Item	Sector	
Vodka (Per Nip) Specify MI Whisky (Per Nip) Specify MI Wine, Per 175 - 250 MI Serving	5540	Public houses, bars, clubs
Primary School- Fixed Charge Secondary School- Cafeteria Staff Restaurant Main Course Staff Restaurant Sweet Staff Restaurnt Hot Snack Item	5551	Canteens
Catering-50 Set Menu Per Head	5552	Catering
Home Removal- 1 Van	6024	Freight transport by road
Car Park Charges	6321	Other land transport activities
Priv Rentd Unfurnishd Property Private Rented Furnished Prpty	7020	Letting of own property
Self-Drive Car Hire Basic 24hr Self-Drive Van Hire	7110	Car rental
Daily Film Dvd Rental	7140	Person,hhld eqt rental
House Conveyancing	7411	Legal activities
Window-Clean 3-Bed Semi	7470	Industrial cleaning
Driving Lesson 1 Hour	8041	Driving school activities
Eyesight Test Charge	8512	Medical practice activities
Private Dental Examination	8513	Dental practice activities
Nursing Home Residential Home	8531	Social work with accomodation
Child Minder - Hourly Rate Playgroup Fees - Per Session	8532	Social work without accommodation
Theatre Adult Eves-Front Stlls	9231	Artistic,literary creation etc
Leisure Centre Membership Squash Court- Evening	9262	Other sporting activities
Dry Cleaning-Man's Suit	9301	Washing,dry cleaning textiles,furs
Basic Manicure Full Leg Wax (Both Legs) Man's Haircut Womens Highlighting Women's Hrdressing-Cut/Blowdry	9302	Hairdressing,other beauty treatments
Dog Kennel Fees Daily Charge	9305	Other service activities
Domestic Cleaner Hourly Rate	9500	Private hhlds with employed person

*The table reports details of how non-tradable goods and services are grouped into 4 digit Sic 2003 sectors.*

**Table 7 - Sectoral characteristics**

Sector		% Below 10th wage percentile	Employment/ Total cost)
5540	Public houses, bars, clubs	0.504	0.196
5530	Restaurants	0.450	0.246 <sup>a</sup>
5535	Take-away	0.450	0.170 <sup>a</sup>
9302	Hairdressing, other beauty treatments	0.414	0.504
9301	Washing, dry cleaning textiles, furs	0.368	0.389
7470	Industrial cleaning	0.367	0.609
5552	Catering	0.333	0.349 <sup>a</sup>
5273	Repair watches,clocks etc	0.313	0.638 <sup>a</sup>
7140	Person,hhld equipmentt rental	0.252	0.310
5551	Canteens	0.207	0.607 <sup>a</sup>
9262	Other sporting activities	0.197	0.231
8531	Social work with accommodation	0.193	0.454
7110	Car rental	0.154	0.080
8532	Social work without accommodation	0.116	0.454
8513	Dental practice activities	0.114	0.501 <sup>b</sup>
5020	Motor vehicles repair	0.112	0.155
9305	Other service activities	0.109	0.066 <sup>a</sup>
9500	Private hhlds with employed person	0.102	
5272	Repair electric hhld goods	0.101	0.325 <sup>a</sup>
7020	Letting of own property	0.068	0.089
4543	Floor or wall covering	0.066	0.174 <sup>a</sup>
4531	Installation of electrical wiring and fittings	0.064	0.261 <sup>a</sup>
4533	Plumbing	0.062	0.265 <sup>a</sup>
6321	Other land transport activities	0.060	0.144 <sup>a</sup>
9231	Artistic,literary creation etc	0.052	0.156
7411	Legal activities	0.045	0.439
6024	Freight transport by road	0.044	0.283
8041	Driving school activities	0.040	0.438
8512	Medical practice activities	0.040	0.501 <sup>b</sup>

*The table reports the list of sectors in which non-tradable goods and services have been grouped. For each sector, the table also reports the share of workers earning a wage below the 10th percentile, and the ratio of employment costs to other costs.*

*a: Figure obtained through extrapolation of data for later years.*

*b: No 4 digit data available, 3 digit information reported*

*Source - wages: NESPD 1996-2010*

*Source - employment and total costs: ABI 1995.*

**Table 8 - Non-tradable goods and services, low wage sectors**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
Imm./nat. ratio	-0.092 (0.060)	-0.041 (0.089)	-0.286** (0.126)	-0.356** (0.176)	-0.315** (0.128)	-0.374** (0.159)
Employment rate		0.184 (0.133)		0.196 (0.138)		0.197 (0.139)
Log native population		0.087 (0.122)		-0.227 (0.194)		-0.245 (0.178)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects before and after the crisis</b>						
Imm./nat. ratio 1997-2007	-0.130 (0.079)	-0.079 (0.108)	-0.374** (0.164)	-0.469** (0.222)	0.350*** (0.131)	0.423*** (0.164)
Imm./nat. ratio 2008 -2012	-0.037 (0.092)	0.00 (0.107)	-0.131 (0.193)	-0.164 (0.209)	-0.234 (0.295)	-0.253 (0.291)
Employment rate		0.183 (0.133)		0.193 (0.138)		0.194 (0.138)
Log native population		0.077 (0.124)		-0.234 (0.196)		-0.235 (0.182)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the immigrant-native ratio is interacted with a dummy for years 1997-2007 and with a dummy for years 2008-2012.*

*Newey-West standard errors in parenthesis.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*

**Table 9 - Non-tradable goods and services, not low wage sectors**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
Imm./nat. ratio	-0.03 (0.071)	-0.005 (0.103)	0.003 (0.142)	0.029 (0.196)	-0.034 (0.142)	-0.026 (0.174)
Employment rate		-0.043 (0.158)		-0.044 (0.158)		-0.042 (0.158)
Log native population		0.05 (0.142)		0.084 (0.218)		0.03 (0.198)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects before and after the crisis</b>						
Imm./nat. ratio 1997-2007	-0.039 (0.092)	-0.013 (0.125)	-0.063 (0.186)	-0.031 (0.247)	-0.039 (0.146)	-0.029 (0.181)
Imm./nat. ratio 2008 -2012	-0.018 (0.110)	0.003 (0.127)	0.119 (0.219)	0.13 (0.233)	-0.023 (0.330)	-0.018 (0.321)
Employment rate		-0.043 (0.158)		-0.046 (0.159)		-0.043 (0.158)
Log native population		0.048 (0.144)		0.08 (0.220)		0.03 (0.203)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the immigrant-native ratio is interacted with a dummy for years 1997-2007 and with a dummy for years 2008-2012.

Newey-West standard errors in parenthesis.

\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%

**Table 10 - Non-tradable goods and services - Individual sectors**

	Floor or wall covering						take-away					
	FD	FD	IV - SP	IV - SP	IV 4 lags	IV 4 lags	FD	FD	IV - SP	IV - SP	IV 4 lags	IV 4 lags
Imm./nat. ratio	-0.162 (0.236)	-0.433 (0.343)	-0.749 (0.473)	-1.092* (0.629)	-1.000** (0.510)	-1.385** (0.644)	-0.130** (0.063)	-0.025 (0.093)	-0.277** (0.131)	-0.300* (0.181)	-0.241* (0.132)	-0.251 (0.162)
Imm./nat. ratio 1997 -2007	-0.101 (0.387)	-0.457 (0.507)	-1.011 (0.736)	-1.522* (0.924)	-0.972* (0.569)	-1.645** (0.739)	-0.210** (0.082)	-0.105 (0.113)	-0.385** (0.168)	-0.419* (0.226)	-0.328** (0.135)	-0.332** (0.166)
Imm./nat. ratio 2008 -2012	-0.198 (0.297)	-0.424 (0.364)	-0.481 (0.596)	-0.637 (0.641)	-1.036 (0.907)	-1.016 (0.840)	-0.015 (0.095)	0.064 (0.110)	-0.087 (0.198)	-0.099 (0.213)	-0.037 (0.302)	-0.048 (0.295)
N	120	120	120	120	120	120	180	180	180	180	180	180
	washing,dry cleaning textiles,furs						hairdressing,other beauty treatments					
	FD	FD	IV - SP	IV - SP	IV 4 lags	IV 4 lags	FD	FD	IV - SP	IV - SP	IV 4 lags	IV 4 lags
Imm./nat. ratio	-0.281** (0.111)	-0.246 (0.161)	-0.646*** (0.227)	-0.810*** (0.314)	-0.802*** (0.230)	-0.967*** (0.285)	-0.142 (0.095)	-0.176 (0.140)	-0.534*** (0.199)	-0.701** (0.280)	-0.604*** (0.202)	-0.711*** (0.252)
Imm./nat. ratio 1997 -2007	-0.307** (0.145)	-0.27 (0.195)	-0.685** (0.295)	-0.903** (0.396)	-0.662*** (0.240)	-0.880*** (0.298)	-0.246** (0.124)	-0.304* (0.170)	-0.606** (0.258)	-0.827** (0.351)	-0.480** (0.211)	-0.659** (0.263)
Imm./nat. ratio 2008 -2012	-0.244 (0.172)	-0.22 (0.197)	-0.577* (0.349)	-0.651* (0.373)	-1.130** (0.545)	-1.187** (0.531)	0.01 (0.145)	-0.034 (0.168)	-0.408 (0.305)	-0.488 (0.330)	-0.897* (0.479)	-0.841* (0.467)
N	180	180	180	180	180	180	180	180	180	180	180	180

The table reports results from regressions of the average change in logarithm of the CPI of items in each sector on the change in the ratio of immigrants to natives. IV is the supply push component or the fourth lag of the ratio of immigrants to natives.

Newey-West standard errors in parenthesis.

\*\*\* denotes significance at 1%, \*\* at 5%, \* at 10%.

**Table 11 - All tradable goods**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
Imm./nat. ratio	0.03 (0.034)	0.036 (0.050)	0.053 (0.070)	0.069 (0.095)	0.02 (0.070)	0.025 (0.085)
Employment rate		-0.078 (0.075)		-0.079 (0.075)		-0.077 (0.075)
Log native population		0.016 (0.068)		0.049 (0.105)		0.005 (0.096)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects before and after the crisis</b>						
Imm./nat. ratio 1997-2007	0.042 (0.044)	0.051 (0.060)	0.112 (0.091)	0.134 (0.121)	0.091 (0.073)	0.090 (0.090)
Imm./nat. ratio 2008 -2012	0.011 (0.052)	0.019 (0.060)	-0.050 (0.107)	-0.042 (0.114)	-0.149 (0.165)	-0.136 (0.159)
Employment rate		-0.078 (0.075)		-0.077 (0.076)		-0.074 (0.077)
Log native population		0.020 (0.069)		0.053 (0.107)		-0.009 (0.100)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

Dependent variable is the change in logarithm of the average regional CPI of tradable goods. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the immigrant-native ratio is interacted with a dummy for years 1997-2007 and with a dummy for years 2008-2012.

Newey-West standard errors in parenthesis.

\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%

**Table 12 - Items-sector matching: tradable goods**

<b>Item</b>	<b>Sector</b>	
Potatoes- Baking Pr Kg Potatoes- Old White Per Kg Potatoes-New-Loose-Per Kg	111	Growing of cereals and other crops nes
Fresh Veg- Lettuce- Round Fresh Veg-Cabbage-Whole-Per Kg Fresh Veg-Carrots-Per Kg Fresh Veg-Cauliflower-Each Fresh Veg-Cucumber-Whole Fresh Veg-Lettuce-Iceberg-Each Fresh Veg-Mushrooms-Per Kg Fresh Veg-Onions-Per Kg Fresh Veg-Organic Carrots Kg Fresh Veg-Sprouts-Per Kg Fresh Veg-Tomatoes-Per Kg	112	Growing of vegetables, horticultural specialities and nursery products
Apples-Cooking-Per Kg Apples-Dessert-Per Kg Avocado Pear-Each Bananas-Per Kg Grapefruit-Each Grapes-Per Kg Kiwi Fruit-Each Oranges-Class 1-Each Pears-Dessert-Per Kg	113	Growing of fruit, nuts and spice crops
Frzen Imp Lamb: Leg (Per Kg) H-Kill Pork-Boneless Shoulder H-Killed Beef Braising Steak Home Killed Beef-Lean Mince Kg Home Killed Beef-Topside Kg Home Killed Lamb-Loin Chops Kg Home Killed Lamb-Shoulder Kg Home Killed Minced Lamb Kg Home Killed Pork-Loin Chops Kg Home Kld Beef-Rump/Popes Steak Imp Lamb Loin Chop-Bone Per Kg	1511	Production and preserving of meat
Fresh Boneless Chicken Breast Fresh Turkey Steaks Per Kg Fresh/Chilled Chicken Per Kg Frozen Chicken Breasts Frzen Roasting Chicken Per Kg	1512	Production and preserving of poultry meat
Bacon-Back-Per Kg Bacon-Gammon-Per Kg Canned Meat-Corned Beef Canned Meat-Stewed Steak Cooked Ham Loose Specify Type Cooked Ham Prepacked Sliced Cooked Meat - Sliced Turkey Frozen Beefburgers Pack Of 4 Individual Meat Pie Pork Pie-Individual-Not Buffet Salami-Sliced Sausages-Pork-Per Kg	1513	Production of meat and poultry meat products

*Table continues on next page*

<b>Item</b>	<b>Sector</b>
Canned Fish-Tuna-180-200g Fresh Fish-Salmon Fillets-Kg Fresh White Fish Fillets Kg Frozen Fish Fingers 8-12 Pk Frozen Prawns Per Kg	1520 Processing and preserving of fish and fish products
Frozen Chips 900g-1kg Potato Crisps-25g/40g Potato Crisps-Multi-Pack Potato Flavour Snack In Tube Premium Potato Crisps/Chips	1531 Processing and preserving of potatoes
Fresh/Chilled Orange Juice 1l Fruit Drink Bottle 4-8 Pack Fruit Juice Not Orange 1l Fruit Squash, 750ml - 1.5lt Pure Orange Juice- Pack 3/4 Pure Orange Juice-1 Ltr Carton	1532 Manufacture of fruit and vegetable juice
Baked Beans, 400-420g Tin Canned Fruit-400-450g Canned Sweetcorn 198-340g Canned Tomatoes 390-400g Frozen Garden Peas 800g-1kg Packet Of Peanuts 100-200g Pre-Packed Salad 100-250g Vegetable Pickle 280-360g	1533 Processing and preserving of fruit and vegetables
Olive Oil - 500ml - 1 Litre	1541 Manufacture of crude oil and fats
Margarine/Low Fat Spread-500g	1543 Manufacture of margarine and similar edible fats
Brie Per Kg Butter-Home Produced-250g Cheddar-Home Produced Per Kg Cheddar-Imported-Per Kg Cheese Spread, 160g-200g Tub Chilled Pot Dessert 125-200g Edam Per Kg Eggs-Large-Per Doz Or 2 X 6 Eggs-Medium-Per Doz Or 2 X 6 Fresh Double Cream 284ml-300ml Hard Regional Cheese Per Kg Hot Milk Drink-300-400g Milk- Flavoured 500-568ml Milk Semi-Per 2 Pints/1.136 L Shop Milk-Pasteurised-4pt/2ltr Yoghurt/Fromage 4-6pk-50-125g Yoghurt/Fromage Frais-Small	1551 Manufacture of dairy products
Choc Covered Ice Cream Bar Ice Cream 500ml-1l	1552 Manufacture of ice cream
Breakfast Cereal 1 Breakfast Cereal 2 Corn Snack Single Packet Flour-Self-Raising-1.5kg Muesli 500g - 1kg	1561 Manufacture of grain mill products
Basmati Rice 500g-1kg	1562 Manufacture of starches and starch products

*Table continues on next page*



Item	Sector	
Cat Food Pouch 85-100g Cat Food-Can-385-400gm Complete Dry Dog Food 2-3kg Dog Food-Can-385-400gm	1572	Manufacture of prepared pet foods
Brown Sliced Loaf Branded 400g French Stick/Baguette Large Loaf-White-Unsliced-800g Pack Of 5-6 Individual Cakes Pitta Bread Six Bread Rolls-White/Brown White Sliced Loaf Branded 800g Whole Sponge Cake Not Frozen Wholemeal Sliced Loaf Branded	1581	Manufacture of bread, fresh pastry goods and cakes
Cream Crackers Pack 200g-300g Plain Biscuits-200-300g	1582	Manufacture of rusks and biscuits, of preserved pastry goods and cakes
Sugar -Granulated-White-Per Kg	1583	Manufacture of sugar
Bag Of Sweets 150 - 250g Candy Coated Chocolate Carton/Box Of Chocolates Chewing/Bubble Gum-Single Pk Choc Coated Biscuits-200-300g Choc Ctd Biscs-Ind Wrapd 6-8pk Chocolate 10 Chocolate 11 Chocolate 4 Chocolate 8 Chocolate Coated Peanut Doughnut-Each Frozn Cake/Gateau No Ice-Cream Fruit Pastilles 2 Fruit Pies-6 Pack Jar Of Jam-340-454g Mints	1584	Manufacture of cocoa, chocolate and sugar confectionery
Dry Spaghetti Or Pasta 500g	1585	Manufacture of macaroni, noodles, couscous and similar farinaceous products
Coffee: Ground: Filter Fine Coffee-Instant-100g Jar Tea Bags 1 Packet Of 80 (250g) Tea Bags-2-Packet Of 240	1586	Processing of tea and coffee
Cook-In Sauce-Jar/Can 350-520g Mayonnaise 400g-500g Tomato Ketchup	1587	Manufacture of condiments and seasoning
Baby Food-Can/Jar Diet-Aid Drink Powder 420-468g Powdered Baby Formula	1588	Manufacture of homogenised food preparation and dietetic food

*Table continues on next page*

<b>Item</b>	<b>Sector</b>	
Canned Soup-390-425g Chill Red Fat Ready Meal Chilled Rdy-Cookd Meal-Serve 1 Coleslaw-Plain-200-250g Dried Potted Snack 50-120g Froz Veg Burger/Grill 200-454g Frozen Pizza-Med Size-300-450g Frozen Veg Ready Meal 300-350g Frzn Ready-Cookd Meal Serves 1	1589	Manufacture of other food products nes
Brandy-68-70 Cl Bottle Vodka-70 Cl Bottle Whisky-70 Cl Bottle	1591	Manufacture of distilled potable alcoholic beverages
Fortified Wine (70-75cl) Imported Sparkling Wine 75cl Red Wine- European 75cl Red Wine- New World 75cl White Wine- European 75cl White Wine- New World 75cl	1593	Manufacture of wines
Spirit Based Drink 275ml	1595	Manufacture of other non-distilled fermented beverages
Bitter-4cans-440-500ml Lager 12 - 24 Cans (440-500ml) Lager 4 Bottles- Premium Lager 4 Cans- Premium 4.3-7.5% Lager Stubbies 4.3-7.5% Abv	1596	Manufacture of beer
Coca/Pepsi Cola 330ml Can Cola Flavoured Drink-2 Ltr Btl Fizzy Canned Drink 330ml Fizzy Energy Drink 250-500ml Lemonade-2 Litre Bottle Mineral Water Still 1.5-2l Pk6/8 Fizzy Drink/Cola Cans	1598	Manufacture of mineral waters and soft drinks
5 Cigars: Specify Brand Cigarettes 10 Cigarettes 12 Cigarettes 13 Cigarettes 14 Cigarettes 15 Cigarettes 18 Cigarettes 2 Cigarettes 8 Hand Rolling Tobacco-25gm	1600	Manufacture of tobacco products
Knitting Wool-Double Knit-100g	1712	Preparation and spinning of woollen-type fibres
Dishcloths Pack Of 10	1754	Manufacture of other textiles not elsewhere classified
Kitchen Roll Tissues-Large Size Box Toilet Rolls	2122	Manufacture of hh and sanitary goods and of toilet requisites
Greetings Card; State Code Packet Of Envelopes Writing Paper Pad-20-50sheeets	2123	Manufacture of paper stationery

*Table continues on next page*

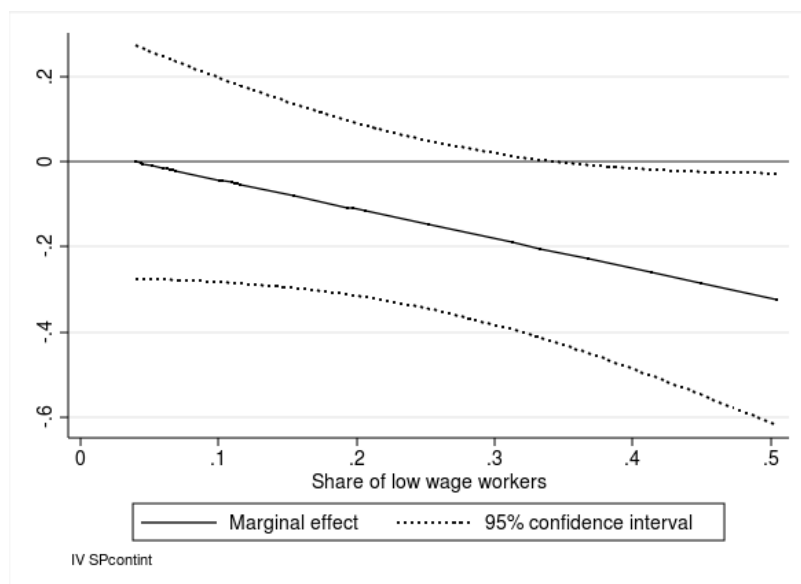
Item	Sector	
Coal-Household Best Qual 50kg Kerosene - 1000l Delivered Oil Per Litre-Multigrade Smokeless Fuel 50kg Ultra Low Sulphur Petrol 10l Ultra-Low Sulphur Diesel 10l	2320	Manufacture of refined petroleum products
Black Inkjet Cartridge	2430	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
Bleach 750ml Fabric Conditioner (750ml-1lt Household Cleaner Cream/Liquid Washing Powder – Automatic Washing Up Liquid-400-600ml	2451	Manufacture of soap and detergents, cleaning and polishing preparations
Refuse Sack From Pack Of 10-20	2522	Manufacture of plastic packing goods
Aluminium Cooking Foil 300mm	2872	Manufacture of light metal packaging
Dish Washer 12-15 Place Set Electric Cooker Electric Hair Styling App Electric Iron Electric Kettle - 1.5-1.7l Food Processor-Standard-1 Bowl Fridge Freezer Rs 2010-11 Microwave (State If Combined) Smoke Alarm-Standard Single Vacuum Cleaner Washing Machine Rs 2010-11	2971	Manufacture of electric domestic appliances
Drycell Battery-Pack Of 4	3140	Manufacture of accumulators, primary cells and primary batteries
Light Bulb	3150	Manufacture of lighting equipment and electric lamps
Phone Nt Mobile(Spec Dig/Anal)	3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
Contact Lens-Soft Per Pair Daily Disposable Contact Lense Prescription Lenses Spectacle Frames Spectacle Frames With Lense Brake Pads, 2 Front Pairs	3340	Manufacture of optical instruments and photographic equipment
Car Battery Childs Car Seat Oil Filter Steering Lock Device Tyres-Tubeless Radial Windscreen Wiper Blades	3430	Manufacture of parts and accessories for motor vehicles and their engines
Plastic Food Storage Container	3613	Manufacture of other kitchen furniture
Animal Cage (E.G For Gerbil) Ball Point Clear Sticky Tape	3663	Other manufacturing nes

*The table reports details of how tradable goods are grouped into 4 digit Sic 2003 sectors.*

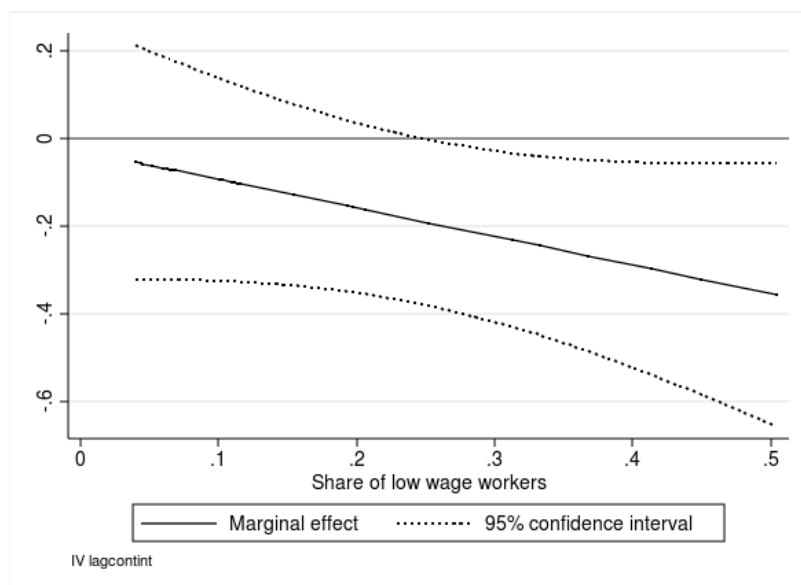
## Figures

**Figure 1 - Effect on prices of services as a function of low wage workers in a sector, 1997-2012**

*Figure 1a – IV is the supply push component*



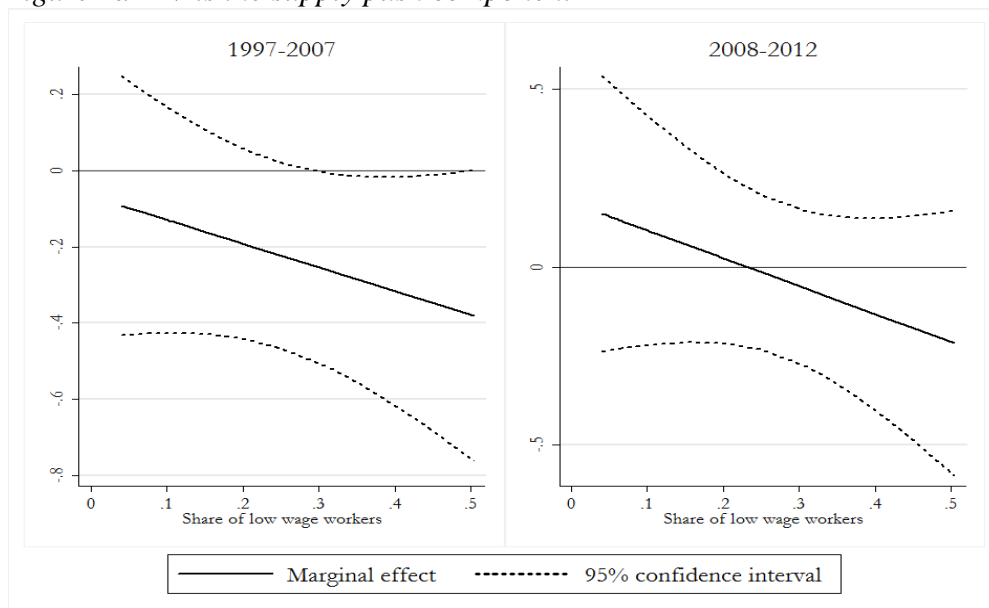
*Figure 1b – IV is the fourth lag of the immigrant-native ratio*



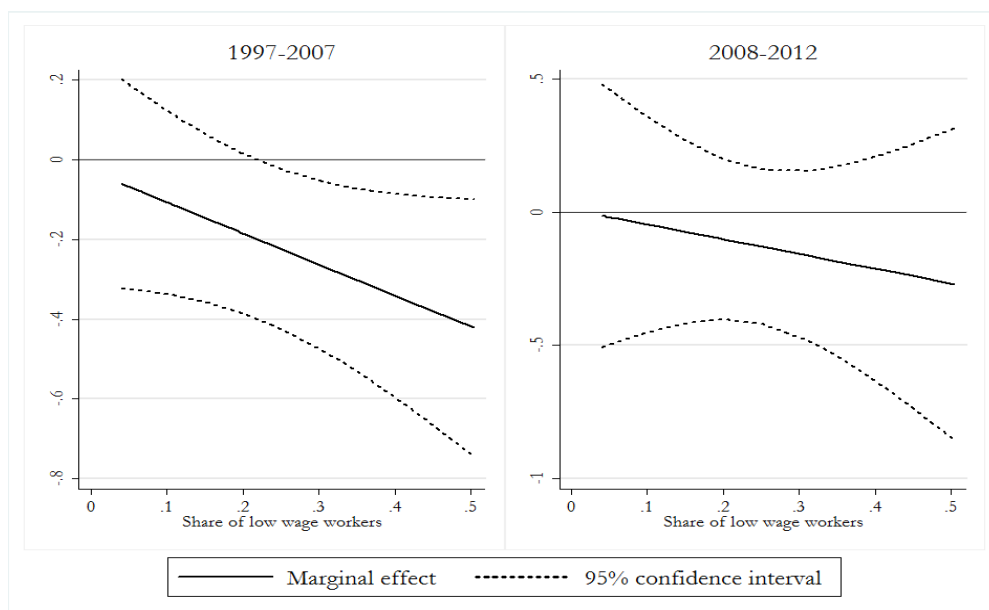
The figure plots the marginal impact of immigration on average prices of non-tradable goods and services as a function of low-wage workers in each sector. Figure a reports results when the IV is the supply push component while Figure b reports results when the IV is the fourth lag of the immigrant native ratio.

**Figure 2 - Effect on prices of services as a function of low wage workers in a sector, pre- and post- recession years**

*Figure 2a - IV is the supply push component*



*Figure 2b – IV is the fourth lag of the immigrant-native ratio*



The figure plots the marginal impact of immigration on average prices of non-tradable goods and services as a function of low- wage workers in each sector for years 1997-2007 and 2008-2012. Figure a reports results when the IV is the supply push component while Figure b reports results when the IV is the fourth lag of the immigrant native ratio.

## Appendix

**Table A1 – Differential effects by time period**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: All non-tradable goods and services</b>						
Imm./nat. ratio 1997-2003	-0.043 (0.051)	-0.002 (0.061)	0.036 (0.104)	0.049 (0.120)	-0.014 (0.083)	-0.017 (0.090)
Imm./nat. ratio 2004-2007	-0.138** (0.067)	-0.091 (0.080)	-0.289** (0.120)	-0.273* (0.140)	-0.293*** (0.101)	-0.304** (0.119)
Imm./nat. ratio 2008 -2012	-0.005 (0.048)	0.027 (0.055)	0.032 (0.097)	0.038 (0.103)	-0.036 (0.147)	-0.045 (0.144)
<b>Panel B: Low wage sectors</b>						
Imm./nat. ratio 1997-2003	-0.058 (0.098)	-0.014 (0.119)	-0.112 (0.201)	-0.165 (0.233)	-0.159 (0.165)	-0.196 (0.180)
Imm./nat. ratio 2004-2007	-0.254** (0.129)	-0.218 (0.154)	-0.558** (0.234)	-0.638** (0.276)	-0.575*** (0.200)	-0.684*** (0.236)
Imm./nat. ratio 2008 -2012	-0.037 (0.092)	-0.007 (0.106)	-0.131 (0.189)	-0.154 (0.203)	-0.234 (0.291)	-0.258 (0.286)
<b>Panel C: Not low wage sectors</b>						
Imm./nat. ratio 1997-2003	-0.031 (0.116)	-0.009 (0.139)	0.142 (0.235)	0.182 (0.272)	0.169 (0.187)	0.175 (0.202)
Imm./nat. ratio 2004-2007	-0.053 (0.152)	-0.021 (0.181)	-0.206 (0.270)	-0.149 (0.316)	-0.282 (0.228)	-0.264 (0.266)
Imm./nat. ratio 2008 -2012	-0.018 (0.110)	0.002 (0.127)	0.119 (0.219)	0.137 (0.233)	-0.023 (0.330)	-0.023 (0.322)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Employment rate and log native population	No	Yes	No	Yes	No	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6.*

*Newey-West standard errors in parenthesis.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*

**Table A2 - All non-tradable goods and services, by origin**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
EEA/nat. ratio	-0.01 (0.015)	-0.004 (0.016)	-0.048 (0.068)	-0.073 (0.091)	-0.120* (0.069)	-0.146 (0.091)
Non-EEA/nat. ratio	-0.005 (0.006)	-0.003 (0.006)	-0.027 (0.022)	-0.024 (0.024)	-0.002 (0.024)	0.001 (0.027)
Employment rate		0.04 (0.071)		0.041 (0.103)		0.109 (0.107)
Log native population		0.075 (0.048)		-0.086 (0.110)		-0.103 (0.126)
F-test excl inst. EEA			8.30	4.86	8.08	4.68
F-test excl inst. Non-EEA			11.08	9.85	10.21	7.47
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects by time period</b>						
EEA/nat. ratio 1997-2003	-0.043 (0.033)	-0.035 (0.034)	0.011 (0.099)	-0.002 (0.103)	1.637 (31.407)	-0.825 (2.401)
EEA/nat. ratio 2004-2007	-0.012 (0.028)	-0.007 (0.029)	0.046 (0.056)	0.031 (0.054)	1.042 (4.057)	-1.203 (18.851)
EEA/nat. ratio 2008 -2012	0.013 (0.025)	0.02 (0.026)	-0.066 (0.070)	-0.084 (0.077)	-0.115 (1.185)	-0.198 (1.189)
Non-EEA/nat. ratio 1997-2003	-0.002 (0.008)	0.002 (0.008)	0.003 (0.015)	0 (0.016)	-0.68 (12.974)	0.383 (1.040)
Non-EEA/nat. ratio 2004-2007	-0.052** (0.024)	-0.040 (0.027)	-0.218** (0.094)	-0.230** (0.102)	-1.189 (4.086)	1.233 (20.422)
Non-EEA/nat. ratio 2008 -2012	-0.01 (0.009)	-0.01 (0.010)	-0.012 (0.022)	-0.009 (0.023)	0.013 (0.202)	0.042 (0.289)
Employment rate		0.038 (0.070)		0.034 (0.089)		0.677 (5.184)
Log native population		0.055 (0.057)		-0.121 (0.114)		0.841 (7.557)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the EEA/native ratio and the non-EEA/native ratio are interacted with a dummy for years 1997-2003, with a dummy for years 2004-2007 and with a dummy for years 2008-2012.*

*Newey-West standard errors in parenthesis.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*

**Table A3 - Non-tradable goods and services, low wage sectors; by origin**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
EEA/nat. ratio	0.019 (0.029)	0.028 (0.031)	-0.223 (0.150)	-0.324 (0.211)	-0.317** (0.160)	-0.353* (0.202)
Non-EEA/nat. ratio	-0.013 (0.011)	-0.007 (0.011)	-0.02 (0.047)	-0.003 (0.054)	0.073 (0.054)	0.089 (0.060)
Employment rate		0.16 (0.135)		0.321 (0.236)		0.463** (0.236)
Log native population		0.143 (0.093)		-0.317 (0.252)		-0.061 (0.279)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects by time period</b>						
EEA/nat. ratio 1997-2003	0.036 (0.063)	0.045 (0.065)	-0.097 (0.197)	-0.119 (0.204)	3.289 (55.101)	-0.533 (4.855)
EEA/nat. ratio 2004 -2007	-0.018 (0.055)	-0.015 (0.057)	0.126 (0.108)	0.079 (0.104)	0.755 (7.081)	-3.018 (37.970)
EEA/nat. ratio 2008 -2012	0.023 (0.048)	0.029 (0.051)	-0.131 (0.138)	-0.177 (0.151)	0.089 (2.036)	-0.062 (2.429)
Non-EEA/nat. ratio 1997-2003	-0.015 (0.015)	-0.008 (0.016)	-0.002 (0.029)	-0.014 (0.029)	-1.424 (22.761)	0.228 (2.117)
Non-EEA/nat. ratio 2004 -2007	-0.099** (0.046)	-0.079 (0.051)	-0.466** (0.186)	-0.498** (0.202)	-1.041 (7.135)	3.013 (41.143)
Non-EEA/nat. ratio 2008 -2012	-0.007 (0.018)	-0.006 (0.019)	0.023 (0.044)	0.032 (0.046)	0.027 (0.345)	0.077 (0.589)
Employment rate		0.17 (0.135)		0.214 (0.173)		1.195 (10.474)
Log native population		0.08 (0.110)		-0.351 (0.223)		1.349 (15.276)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the EEA/native ratio and the non-EEA/native ratio are interacted with a dummy for years 1997-2003, with a dummy for years 2004-2007 and with a dummy for years 2008-2012.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*



**Table A4 - Non-tradable goods and services, not low wage sectors; by origin**

	OLS (1)	OLS (2)	IV - SP (3)	IV - SP (4)	IV -4th lag (5)	IV -4th lag (6)
<b>Panel A: Years 1997-2012</b>						
EEA/nat. ratio	-0.046 (0.035)	-0.047 (0.037)	0.052 (0.149)	0.043 (0.192)	-0.026 (0.142)	-0.009 (0.176)
Non-EEA/nat. ratio	-0.001 (0.013)	-0.002 (0.013)	-0.05 (0.046)	-0.053 (0.049)	0.012 (0.048)	0.011 (0.052)
Employment rate		-0.026 (0.160)		-0.137 (0.214)		-0.024 (0.204)
Log native population		-0.014 (0.110)		-0.059 (0.229)		0.08 (0.242)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180
<b>Panel B: Differential effects by time period</b>						
EEA/nat. ratio 1997-2003	-0.153** (0.073)	-0.156** (0.076)	0.171 (0.211)	0.143 (0.214)	4.118 (66.727)	-0.189 (3.906)
EEA/nat. ratio 2004 -2007	-0.004 (0.064)	-0.005 (0.067)	0.091 (0.117)	0.08 (0.112)	0.594 (8.611)	-2.353 (30.559)
EEA/nat. ratio 2008 -2012	-0.007 (0.057)	-0.009 (0.060)	-0.064 (0.149)	-0.086 (0.161)	0.147 (2.508)	0.085 (1.952)
Non-EEA/nat. ratio 1997-2003	0.006 (0.018)	0.004 (0.019)	-0.003 (0.032)	-0.004 (0.033)	-1.633 (27.565)	0.217 (1.702)
Non-EEA/nat. ratio 2004 -2007	-0.021 (0.055)	-0.026 (0.061)	-0.227 (0.199)	-0.239 (0.213)	-0.733 (8.674)	2.497 (33.112)
Non-EEA/nat. ratio 2008 -2012	-0.014 (0.021)	-0.014 (0.022)	-0.032 (0.048)	-0.03 (0.049)	-0.007 (0.426)	0.024 (0.473)
Employment rate		-0.035 (0.159)		-0.102 (0.186)		0.696 (8.427)
Log native population		-0.024 (0.129)		-0.116 (0.238)		1.321 (12.290)
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
N	180	180	180	180	180	180

*Dependent variable is the change in logarithm of the average regional CPI of non-tradable goods and services. IV is the supply push component in columns 3 and 4, and the fourth lag of the ratio of immigrants to natives in columns 5 and 6. In panel B the change in the EEA/native ratio and the non-EEA/native ratio are interacted with a dummy for years 1997-2003, with a dummy for years 2004-2007 and with a dummy for years 2008-2012.*

*\*\* \*denotes significance at 1%, \*\* at 5%, \* at 10%*