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The Effects of Immigration on Household Services, Labour Supply and Fertility

Agnese Romiti

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Agnese Romiti (IAB)

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Abstract

Fertility and female labour force participation are no longer negatively correlated in developed countries. Recently, the role of immigration has been put forward as a driving factor among others. Increased immigration affects supply and prices of household services, which are relevant for fertility and employment decisions. This paper analyses the effect of immigration on labour supply and fertility of native women in the UK, with a focus on the role of immigration on household services. Adopting an instrumental variable approach based on the country-specific past distribution of immigrants at regional level, I find that immigration increases female labour supply, without affecting fertility. My results show that immigration increases the size of the childcare sector, and reduces its prices, suggesting that immigrants may ease the trade-off between working and child rearing among native women.

Zusammenfassung

In den Industrieländern korreliert die Geburtenrate heutzutage nicht mehr negativ mit der Teilnahme von Frauen am Arbeitsmarkt. In aktuellen Studien wird neben anderen Faktoren ein Zusammenhang mit Immigration hergestellt. Immigration beeinflusst das Angebot und die Preise von haushaltsnahen Dienstleistungen, welche eine wichtige Rolle für die Familienplanung und die Arbeitsentscheidungen der heimischen Bevölkerung spielen. Diese Arbeit analysiert den Effekt von Immigration auf die Beschäftigungsentscheidung von Frauen im Vereinigten Königreich unter dem Gesichtspunkt der verbesserten Verfügbarkeit von haushaltsnahen Dienstleistungen. Unter Verwendung der länderspezifischen Verteilung von Immigranten über Regionen in der Vergangenheit als Instrument für die Immigration heute wird gezeigt, dass Immigration zu mehr Beschäftigung von Frauen führt, ohne die Geburtenrate negativ zu beeinflussen. Desweiteren lässt sich zeigen, dass Immigration die Verfügbarkeit und den Preis von Angeboten im Bereich der Kinderbetreuung verbessert. Diese Ergebnisse deuten darauf hin, dass Immigration für Frauen in der heimischen Bevölkerung zu einer verbesserten Vereinbarkeit von Beruf und Familie führt.

JEL classification: D10, F22, J13, J22, J61.

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1 Introduction

After the mid-1980s the negative relationship between fertility and female labour force participation has reversed across developed countries (Ahn and Mira, 2002; Rindfuss et al., 2003). Rich countries with higher female labour force participation also enjoy higher total fertility rate (TFR). This trend seems to be explained by country-specific factors, and by country-heterogeneity in the magnitude of the negative within-country correlation (Kögel, 2004). Institutional factors, labour market rigidities, and unemployment have been considered responsible for this reversal (Adserà, 2004).

More recently Furtado and Hock (2010) pointed to an additional potential explanation: the role played by low skilled immigrants in the childcare sector. Household services, in particular childcare, provided by immigrants can be more flexible in terms of opening hours and more convenient in terms of proximity with respect to existing services provided by natives, thus more compatible with full-time jobs or a long working schedule.[1] Higher availability ultimately translates into an indirect reduction in the costs of these services, such as search costs. In addition, inflows of immigrants can directly reduce their market cost, pushing down the wages of those employed in this sector. Given the broad evidence that reduced childcare costs have a positive effect on both fertility and labour force participation, immigration can ultimately have an impact on their correlation, by easing the trade-off between the labour supply and fertility.

This paper analyses the effect of immigration on labour supply and fertility decisions of native women in the UK in the years 2000-2007, with a focus on the role of immigration on household services, and in particular on childcare. In order to identify the effect of immigration I use panel data in addition to an instrumental variable approach based on the past country-specific distribution of immigrants across regions. This instrumental variable strategy allows us to isolate the causal effect of immigration on labour supply and fertility. The individual fixed effects control for potential omitted variables related to unobserved individual characteristics and the presence of immigrants, not controlled for by my instrumental variable strategy. I look at native women in reproductive age, and, thanks to the longitudinal dimension of the data, I can construct an appropriate measure of fertility, identifying the timing of the decision. In order to learn whether the mechanism driving my results is due to an immigrant-induced reduction in childcare costs, I complement the analysis by looking at the effect of immigration on the labour market structure of household services.

My results show that immigrants increase the labour supply of women at the intensive margin, without affecting fertility decisions. The effect is driven by more educated women, and women with young children. The results seem to be driven by the contribution of immigrants to household production, since higher shares of immigrants in the local labour force rise the market size of childcare services, and reduce their market costs. Overall, I interpret these effects as operating through a reduction in the negative correlation between fertility and labour supply, driven by the immigrant-induced reduction in the cost of childcare.[2]

This paper contributes to the literature on the impact of immigration on the host country

[1] The higher flexibility provided by immigrants is evident comparing the difference in weekly hours worked between immigrants and natives working in the household services sector. Immigrants work 3.57 hours per week more than natives (QLFS, 2000-2007), whereas the gap in other sectors is much lower (+1.29 hrs).

[2] My results are robust to potential omitted factors which can be linked to the production side of the economy, such as complementarity effects as well as to endogenous mobility of natives.

labour market. Despite the broad evidence on the effect of immigration on labour supply, the evidence on fertility is still scarce. To my knowledge, only Furtado (2016) recently analysed the effect of low-skilled immigration on fertility decisions for highly educated women in the US. I look at the UK, which has a different and more generous childcare system than the US.[3]

The UK seems to be particularly suitable for my question. First of all, it is one of the countries experiencing, over the last two decades, a positive correlation between fertility and female labour force participation.[4] My descriptive evidence also confirms these aggregate features and suggests that the reduction in the negative correlation between labour supply and fertility seems to be driven by more educated women. Over the period of my analysis the unconditional correlation coefficient between labour force participation and fertility (defined as having a child of age zero) decreases by 14.6 percent, as opposed to 23.67 percent for high educated women (see Figure 1). In addition, over the same period, the country has witnessed a steady increase in the number of immigrants.[5]

Furtado and Hock (2010) present the first study looking at the effect of low skilled immigration on the trade-off between fertility and labour supply. Their analysis looks at the aggregate level, and concentrates only on highly educated women using cells defined by age-brackets, city and time. The results show that immigrants, by increasing the size and reducing the market cost of childcare services, reduce the negative correlation between fertility and labour supply for highly educated US women.

In theory the effect of a reduction in childcare cost on fertility and labour supply decisions is ambiguous, depending on which mechanism prevails between substitution and income effect (Willis, 1973; Blau and Robins, 1989). If the child is a normal good, a reduction in the cost of child rearing would increase the demand for children through the standard income effect, as a consequence the labour supply decreases. On the contrary, the labour supply would increase if the substitution effect prevails, given the increased opportunity cost of child-rearing brought about by a reduction in childcare costs. In addition, the income elasticity of demand for children can be rather small with respect to the quality income elasticity (Becker, 1965), in particular for high-earning women. Women may react by increasing the quality of childcare instead of having an additional child. On the other hand, if immigrants reduce the cost of household services, the theory (Cortès and Tessada, 2011), confirmed by broad empirical evidence (Cortès and Tessada, 2011; Barone and Mocetti, 2011; Farrè et al., 2011), suggests that high educated (wage) women react by increasing their labour supply. Given the time constraint, this may come at a cost of reducing fertility. An increase in fertility or an absence of reduction thereof would occur only if immigrants, in addition to reducing the cost of childcare also reduce the negative correlation between child-rearing and work, by easing the trade-off between the two decisions.

Furtado (2016) is the only existing study I am aware of that looks at the relationship between immigration and fertility decisions at the individual level. The author analyses only

[3] Starting from April 2004 all Local Education Authority in the UK have been mandated to provide free nursery places for all 3- and 4-years old children for 12.5 hours a week and for 33 weeks per year.

[4] Between 1995 and 2008 both TFR and female labour force participation followed an upward trend. The TFR was equal to 1.7 in 1995 and reached 1.96 in 2008 (Office for National Statistics, ONS), a value only slightly below the replacement level (2.1). Over the same time-span, the labour force participation for women increased from 71 percent to 74 percent (QLFS).

[5] In the mid 1990s, immigrants represented 6.7 percent of the working age population (QLFS), and they reached 12 percent in 2008.

high skilled women in the US and, due to the lack of longitudinal data, models the fertility decision by an indicator of having a child of age zero, and then links this indicator to the current immigration. By exploiting the same instrumental variable approach as I do, the main findings of Furtado (2016) show that low-skilled immigration raises the probability of having a recently born child, as well as the joint probability of working long hours and having a recently born child.

This paper is closely related to the literature on the impact of immigration on the host country labour market, it is also close to the literature on the impact of childcare costs on female labour supply and fertility decisions. Different studies show that immigration contributes to the household production by either increasing the availability of household services or reducing their market cost (Barone and Mocetti, 2011; Cortès and Tessada, 2011; Farrè et al., 2011; Cortès and Pan, 2013). At the same time immigration brings about a positive impact on high skilled native female labour supply, mainly at the intensive margin (Barone and Mocetti, 2011; Cortès and Tessada, 2011; Forlani et al., 2015).[6] Cortès and Tessada (2011) represents the first study analyzing this question for the US and providing the theoretical underpinning. They find that low-skilled immigrants affect the intensive margin of the labour supply of native women at the top quartile of the wage distribution, at the same time reducing the time women spend on housework and increasing the expenditures on housekeeping services. Barone and Mocetti (2011), Farrè et al. (2011), Cortès and Pan (2013), and Forlani et al. (2015) use a similar identification strategy and confirm similar results for other countries.

The relationship between childcare, labour supply and fertility decisions has been extensively analysed as well. Several studies exploiting policy variation show that lower costs of childcare increase female labour supply: Cascio (2009) for the US, Baker et al. (2008), and Lefebvre and Merrigan (2008) for Canada, and recently Bauernschuster and Schlotter (2015) for Germany, among others.[7] At the same time several papers also exploiting variation introduced by policies, share the evidence on the negative effect of childcare costs on fertility: Milligan (2005), Cohen et al. (2013), Mörk et al. (2013), and Bauernschuster et al. (2015).[8]

The rest of the paper is organised as follows: Section 2 presents the identification strategy. First I start describing the aggregate analysis in Section 3: Section 3.1 defines the empirical specification, Section 3.2 describes the data, and Section 3.3 the relevant results. Then I move to the individual analysis in Section 4, by describing the empirical specification in Section 4.1, moving to the data in Section 4.2, and to the results in Section 4.3. Sections 4.4 and 4.5 refer to the heterogeneity of the results by education, and by presence of young children, respectively, whereas Section 4.6 presents the robustness checks. I close with Section 5 with few concluding remarks and a discussion.

[6] Only Farrè et al. (2011) find that the results are driven by the extensive margin.

[7] To my knowledge, the only two examples finding a null effect are Lundin et al. (2008) and Havnes and Mogstad (2011).

[8] Other studies using different identification strategies not based on exogenous policy variations find positive effects of childcare availability on female labour supply or fertility decisions (Del Boca, 2002; Hank and Kreyenfeld, 2003; Del Boca and Vuri, 2007; Del Boca et al., 2009; Rindfuss et al., 2007, 2010).

2 Identification Strategy

In order to detect whether the immigration-induced reduction in the cost of childcare has an impact on labour supply and fertility decisions of women, the empirical strategy develops in two steps, with an analysis at regional level followed by individual level estimates. First, I estimate the effect of the share of immigrants in the regional labour force on the market structure of childcare such as cost and size. I do so by looking at employment and log of median hourly wages in each local labour market. The labour market is defined at the region-year level. I start by considering the entire household services sector, and then I focus on childcare services. Second, I analyse the effect of the same share of immigrants on individual labour supply and fertility decisions.

In both steps of my analysis, in order to identify the impact of immigration, I need to isolate the exogenous component of the share of immigrants in local areas. Since immigrants tend to settle in areas characterized by favourable labour demand conditions, which are in turn correlated with the dependent variables I consider, the correlation between immigrant shares and labour market outcomes is unlikely to be a reliable measure of the causal effect I try to analyse. Therefore I adopt an instrumental variable strategy that predicts the current regional share of immigrants, Im_{rt}, using the past immigrants distribution across regions (see Altonji and Card, 1991; Card, 2001; Cortès, 2008; Cortès and Tessada, 2011). The rationale behind the instrument rests on the use of the historical country-specific settlement of immigrants across regions as an exogenous determinant of the current regional distribution. The current stock of immigrants from each country is then distributed into regions according to this past distribution. The instrument predicting the current share of immigrants, Im_{rt}, in region *r* at time *t*, is denoted by the variable IV_{rt} and it is computed according to the following formula:

$$IV_{rt} = \Sigma_c \frac{Im_{crt_0}}{Im_{ct_0}} Im_{ct} \tag{1}$$

where Im_{crt_0} represents the stock of immigrants in the labour force from country *c* residing in region *r* at time $t = t_0$. The selected past distribution is relevant to the year t_0=1991 and it is computed from the 1991 Census data.[9] Im_{ct} is the stock of immigrants from country *c* at time *t* (with *t*=2000,..,2007). Equation (1) is further divided by the sample labour force corresponding to the first year of the analysis (2000), so that endogenous changes in the native population do not affect the instrument.

The first stage estimating equation is the following:

$$Im_{rt} = \mu_0 IV_{rt} + \mu_1 X_{rt} + D_r + D_t + \psi_{rt} \tag{2}$$

where D_r denotes region fixed effects, D_t refers to time fixed effects, and X_{rt} is a vector including the share of high skilled women aged 20-44, the log of the median monthly labour

[9] In Section 3.2, I describe in greater depth the data used for the implementation of the instrument.

income of high skilled men, the share of families with children under age two, and unemployment rate. The first three regressors are meant to control for potential demand-factors for childcare services, whereas the unemployment rate controls for local demand shocks. All regressions are estimated using the size of the labour force in the region-year as weight. In order to account for the serial correlation within region across years, the standard errors are clustered at the regional level.

The validity of the IV strategy relies upon two main requirements: exogeneity and relevance. For the first requirement to be fulfilled, the past regional distribution as well as the stock of immigrants from each country must be unrelated to current local pulling demand factors. I take a sufficient time-lag between the past distribution and the time of the analysis, and I include region fixed effects, which should account for time invariant regional factors. Additionally, the local unemployment rate should control for demand-driven omitted factors still remaining. In order to rule out that my results are driven by complementarity in production, I additionally run a falsification exercise as a robustness check (see Section 4.6). The second requirement for the instrument validity is that past and current regional distributions are correlated. This requirement is strongly supported by the broad empirical evidence about the tendency of newly-arrived immigrants to cluster in areas highly populated by immigrants from the same country to take advantage of the pre-established networks. Bartel (1989) represents one of the first papers reporting this evidence for the US, later confirmed by Cutler and Glaeser (1997), whereas Åslund (2005) and Damm (2009) provide two recent examples for Sweden. Unlike the exogeneity assumption, this requirement can be tested: I report the results of the first stage regression as well as the graph of the correlation between the endogenous variable and the instrument both first residualized from the vector of the explanatory variables used in the first stage equation (A.1). Table A.3 reports the results of the first stage regressions. Despite the small sample size and the clustering of the standard errors at regional level, the cluster robust F-statistics is always close to the threshold typically considered for the test of weak instruments.[10]

In addition to the validity of the instrument, I also check that the exclusion restriction holds. It might be that immigrants affects both wages and employment through channels other than the cost of household services, for instance if natives move away from areas receiving large waves of immigrants. My results suggest that increasing the share of immigrants in a region does not affect the probability that natives move out.[11]

In the second step of my analysis, where I estimate individual regressions, I also add individual fixed effects, so as to control for remaining spurious correlation between unobserved individual characteristics and the share of immigrants. Let us imagine the case in which some past shocks affect the characteristics of a region, such as shocks to the labour demand, which may attract additional workers, and as a consequence housing prices start growing. Immigrants, especially if low skilled, might start moving out of these areas. While

[10] Stock and Yogo (2005) consider the value 16.38. The instrument has a mean value of 0.761, and ranges between 0.013 and 0.484. The magnitude of the coefficient suggests that by increasing the predicted share of immigrants based on the past distribution by one percentage point the actual regional share rises by 0.582 percentage point (Columns 2-4). For comparison, other papers using a similar formulation of the instrument find values ranging between 0.188 in case of variation at city level (Cortès and Tessada, 2011), or between 0.288 and 0.608, in case of variation at regional level (Farrè et al., 2011; Peri et al., 2015).

[11] I use the same specification that I describe in Section 4.1. The results are available upon request. Hatton and Tani (2005) find also no substantive evidence that immigration in UK has any displacement effect at regional level on natives.

natives may be more likely to stay, possibly because of higher mobility costs, because they have more established networks, they are more often home owners, or they have high labour market attachment. Another example would be if natives with anti-immigrants preferences start moving away from areas that experience a shock of immigrants coming from certain countries. In both of these cases, specifications that exclude individual fixed effects would deliver estimates suffering from omitted variable bias. The first case would be a source of downward bias in case natives staying have also strong preferences for working, whereas the direction of the bias is less clear in the second case. Although these mechanisms may operate at finer geographical levels, a bias is possible also at the geographical level I consider.[12]

3 Aggregate Analysis

3.1 Specification

As previously mentioned, there might be two channels by which immigration can have an impact on household services; they can have an impact on their availability or on their market cost. Immigrants can enlarge the size of the household services sector, that represents itself an indirect reduction in the cost, due to lower search costs, or they can have a direct impact on the prices of these services. As common in the literature, I use the wages of workers in the household services as a proxy for their cost (see Furtado and Hock, 2010; Barone and Mocetti, 2011; Farrè et al., 2011; Furtado, 2016). I argue that this can provide a reasonable approximation, given that it has been estimated that both in standard and home-based childcare centres the wage bill accounts for around 70 percent of all expenses in the US (Blau and Mocan, 2002).[13]
My identification strategy exploits the within-region variation in the share of immigrants. I estimate the effect of immigrants on the size and the market cost of household services separately, using the following two equations

$$EmplHS_{rt} = \alpha_0 X_{rt} + \alpha_1 Im_{rt} + D_r + D_t + \eta_{rt} \tag{3}$$

$$LogWageHS_{rt} = \beta_0 X_{rt} + \beta_1 Im_{rt} + D_r + D_t + \epsilon_{rt} \tag{4}$$

$EmplHS_{rt}$ is the share of the labour force in region *r* at time *t* employed in household services, whereas $LogWageHS_{rt}$ represents the log median real hourly wages of those employed in this sector. X_{rt} represents a vector of additional controls capturing omitted time varying factors as described for equation (2). D_r and D_t are region and time fixed effects, respectively and η_{rt} (and similarly ϵ_{rt}) is a standard zero-mean error term. Since

[12] In the Appendix (Table A.4) I compare the results of the estimation with and without individual fixed effects, and indeed the specification without individual fixed effects has point estimates substantially lower in magnitude than the corresponding ones with individual fixed effects. The difference is particularly high for hours worked.

[13] Which likely represents a lower bound in case of more informal childcare, such as nannies.

the dependent variables represent aggregates, I allow and control for heteroskedasticity by weighting each observation with the size of the region-year labour force. In addition, in all aggregate regressions the standard errors are clustered at regional level, so as to allow for serial correlation of the errors within a region over time. The coefficients of interest are α_1 and β_1. If the share of immigrants at regional level reduces (both indirectly, by reducing search cost, and directly) the market cost of household services, I expect α_1>0 and β_1<0.

3.2 Aggregate Data

For the aggregate analysis as well for computing the immigration related variables I use the QLFS (Quarterly Labour Force Survey). Whereas for the past regional distribution of immigrants as described in equation (1) I use the 1991 UK Census data. The QLFS is a quarterly survey conducted in UK throughout the years since 1992, in which each sampled address is called on five times at quarterly intervals, and yields about 60,000 responding households in each quarter. I pool together all quarters relevant to the period between 2000 and 2007.

Immigrants are defined as those who were born outside the UK and Ireland. This choice is motivated by the fact that English and Irish people are a fairly homogeneous group, both in terms of their language and the proximity of their culture. In order to implement the instrument immigrants are categorised according to 8 macro-areas of origin, which I consider might represent enclaves, in terms of sharing similar cultures: Western Europe, Eastern Europe, US and Canada, Central and South America, Middle East, Asia, Africa, and Others.

The household services sector consists of the following occupations according to the 2000 Standard Occupational Classification (SOC): cleaning and housekeeping, food preparation services, childcare, care for adult people, gardeners, and other personal services occupations such as dry-cleaning, laundering, barbers, and shoe repairing. Table A.1 in the Appendix shows the distribution of occupations of immigrants. The household services sector represents the top fourth most common occupational group (13.07 percent). The first three occupations require relatively high skill level. In fact, 39.61 percent of immigrants have left full time education at age 21 or older, as opposed to only 16.83 percent of natives. Within the household services sector, even if the percentage of high skilled immigrants is lower than in the full sample, the gap with natives is much higher (21.35 percent versus 4.33 percent), which could be explained by the substantial downgrading they experience once in the host country (Dustmann et al., 2005).[14] If I disaggregate the household services sector further, it emerges that 33.4 percent of immigrants work in food-preparation-related occupations, 22.28 percent in cleaning activities, 20.37 as caretakers for elderly people, 15.56 percent in child-care related occupations, and 8.39 percent in personal services occupations. These sub-sectors are also heterogeneous in terms of the skill distribution: if the share of high skilled immigrants in all household services is 21.35, this share is the highest in the childcare sector, where 28.36 percent are high skilled. Given that my anal-

[14] The definition of skill for immigrants is based on the age when the respondent has left full-time education. By doing so I follow Manacorda et al. (2012) because the definition of the educational level based on the highest qualification attained according to the UK system is misleading. Most of the immigrants in fact tend to answer “other qualifications”.

ysis focuses primarily on the childcare sector, I decide not to restrict the sample to low skilled immigrants, since a substantial share of the immigrants' sample working in this sector would be excluded.[15]

In Panel A of Table A.2 of the Appendix I report the main descriptive statistics of the aggregate data: the labour force share of immigrants is 8 percent, it ranges between 6 percent in 2000, and rises up to 10 percent in 2007.[16] Among immigrants in the labour force, 2.2 percent work in the childcare sector, whereas 10.3 percent have a job in services such as cleaning, food preparation, or personal care services. The childcare sector has a relatively high median wage compared to all other jobs in the household services sector (6 percent higher).

3.3 Aggregate Results

Table 2 reports the OLS and 2SLS estimates of regressions (3) and (4): Panel A refers to equation (3), whereas Panel B refers to equation (4). The first four columns show the results where I pool together all occupations belonging to the household services sector. Since my focus is manly on the effect on childcare services, Columns (5) and (6) consider all household services excluding childcare (food preparation, housekeeping, caretakers, and other personal services occupations), whereas Columns (7) and (8) report only the childcare sector. Starting from the results on employment (Panel A), the first two columns show the baseline specification where I only control for year and region fixed effects, whereas all other columns include all controls. According to my preferred estimates, the 2SLS, it is clear how rising immigrants as a share of the regional labour force has a positive impact on the size of the childcare sector (Column 8). Increasing the regional share of immigrants in the labour force by one percentage point enlarges the size of the childcare sector by 0.06 percentage points, corresponding to a three-percent rise of the baseline dependent variable. Similarly, there is a positive effect on the entire household services sector (Column 4), the point estimate is less precisely estimated and slightly higher but not statistically different from the results on childcare. The labour force share in the household services sector rises by 0.087 percentage points by letting the share of immigrants in the regional labour force rise by one percentage point. This increase corresponds to a one percent rise of the baseline dependent variable.

The results on wages (Panel B) show that the regional share of immigrants reduces the costs of household services overall (Column 4) as well as of the childcare sector (Column 8), with point estimates very precisely estimated. Similarly to the effect on employment, the point estimate is slightly lower for the childcare sector. Rising the regional share of immigrants by one percentage point brings about a reduction in the cost of household services by 1.39 percent. The same increase in the regional immigrant share reduces by 1.075

[15] High skilled immigrants might be less exogenous to the labour supply of (high skilled) natives. For example my identification strategy does not control for potential past skill-specific shocks to the regional labour market, which are persistent in the long term. However, in a robustness check, I include as additional regressors the interaction of unemployment rate with the three education categories, and the main results are unaffected. Results available upon request.

[16] My regional units are the 19 regions reported in the BHPS: Inner London, Outer London, Rest of South East, South West, East Anglia, East Midlands, West Midlands Conurbation, Rest of West Midlands, Greater Manchester, Merseyside, Rest of North West, South Yorkshire, West Yorkshire, Rest of Yorks and Humberside, Tyne and Wear, Rest of North, Wales, Scotland, Northern Ireland.

percent the hourly wages of workers in the childcare sector.
My results are qualitatively similar to the results for the US by Furtado (2016),[17] I also find a much lower effect on employment than on wages. As pointed out by Furtado (2016), this can be motivated by the fact that immigrants displace higher-wage native workers of the childcare sector, therefore it is the composition of the workforces in the sector that is changing as opposed to its size. I also replicate the analysis on all low skilled occupations other than household services, defined as the bottom fourth categories in terms of the ten category-wage distribution. The results show that immigration has no effect, thus supporting the interpretation that the effect on household services is not simply driven by a general shift affecting the entire low-skilled sector.[18]

4 Individual Analysis

4.1 Specification

In the second step of my analysis I look at how immigration affects fertility and labour supply decisions of native women, by estimating the following two individual regressions:

$$Work_{irt} = c_i + \gamma_0 X_{irt} + \gamma_1 Im_{rt} + D_r + D_t + \eta_{irt} \tag{5}$$

$$Birth_{irt+1} = d_i + \delta_0 X_{irt} + \delta_1 Im_{rt} + D_r + D_t + \epsilon_{irt} \tag{6}$$

Equation (5) refers to the labour supply decision, whereas equation (6) refers to the fertility decision of individual *i* living in region *r* at time *t*. I use three different measures of labour supply for the dependent variable $Work_{irt}$: a dummy for working, two indicators for the intensive margin, the log of weekly hours worked, and a dummy for working full-time versus part-time. c_i (and similarly d_i) are individual fixed effects. X_{irt} represents a vector of individual characteristics: age, age squared, education,[19] a dummy for being married or having a partner, number of dependent children in different age brackets (0-2, 3-4, 5-11), a dummy for having co-resident father, a dummy for having co-resident mother, total household income minus total individual income (in log) and its squared value, a dummy for the intensity of care activities towards people inside or outside the family (set equal to one if the weekly hours are higher than 20), and unemployment rate. D_t are time fixed effects, D_r are region fixed effects.
The dependent variable $Birth_{irt+1}$ denotes the fertility decision, corresponding to having a child born in year $t+1$. Similar definitions are quite standard in the fertility literature, which motivates this choice in order to take into account for the nine-month gestation period, and

[17] By using a similar estimation strategy and only low skilled immigrants Furtado (2016) reports an effect on employment corresponding to 0.04 percentage points, whereas the effect on hourly wages is -4.281 percent.
[18] The median hourly wage for this selected group is equal to 1.814, and they represent 25.66 percent of the total workforce. Results available upon request.
[19] I consider the following categories according to the ISCED classification: at most secondary education, vocational education corresponding to post secondary non tertiary education, and college or higher education.

the average birth occurring in the middle of the calendar year (Del Boca, 2002; Rindfuss et al., 2007, 2010). This definition is not possible with other dataset, such as the LFS. Im_{rt} denotes the regional share of immigrants in the labour force, and η_{irt} (and analogously ϵ_{irt}) is a standard mean-zero error term. My coefficients of interest are γ_1 and δ_1. In case immigrants bring about a reduction in the negative correlation between fertility and labour supply, I would expect that one of the following cases occur: $\gamma_1 >$0 and $\delta_1 >=$0 (or not significant), or, alternatively, $\delta_1 >$0 and $\gamma_1 >=$0 (or not significant).[20]

4.2 Individual Data

For the individual analysis I use the BHPS (British Household Panel Survey), and I import the share of immigrants as well as the instrument described in Section 2 from the QLFS. The BHPS is an annual longitudinal survey, and it consists of a nationally representative sample of about 5,500 households recruited in 1991. All individuals living at the sampled address are interviewed each year, if the individual split-offs from the original family, he/she is followed and re-interviewed at the new address. Since 2001 the sample is representative of the UK and each year around 10,000 households are interviewed. The survey has been run for 18 years until 2008. All members of the household aged 16 or over are interviewed and the survey covers a broad range of topics, among which: household composition, education, health, employment status, income from employment. The most important reason for the choice of this dataset is that I am able to follow the same individuals over time, which is crucial for the reliability of my estimates.

I select the period between 2000 and 2007 primarily due to data restrictions. First, I need to exclude the year 2008, which is the last available from the BHPS, because the definition of the decision about fertility is based on the one-year lead of the variable about birth spell.[21] Second, I need to leave a sufficient time lag between the first year of the analysis and the reference year I use for the past regional distribution of immigrants, which is year 1991.

The final sample, after excluding all observations with missing information about the variables included in the empirical analysis, consists of 5,069 women aged 20-44 born outside UK and Ireland,[22] corresponding to 26,045 person-year observations.[23] Panel B of Table A.2 in the Appendix reports the summary statistics of the individual sample. The definition of employment is based on either having worked the week prior to the interview or having not worked but having a job that the person was away from. Maternity leave is considered as non employment since hours and full time would refer to the job previous to potentially re-entering the labour force after a birth. The employment rate is relatively high (73.5), and, among women working, the average number of hours worked per week is 32.98, whereas 65.9 percent works full time. The average educational level is also high with 37.7 percent having completed tertiary education.

Table 1 reports the variation in labour supply over time for women with and without a birth

[20] For a discussion about the choice of the estimation of two independent equations see the Appendix.

[21] The question refers only to biological mothers, therefore step children as well as adopted children are excluded from this measure.

[22] Hereafter I refer to this group as native.

[23] I do not restrict the sample only to individuals that have no missing information in all dependent variables because that would reduce the sampled individuals by 13 percent. However, the main results, available upon request, are robust to this restriction, suggesting that the missing are at random.

spell, where a birth spell refers to a child of age zero. I consider the three labour supply measures that I use as dependent variables. Although the share of women working rises only by 1.2 percentage points, it increases substantially more for women with a recently born child (5.4 percentage points). The same trend applies to the intensive margin. The average weekly hours worked increase by 5.1 percent for those with a recently born child (an increase by 1.21 hours), as opposed to only 1.2 percent (an increase by 0.4 hours) for those without. Similarly, the share of women in the former group working full time increases by 8.2 percentage points, and by only 1.6 percentage points for those in the latter group. This descriptive evidence is overall in line with a general reduction in the negative correlation between fertility and labour supply, as reported in Figure 1, where I look at labour force participation. However, before attributing any role to immigration, I need to rule out that this evidence is driven by spurious correlation linked to areas with specific labour market conditions and other unobserved pulling factors attracting immigrants. Therefore, in order to isolate the causal effect brought about by immigration, I rely on the results of the empirical analysis.

4.3 Individual Results

I describe now the results of regressions (5) and (6), focusing on the 2SLS estimation. The regressor share of immigrants has variation at the regional level and at the same time I have repeated observations for the same individual. Therefore I use a double clustering, with the two clusters defined at the regional and individual level, allowing for any type of correlation between individuals belonging to the same region, in addition to any serial correlation within individual. In order to control for the different size of the region, I use the size of the labour force as weight in all regressions.

I start from commenting the 2SLS results relevant to the impact of immigration on the three different measures of labour supply as well as on fertility decision and the joint probability of working and having a new born child (Bottom Panel, Table 3).[24] The point estimate of the effect of immigration on the probability of working is negative. Its magnitude, however, is very small and not statistically significant (Column 1). Other papers also found a negative effect on the extensive margin. For comparison the closest paper is by Farrè et al. (2011), who use the regional share of female immigrants in Spain and find also a negative effect on employment probability of all women. Despite only looking at low skilled immigrants, Cortès and Tessada (2011) and Furtado (2016) also find a negative effect on the probability of working of high skilled women in the US. This is also what I find once I disaggregate the analysis by skill level: the negative result on employment, even tough never significant, is driven by high skilled women (Table 4). Therefore it is unlikely to be due to competition in the labour market, given that the majority of immigrants is low skilled. An alternative explanation, suggested by Furtado (2016), might be that mothers with very young children temporarily stop working to take care of them, but work more hours once they re-enter the labour force.

[24] As for the impact of the other regressors (not shown but available upon request), as expected, having children exerts a negative effect on labour supply decisions, a signal of the trade-off between labour force participation and fertility. The highest negative effect comes from having children in the age bracket between 0 and 2, and between 3 and 4. This effect is much lower and not significant for the men sample, suggesting that the burden of childcare is lower for them.

Results for the intensive margin are different: a higher share of immigrants exerts a positive effect on both hours worked and probability of switching from a part time to a full time job, and both point estimates are highly significant. An increase by one percentage point in the regional share of immigrants brings about an increase in hours worked by 2.14 percent (Column 2). This translates into an increase of 43 minutes per week. At the same time, the corresponding increase in the probability of switching to a full time job is equivalent to 1.63 percentage points (Column 3).

Column 4 reports the results on fertility. Immigration does not seem to have any significant impact on the decision of giving birth. Despite the point estimate being positive and very high with respect to the baseline dependent variable, it is very imprecisely estimated.[25]

Having established that immigration fosters the intensive margin of the labour supply, without at the same time having any effect on the decision about having a child, I look at the effect of immigration on the joint probability of working and having a recently born child (Columns 5 and 6).[26] The share of immigrants in the labour force has a positive effect on the joint probability of working and having a recently born child, however it is not significant (p value=0.13). Once I restrict the sample to women without any informal childcare, given by the presence of at least one parent of the woman living in the same house,[27] the effect on the joint likelihood becomes higher and precisely estimated (Column 6). By letting the labour force share of immigrants rise by one percentage point, the joint probability of working and having a recently-born baby rises by 0.52 percentage points for women without access to informal childcare.[28]

4.4 Results by Education

I now break down the sample according to different education categories. The theoretical mechanism underpinning my reduced-form specification is well described by Cortès and Tessada (2011). One of the predictions of their model is that the group reacting more to an immigration-induced reduction in the price of household services are higher-wage women, those with a higher opportunity cost of time and higher labour market attachment. Their model predicts that, within the group of women reacting more to the price change, who are those with higher wages, women with relatively lower wages have a more elastic labour supply to the price change. By classifying women according to the three education

[25] The results, available upon request, are still not significant, once I distinguish between first, second or third child. In addition, in a robustness check I analyse potential heterogeneity by age, and I find that the highest effect in terms of labour supply occurs for women below age 36, again with no effect on fertility. Below age 36 both the intensive margin of the labour supply and the fertility rate are at their highest level, at age 36 they start declining and are below the average level.

[26] A recently born child refers to a child of age zero.

[27] See, among others, Maurer-Fazio et al. (2011), Posadas and Vidal-Fernández (2013), and Compton and Pollak (2014) for evidence about the positive effect of granparents, as provider of informal childcare, on female labour force participation.

[28] Breaking down the sample by couple versus single, the results on hours worked are driven by singles, whereas the ones on full time are not significant in both samples, and the point estimates very close. The effect on fertility is for both samples null. I argue that the effect of immigration operates by reducing the cost of childcare. Therefore, the higher results on labour supply for singles could be explained, provided that single women outsource childcare, and are those with no support from the partner. According to the descriptive evidence from the BHPS, even if to a lesser extent than mothers in couples, a substantial share of single mothers outsources childcare, in fact 38 percent of them rely on paid childcare as opposed to 45 percent of mothers in couple. These results are also in line with some evidence for the US that subsidized public childcare affects the employment decisions only of single mothers (Cascio, 2009).

categories, the median hourly wage is 6.09 for the lowest education group, 7.39 for the medium educated, and 11.00 for the higher educated.

In Table 4 I report the results for labour supply broken down by education. As for the extensive margin the effect is not significant for any of the education groups, whereas the overall effect of immigration on the intensive margin is driven by medium and high skilled. Among more educated women, those with medium education report the highest effects: by letting the share of immigrants in the labour force increase by one percentage point, hours worked rise by 2.433 percent, whereas the effect is slightly lower and less precisely estimated for the highest educated (1.736). I find the same trend also for women working full time. The effect of one-percentage-point increase in the labour force share of immigrants corresponds to 2.372 percentage points for the medium educated, whereas it is 1.140 percentage points for the highest educated. Even if the difference between the point estimates of medium and high skilled is not statistically significant, my results overall are qualitatively in line with the theoretical predictions of Cortès and Tessada (2011).

Table 5 report the results on fertility (Columns 1-3) and on the probability of working and having a recently born child (Columns 4-6). The effect on fertility is still null regardless of the education level, whereas the only group where immigrants exerts a positive effect on the joint probability is the group of high skilled (Column 6): for this group rising the labour force share of immigrants brings about an increase of 0.696 percentage points in the likelihood of working with a recently born child.

4.5 Results depending on the Presence of Young Children

Next, I allow effects to differ between women with young children (children aged 0-4), and women with either old or no children. Table 3 shows that having children under age three and between three and four exterts a very negative effect on labour supply. By doing so I want to isolate the group using childcare services the most, and more subject to the trade-off of participating in the labour market and taking care of the children. Table 6 reports the results for different measures of intensive margin of the labour supply: hours worked, and full time as before, and I add an indicator for working longer than 50 hours,[29] which corresponds to the top five percentile of the hours worked distribution.[30] For all dependent variables, the effect of immigration is higher for women with young children, as opposed to women with older children or women with no children. If immigration is helping women with young children disproportionally more to work longer hours, the mechanism through which immigration operates is via the reduction in the trade-off between child rearing and participation in the labour market. Among other studies estimating similar specifications, the results by Farrè et al. (2011) and Cortès and Pan (2013) are qualitatively in line with mine, whereas Cortès and Tessada (2011) find that mothers with young children, if anything, react less to immigration than women with older children.

[29] A similar indicator has been used by Cortès and Tessada (2011) and Furtado (2016).

[30] Given that for this breakdown there is not enough variation across region within individual, I do not include the individual fixed effects in the estimation.

4.6 Robustness

Although my identification is based on a 2SLS strategy that should exploit the exogenous variation in immigration, potential unobserved factors linked to the share if immigrants as well as to the dependent variables could still linger and drive part of my results. Therefore in this section I try to verify how my effects hold to a series of robustness checks. First, I start with a falsification exercise by considering the sample of men as a control group. If the mechanism driving my results is due to the contribution of immigrants to household production, I expect the labour supply of men to be less responsive, given men's lower contribution to the household production compared to women.[31] In addition, if my past distribution is not sufficiently lagged so that, for instance, past positive country-specific shocks to the regional labour market still persist in the period of my analysis affecting also natives, my identification strategy would not be able to control for this. As a consequence, the effect that I am observing would rather be due to complementarity effects in production. The supply shift brought about by immigration would shift the labour demand curve for natives as well, especially if high skilled, given their higher complementarity, and I would observe positive effects on wages potentially for both men and women.

Table 7 reports both the results of the main labour supply regressions for men (Columns 1-3), and the results for log hourly wages of men and women, respectively (Columns 4-5). The point estimates in the labour supply regressions are much lower compared to those I found for women, and never significant. Even if I fail to detect any reaction in the labour supply of men - despite their complementarity with immigrants - just because the elasticity of labour supply of men is very small and lower than the one for women (Blundell and MaCurdy, 1999), the results on wages would unveil whether this effect through complementarity in production is at work. When I look at wages, however, if anything the point estimate for men is higher then the one for women, even though they are both imprecisely estimated and not significant. Complementarity effects do not seem to explain my results.

An additional concern could be motivated by the endogenous mobility of women. Women willing to work long hours can move to areas characterized by better job opportunities and favourable labour demand conditions. These same areas may also attract immigrants moving towards thriving labour markets. In this case I would observe a spurious positive correlation between immigration and labour supply. In order to control for such a mechanism, I replicate the main analysis excluding people who change region between two consecutive years and the results are almost unchanged (Table A.5 in the Appendix).

Finally, my estimates provide, for each regression, the total effect of immigration on labour supply and fertility, without taking into account the correlation in the cross-equation error terms, given the extremely low conditional correlation found (see the discussion in the Appendix). However, the results are unaffected by the correlation in the cross-equation error terms. This is reported in the Appendix (Table A.6), where I additionally control for the fertility spell in the labour supply equations (Columns 1-4), and for current labour supply in the regressions on fertility (Columns 5-6).

[31] In a BHPS module each couple is asked about which member of the couple is in charge of several family commitments. It turns out that only 4 percent of working women in couple reports that the partner does the cleaning activities, 21 percent reports that it is shared, and 72.5 percent reports that it is entirely on women' shoulders.

5 Discussion

Although other studies have already provided robust evidence that immigrants foster female native labour supply, in particular for highly educated women, the evidence on the impact on fertility is still scarce, with the exception of Furtado (2016), who uses cross-sectional data from the US.

This paper contributes to the literature by providing evidence for the UK, a country with a different childcare system than the US. I look at the role played by immigration on individual decisions about fertility and labour supply of young native women, controlling for unobserved individual heterogeneity, and endogeneity of immigrants' location. My results first show that immigration affects the market structure of childcare services by increasing their size and reducing their market cost. In addition, I confirm previous findings about the positive impact of immigration on labour supply of more educated women. Immigrants positively affect hours worked and the probability of shifting from a part time to a full time job without reducing fertility, and marginally increase the probability of working with a recently born child.

As for labour supply, my results are qualitatively in line with the results for the US (Cortès and Tessada, 2011; Furtado, 2016), and for other European countries (Barone and Mocetti, 2011; Farrè et al., 2011). On the other hand, if fertility adjusts slowly to price changes, the relatively short time span I consider can be one of the reasons whereby I do not detect a significant positive effect on fertility decision, as opposed to Furtado (2016) who is able to look at a longer time horizon. An alternative explanation could be due to the substantially lower effect that in my results immigrants have on the price of childcare with respect to what Furtado (2016) finds. In addition, it might be that the elasticity of demand for children to the price of childcare is small, in particular for high-earning women, therefore women may react to the lower price by increasing the intensive margin of the childcare outsourced so as to being able to work longer hours, instead of having an additional child. This would be in line with my findings that immigration helps disproportionally more women with young children to work longer hours.[32] Overall, I interpret my results by arguing that immigrants may represent one additional factor responsible for the observed reduction in the negative correlation between fertility and labour supply in the UK.

I believe that further research in this direction is needed to extend the current evidence. First, looking at a longer time horizon could unveil different results on fertility. Second, the literature so far has extensively looked at the price effect of immigration. However, mainly due to data limitation, not much is known about the potential immigrant-induced change in the quality of the services provided. Given that they substitute parental time or other forms of childcare, this would be relevant in light of the importance of inputs in the children skill formation and the consequence on later labour market outcomes (Cunha et al., 2006).

[32] Unfortunately I do not have access to data on the quantity of childcare outsourced so as to verify this mechanism.

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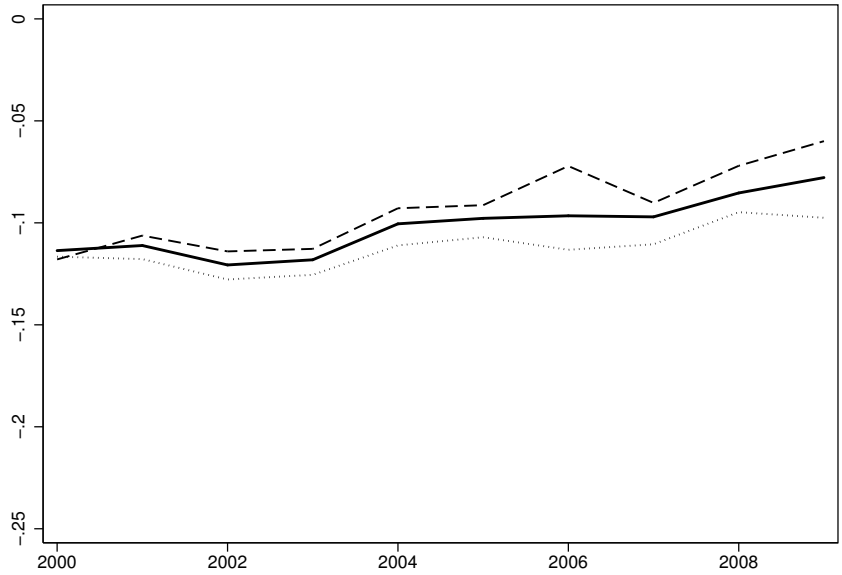
Figures and Tables

Figure 1: Correlation between Fertility and Labour Force Participation



Source: QLFS (2000-2009).
Note: Each point represents the unconditional correlation between labour force participation and a fertility spell. The solid line refers to the full sample of women, the dashed line refers to women with college of higher education, and the dotted line refers to women without college. A fertility spell refers to having a child of age zero. Sample: native women, 20-44 year old.

Table 1: Labour Supply with and without a Fertility Spell

	Work (Share)		Hours Worked		Full time	
	Without Fertility Spell	With Fertility Spell	Without Fertility Spell	With Fertility Spell	Without Fertility Spell	With Fertility Spell
2000	0.749	0.556	31.262	23.440	0.598	0.431
2001	0.750	0.549	31.448	23.913	0.601	0.453
2002	0.751	0.535	31.435	23.009	0.603	0.439
2003	0.751	0.551	31.330	22.213	0.603	0.422
2004	0.754	0.588	31.235	23.849	0.602	0.489
2005	0.756	0.600	31.569	23.894	0.613	0.483
2006	0.757	0.612	31.602	24.256	0.613	0.503
2007	0.758	0.610	31.662	24.648	0.614	0.513

Source: QLFS, 2000-2007.
Note: The heading "With Fertility Spell" refers to women with a child of age zero. Sample: native women, 20-44 year old.

Table 2: Effect of Immigration on Household Services

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Base				Exclude Child Care		Child Care	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Panel A	Employment							
Im_{rt}	-0.039	0.031	0.030	0.087*	0.012	0.028	0.018	0.060***
	(0.078)	(0.075)	(0.054)	(0.049)	(0.044)	(0.043)	(0.028)	(0.021)
Mean Dep. Var.	0.103	0.103	0.103	0.103	0.080	0.080	0.022	0.022
F-stats		12.853		15.887		15.887		15.887
N	152	152	152	152	152	152	152	152
Panel B	Log Median Wages							
Im_{rt}	-0.600***	-1.390***	-0.440*	-1.437***	-0.571***	-1.439***	-0.440	-1.075***
	(0.160)	(0.381)	(0.212)	(0.330)	(0.177)	(0.359)	(0.566)	(0.296)
Mean Dep. Var.	1.705	1.705	1.705	1.705	1.682	1.682	1.810	1.810
F-stats		12.853		15.887		15.887		15.887
N	152	152	152	152	152	152	152	152
Controls	no		yes	yes	yes	yes	yes	yes

Source: QLFS (2000-2009).
Note: The estimation method is OLS or 2SLS, according to the heading. Panel A reports the coefficient from regression (3), where the dependent variable is the share of the labour force working in the household services sector (Columns 1-4), in the household services sector excluding the childcare sector (Columns 5-6) and in the childcare sector (Columns 7-8). Panel B reports the coefficients from regression (4) and the dependent variable is the log of the median hourly wages. All regressions include year and region fixed effects, whereas Columns 3-8 include the following additional controls: log of the median monthly labour income of high skilled men by region-year, share of high skilled women in the labour force of 20-44 age, share of families with children under age two, and unemployment rate. Sample: native women, 20-44 year old. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Table 3: Effect of Immigration on Labour Supply and Fertility

	(1)	(2)	(3)	(4)	(5)	(6)
	Work$_t$	Log Hours$_t$	Full Time$_t$	Birth$_{t+1}$	Birth$_t$ and Work$_t$	
	OLS					
Im$_{rt}$	-0.674***	0.520	0.917**	0.501	0.465*	0.690***
	(0.252)	(0.367)	(0.375)	(0.487)	(0.247)	(0.246)
Individuals	5069	3970	3977	4422	5069	4507
Observations	26045	18553	18648	24081	26045	23057
	2SLS					
Im$_{rt}$	-0.355	2.139***	1.630***	0.516	0.259	0.524***
	(0.397)	(0.670)	(0.437)	(1.134)	(0.174)	(0.196)
Mean Dep. Var.	0.735	3.398	0.659	0.069	0.027	0.029
F-stats	14.291	12.987	13.430	15.031	14.305	14.580
Individuals	5069	3970	3977	4422	5069	4507
Observations	26045	18553	18648	24081	26045	23057
						w/o Coresident Grandparents

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is OLS or 2SLS, according to the heading. All columns include individual fixed effects. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, a dummy for working full time, a dummy for having a child of age zero the following year, and a dummy for the former interacted with working. Additional controls: the log of household income (- individual income) and its squared value, education, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Table 4: Effect of Immigration on Labour Supply by Education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Education	Low	Medium	High	Low	Medium	High	Low	Medium	High
	Work$_t$			Log Hours$_t$			Full Time$_t$		
Im$_{rt}$	1.879	0.491	-1.367	-0.455	2.433***	1.736*	-6.490*	2.372***	1.140*
	(3.027)	(1.632)	(0.908)	(4.808)	(0.768)	(1.047)	(3.550)	(0.842)	(0.646)
F-stats	11.052	10.488	17.684	8.584	8.841	17.523	8.545	8.716	18.051
Individuals	793	2486	1862	407	1932	1660	404	1934	1670
Observations	3773	12328	9744	1712	8810	7893	1693	8856	7959

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. All columns include individual fixed effects. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, and a dummy for working full time. Additional controls: the log of household income (- individual income) and its squared value, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Table 5: Effect of Immigration on Fertility by Education

	(1)	(2)	(3)	(4)	(5)	(6)
Education	Low	Medium	High	Low	Medium	High
		$Birth_{t+1}$			$Birth_t$ and $Work_t$	
Im_{rt}	1.007	0.276	0.483	0.220	-0.490	0.696**
	(1.847)	(0.631)	(1.875)	(0.813)	(0.456)	(0.289)
F-stats	10.641	10.089	19.640	11.140	10.476	17.725
Individuals	663	2163	1663	793	2486	1862
Observations	3405	11384	9108	3773	12328	9744

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. All columns include individual fixed effects. The dependent variables, reported in the heading, are a dummy for having a child of age zero the following year, and a dummy for the former interacted working. Additional controls: the log of household income (- individual income) and its squared value, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Table 6: Effect of Immigration on Labour Supply and Fertility for Women with or without Young Children

	(1)	(2)	(3)	(4)	(5)	(6)
	With Young Children	Without Young Children	With Young Children	Without Young Children	With Young Children	Without Young Children
	$Log\ Hours_t$		$Full\ Time_t$		Hours Worked>50	
Im_{rt}	5.091**	1.600*	9.078**	0.706	1.029**	0.540
	(2.378)	(0.913)	(3.736)	(0.542)	(0.469)	(0.511)
F-stats	6.502	14.084	6.996	14.649	6.502	14.084
Individuals	863	3554	870	3561	863	3554
Observations	2841	15146	2863	15221	2841	15146

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. The heading “With Young Children" refers to having at least one child under age five, the heading “Without Young Children" refers to having at least one child older than five, or not having children. The dependent variables, reported in the heading, are: the log of weekly hours worked, a dummy for working full time, and a dummy for working and having a child of age zero. Additional controls: the log of household income (- individual income) and its squared value, education, age and its squared value, number of children of age 5-9, a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

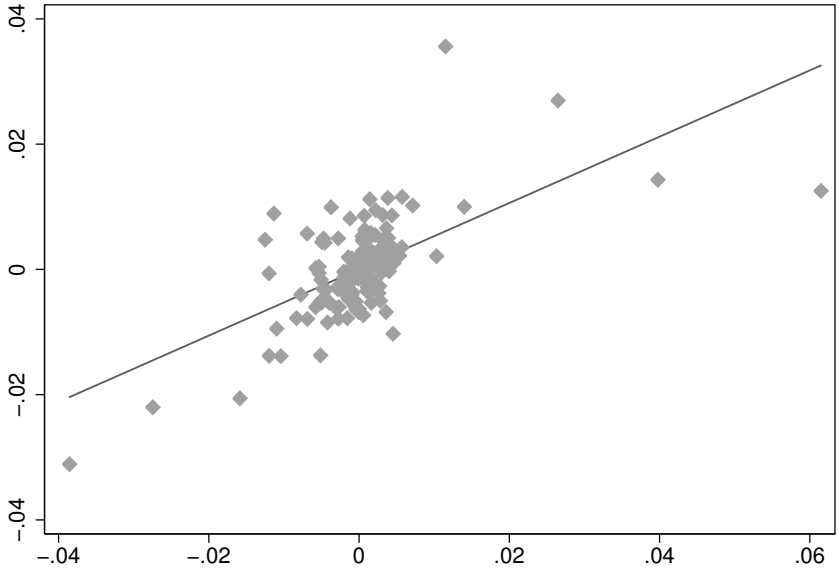
Table 7: Effect of Immigration on Labour Supply of Men and Log Hourly Wages

	(1)	(2)	(3)	(4)	(5)
	Men				Women
	Work$_t$	Log Hours$_t$	Full Time$_t$	Log Hourly Wages$_t$	
Im$_{rt}$	0.171	0.154	-0.555	1.945	1.355
	(0.414)	(0.372)	(0.564)	(2.190)	(1.539)
F-stats	17.139	15.016	15.333	2.164	2.778
Individuals	4435	3915	3934	2819	2479
Observations	22246	19117	19289	10467	9353

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, a dummy for working full time, or the log of hourly wages. Controls for Columns 1-3 are the same as in Table 3. Controls for Columns 4-5 are: education, age and its squared value, a dummy for working in the public sector, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p$<$.1, ** p$<$.05, *** p$<$.01.

Appendix A: Additional Figures and Tables

Figure A.1: Residualized First Stage



Source: QLFS (2000-2007).
Note: The graph reports the residuals from regressing the variable share of immigrants (vertical axis) and the instrument (horizontal axis), respectively, on all regressors included in regression (2).

Table A.1: Distribution of Immigrants by Occupation (Share)

Professionals	0.168
Manager	0.154
Associate Professionals	0.147
Household Services	0.131
Administrative	0.102
Elementary Occupations	0.081
Sales and Costumer Services	0.065
Skilled Trades	0.052
Other Personal Services	0.022

Source: QLFS. 2000-2007

Table A.2: Summary Statistics

Variable	Mean	St. Dev.
Panel A	Aggregate Data	
Im_{rt}	0.08	0.089
Employment Household Service	0.103	0.014
Employment Household Service excl. Child Care	0.08	0.013
Employment in Child Care	0.022	0.005
Log Median Wage in Household Services	1.705	0.097
Log Median Wage in Household Services excl. Child Care	1.682	0.094
Log Median Wage in Child Care	1.81	0.112
Panel B	Individual Data	
Working	0.735	0.441
Log of Weekly Hours Worked	3.398	0.495
Weekly Hours Worked	32.975	12.477
Full Time	0.659	0.474
$Birth_{t+1}$	0.069	0.253
Low Education	0.145	0.352
Medium Education	0.478	0.5
High Education	0.377	0.485
Father lives in Household	0.076	0.265
Mother lives in Household	0.104	0.305
More than 20 Hours Spent Caring People	0.036	0.186
Age	32.949	6.92
Number of Children 0-2 Age	0.144	0.371
Number of Children 3-4 Age	0.145	0.37
Number of Children 5-11 Age	0.502	0.721
Couple	0.707	0.455
Log of Household Income-Individual Income	8.352	3.629

Source: QLFS (top Panel); BHPS (bottom Panel).

Table A.3: First Stage

	(1)	(2)	(3)	(4)
	Base		Exclude Child Care	Child Care
IV_{rt}	0.616***	0.582***	0.582***	0.582***
	(0.172)	(0.146)	(0.146)	(0.146)
F-stats	12.853	15.887	15.887	15.887
Observations	152	152	152	152
Controls	no	yes	yes	yes

Source: QLFS: 2000-2007.
Note: The dependent variable is the share if immigrants at the region-year level and the instrument is defined in equation (1). Each column corresponds to the first stage of the corresponding specification in Table 2. All regressions include year and region fixed effects, whereas Columns 2-4 include the following additional controls: log of the median monthly labour income of high skilled men by region-year, share of high skilled women aged 20-44 in the labour force, share of families with children under age two, and unemployment rate. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: * p<0.10, ** p<0.05, *** p<0.01

Table A.4: Effect of Immigrants on Labour Supply and Fertility. Results with or without Individual Fixed Effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Work$_t$		Log Hours$_t$		Full Time$_t$		Birth$_{t+1}$	
Im$_{rt}$	-0.882***	-0.355	0.892***	2.139***	1.178**	1.630***	-0.455	0.516
	(0.225)	(0.397)	(0.312)	(0.670)	(0.515)	(0.437)	(0.521)	(1.134)
F-stats	18.416	14.291	18.895	12.987	19.280	13.430	17.735	15.031
Individuals	6358	5069	5204	3970	5220	3977	5576	4422
Observations	27334	26045	19787	18553	19891	18648	25235	24081
Individual FE	no	yes	no	yes	no	yes	no	yes

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, a dummy for working full time, a dummy for having a child of age zero the following year. Additional controls: the log of household income (- individual income) and its squared value, education, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Table A.5: Effect of Immigration on Labour Supply and Fertility. Full Sample versus never Movers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Work$_t$		Log Hours$_t$		Full Time$_t$		Birth$_{t+1}$	
Im$_{rt}$	-0.355	-0.444	2.139***	1.961***	1.630***	1.630***	0.516	0.658
	(0.397)	(0.510)	(0.670)	(0.693)	(0.437)	(0.502)	(1.134)	(1.021)
F-stats	14.291	14.196	12.987	13.482	13.430	14.009	15.031	15.026
Individuals	5069	5027	3970	3936	3977	3943	4422	4390
Observations	26045	25514	18553	18186	18648	18276	24081	23598
Movers	yes	no	yes	no	yes	no	yes	no

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. All columns include individual fixed effects. I define as movers those who change region of residence across two consecutive years in the data. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, a dummy for working full time, a dummy for having a child of age zero the following year. Additional controls: the log of household income (- individual income) and its squared value, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), an indicator for couple, an indicator for co-resident father, and one for co-resident mother, and indicator for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Table A.6: Effect of Immigration on Labour Supply and Fertility. Control for Cross-Equation Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Work$_t$		Log Hours$_t$		Full Time$_t$		Birth$_{t+1}$	
Im$_{rt}$	-0.355	-0.454	2.139***	2.128***	1.630***	1.626***	0.516	0.496
	(0.397)	(0.377)	(0.670)	(0.664)	(0.437)	(0.433)	(1.134)	(1.129)
Birth$_{t+1}$		-0.255***		-0.077***		-0.058***		
		(0.017)		(0.017)		(0.014)		
Work$_t$								-0.058***
								(0.009)
F-stats	14.291	14.290	12.987	12.987	13.430	13.431	15.031	15.030
Individuals	5069	5069	3970	3970	3977	3977	4422	4422
Observations	26045	26045	18553	18553	18648	18648	24081	24078

Source: BHPS and QLFS (2000-2007), 1991 Census data for the computation of the instrument.
Note: The estimation method is 2SLS. All columns include individual fixed effects. The dependent variables, reported in the heading, are: a dummy for working, the log of weekly hours worked, a dummy for working full time, a dummy for having a child of age zero the following year. Additional controls: the log of household income (- individual income) and its squared value, education, age and its squared value, three variables for the number of children by age brackets (0-2, 3-4, 5-9), a dummy for couple, a dummy for co-resident father, a dummy for co-resident mother, and a dummy for the intensity of care duties towards persons inside or outside the household, unemployment rate, regional and time fixed effects. All regressions are weighted using the size of the labour force by year-region as weight. F-stats refers to cluster-robust first stage F statistics. Standard errors clustered at region level are reported in parentheses: *p<.1, ** p<.05, *** p<.01.

Appendix B: Estimation of Two Independent Equations

Labour supply and fertility decisions are individually negatively correlated (Angrist and Evans, 1998; Francesconi, 2002; Kögel, 2004), suggesting a simultaneous equation framework as preferred estimation strategy. However, there are a number of concerns about the joint estimation of the system of equations.[33] First of all, it is not clear the real advantage of a joint estimation with respect to a single equation estimation in case of finite samples. Comparing the single equation 2SLS approach with the 3SLS strategy allowing for the correlation in the error terms (Mikhail, 1975; Belsley, 1988) the relative advantage of the joint estimation holds true only when the cross-equation correlation is sufficiently high, especially in a two-equation system. In my case, the cross-equation correlation between labour supply and fertility, estimated as residual from equation (5), where the dependent variable if a dummy for working, and equation (6), is zero (0.000), thus not justifying the use of a joint estimation.[34] On top of that, 3SLS techniques that account for the panel dimension (EC3SLS) are random effect estimators which assume the individual fixed effects uncorrelated to the other regressors, unlikely to be a realistic assumption. The alternative estimation strategy would be a Full Information Maximum Likelihood estimator, which has the drawback of not accounting for the endogeneity of my main variable of interest unless I rely on a control function approach and include the first stage residuals. Therefore I decide to use a single equation estimation strategy.[35] With my strategy I first evaluate the total effect on each decision and then I try to infer the effect on their correlation.

[33] Studies using a simultaneous estimation strategy are, among others, Francesconi (2002), and Del Boca et al. (2009).

[34] The correspondent cross-equation correlation between the log of weekly hours worked and fertility is also very low (-0.019)

[35] As further support of the validity of this strategy, I run a series of robustness checks in order to quantify the potential effect of the cross equation correlation on my results - by controlling for fertility in the labour supply equation and vice-versa. Ideally I would like to include these regressors and instrument for them. However, it is difficult to find an instrument providing exogenous variation for fertility (labour supply) and not being correlated with labour supply (fertility).

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Editorial staff
Ricardo Martinez Moya, Jutta Palm-Nowak

Technical completion
Renate Martin

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For further inquiries contact the author:

Agnese Romiti
Phone +49.911.179 7657
E-mail Agnese.Romiti@iab.de