Society for the Study of Economic Inequality

Working Paper Series

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ECINEQ 2022 610

ECINEQ 2022 610
2022 March
www.ecineq.org

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Abstract

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Keyword: D10, F22, J22, J31

JEL Cassification: Immigration, gender gap, labor market, household services

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* I gratefully acknowledge comments and suggestions from Pedro Salas-Rojo, Elena Bárcena-Martín, Coral del Río and Olga Cánto. The usual disclaimer applies. Declarations of interest: none.
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1. Introduction

Research on immigration and its impact on the host country has received a growing attention in the public and academic debates. Taking different theoretical and methodological approaches, scholars have considered their effect over different economic and social outcomes, although the analysis of employment and wages have received greater attention.[1] Yet, another topic of major concern is the persistent gender gap in the labor market. For instance, Bertrand (2011) and Blau and Kahn (2017) focus on the role of human capital, occupation, and discrimination in explaining those gender inequalities, while Kleven et al. (2019) highlight the important role played by parenthood. This paper delves into these subjects and examines the effect of immigrants on gender gaps in the Spanish labor market, focusing on their role as childcare substitutes of women.

A number of studies have pointed out that immigrants can affect natives' labor outcomes by increasing the supply of domestic and care services. If the arrival of immigrants reduces the price of household services, natives can purchase those cheaper services, and trade some housework for market work. Providing evidence for this new channel, researchers went beyond the standard analysis, which was largely focused on proposing different mechanisms through which economies absorb immigration inflows (Lewis, 2011, 2013; Peri and Sparber, 2009; Ottaviano and Peri, 2012). In particular, they found that immigration allow highly educated native women to increase their labor supply by improving the availability and affordability of household services, especially those related to childcare (Cortes and Tessada (2011) or Furtado (2016) studied the US, Barone and Mocetti (2011) Italy, Cortes and Pan (2013) Hong Kong, and Romiti (2018) the UK).

This literature has paid particular attention to childcare, but elderly care is also becoming relevant in many developing countries due to a rapidly aging population. While only a few studies have examined the role that immigrants play as caretakers of elderly people, they reached similar conclusions (Farré et al., 2011; Peri et el., 2015). Peri et el. (2015) show that migration inflows led Italian women to delay retirement and increase their labor supply, relative to men, by substituting them as elderly caretakers. In doing so, the authors included both native men and women in the sample, departing from the approach usually

[1] Edo (2019) provides a review regarding these two variables and De la Rica et al. (2015) summarize the economic consequences of immigration in Europe.

followed in the literature analyzing the home-care substitution effects of immigration. This research has indeed focused on female labor supply, excluding men from the sample and ignoring gender-based differences. To the best of our knowledge, Cortes and Pan (2019) are the only ones who study the impact over the skilled gender gap by selecting natives of both genders. Following this line, we exploit the heterogeneous impact that immigrants have on men and women with and without children in Spain.

After the wave of mass migration that Spain experienced at the turn of the 21st Century, with the share of foreign-born population rising from 3% in 1998 to 13% in 2008, several studies have already examined the impact of immigration on different economic outcomes.[2] The housework substitution effect has also been analyzed, as the growing demand for personal care services was largely met by the increasing presence of immigrants in the sector, leading to a massive expansion of the household sector (León, 2013). Farré et al. (2011) show that the labor supply of skilled women with family responsibilities increased, relative to women without child or elderly coresidents, due to the domestic work substitution attributed to immigrants.

Linked to family responsibilities, there is also a growing interest regarding the child and motherhood penalty. This literature examines to what extent women fall behind men or childless women in the workforce after childbirth. The evidence shows that mothers face extra disadvantages, such as lower wages or labor intensity, and remark the importance of children in understanding those inequalities (Cukrowska-Torzewska and Matysiak, 2020; Kleven et al., 2019). This reality also applies to Spain, as mothers do not only present a lower earning profile relative to childless women (Fernandez-Kranz et al., 2013) and men (de Quinto et al. (2021), but having children also implies a setback in their careers. Despite the relevance of parenthood for the persistence of gender inequalities in labor market outcomes, most research has hardly considered the role played by immigrants in reducing gender-based labor disparities.

Filling this gap, we analyze whether the household substitution effect narrows gender labor gaps. We follow the double-difference approach proposed by Peri et al., (2015), and

[2] Most empirical works have focused on the labor market effects (Bentolila et al., 2008; Carrasco et al., 2008; González & Ortega, 2011; Amuedo-Dorantes & de la Rica, 2010, 2011, 2013; Farré et al., 2011, Özgüzel, 2020). However, recent studies have also considered the impact of immigration on trade (Peri & Requena, 2010), productivity (Kangasniemi et al., 2012), crime (Alonso-Borrego et al., 2012), public spending in social services (Jofre-Monsenyetal et al., 2016), public-private school choices (Farré et al., 2018), housing market (Gonzalez & Ortega, 2013; Sanchis-Guarner, 2017) or workplace safety (Bellés-Obrero et al., 2021).

explore the differential effect of immigrants on the relative women–men labor supply between families with and without children. If migration inflows increased the labor supply of native women, relative to men, and this effect was especially strong for families with children, we could determine that immigrants reduce women–men differentials in probability of employment by substituting women in childcare. On top of that, we consider several labor outcomes that remained understudied in Spain and get a broader picture of the phenomenon. Using administrative data from the Spanish Social Security for the period 1998-2008, we study annual and daily labor earnings, the part-full time working decision or the annually working days. Most remarkably, including earnings in the analysis is particularly important as, despite its link with the gender wage gap, its study has been overall limited.[3] Finally, we deal with potential selection and omitted variable bias by including individual fixed effects and following an instrumental variables approach based on the distribution of early migrants across provinces (Card, 2001).

Consistent with the abovementioned ideas, we show that migration inflows into a region have a positive impact on the woman-men differentials in most labor market outcomes considered. This differential effect is still larger in families with children than in childless ones, hence providing evidence supporting the house/child-care substitution effect of immigrants. For instance, while 1 percentage point increase in the regional share of immigrants rises the women-men differential in employment by 0.6 points in families with children, the effect only reaches 0.2 for the childless. The additional effect of 0.4 points on families with children is attributed to the role of immigrants as child caretakers. In particular, immigrants led mothers to increase their labor supply, relative to fathers, so migration flows can help narrow the persistent gender gap. Most remarkably, these results also extrapolate to work intensity (days and hours worked) and pay (annual and part-time adjusted daily earnings). Further analysis suggests that our results are largely driven by individuals below tertiary education. Finally, we provide more evidence regarding child penalties. While parenthood is positively associated with men's labor supply and earnings, it represents a setback for women, who seem to trade market work for housework. Interestingly, our results confirm that migration attenuates this trade-off by substituting women on caring activities, thus suggesting a channel to reduce barriers to women's work supply and gender differences.

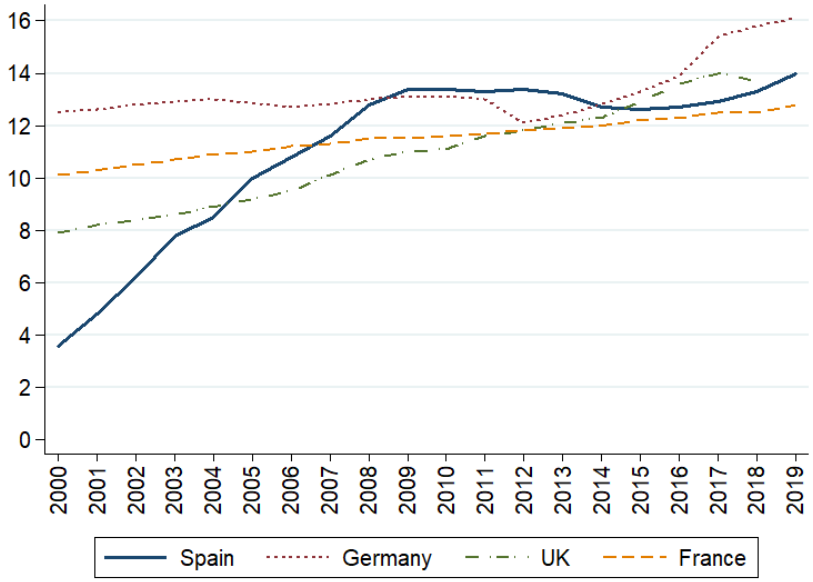
[3] Peri et al. (2015) and Cortes and Pan (2019) are the only ones considering earnings.

The paper is structured as follows. Section 2 overviews the most relevant features of immigration in Spain. Section 3 presents the empirical approach, focusing on the identification strategy. Section 4 describes the data. Section 5 discusses the results, including a heterogeneous analysis by educational levels. Section 6 presents some robustness checks and Section 7 concludes.

2. Why Spain?

There are several reasons that make Spain suitable to study the effect of immigration on the gender gap in the labor market. Most remarkably, between 1998 and 2008, Spain registered one of the largest waves of international migration, the foreign-born population having increased from 1.1 million to 6 million. As Figure 1 shows, their population share rose from 3% to 13% in this decade, a growth not experienced by the greatest European economic powers. These migration flows completely shifted the traditional path of emigration, as Spain only started attracting a significant number of immigrants during the XXI century, a trend that kept rising until it reversed in 2012. Indeed, while the strong economic growth and the Housing Boom experienced from the mid-1990s to 2007 provided many employment opportunities for immigrants, especially in the construction and services sectors, the onset of the Great Recession in 2008 entirely changed the trend. The massive job destruction made the Spanish labor market less attractive, and the foreign population started shrinking in the subsequent years.

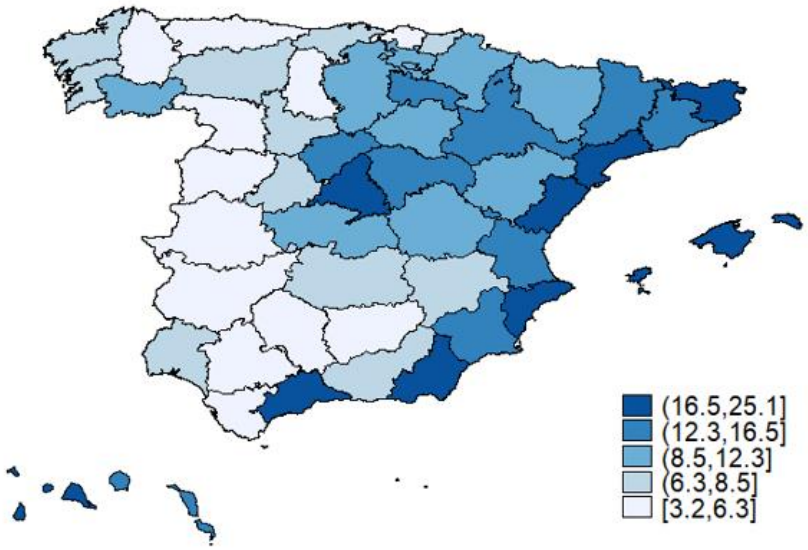
Figure 1. The share of foreign-born population (%).



Source: International migration database (OECD).

The Spanish case is also adequate to carry spatial correlations analyses with a regional approach. As Figure 2 shows, the distribution of immigrants across provinces in 2008 is far from homogeneous. While the regions around Madrid and the Mediterranean coast have attracted a significant amount of immigrants, their share being above 15% of the total population, immigration shares are rather low in the West, with values usually lying below 5%. Moreover, the immigrant population did not grow equally in all provinces. Figure A1 in the Appendix illustrates the percent change in the share of immigrants between 1998 and 2008. The share of immigrants grew more than 10% in several provinces located at the center of the peninsula, which started from very low levels, but experienced little change in some regions of the periphery.

Figure 2. Regional distribution of foreign-born over total population (2008)

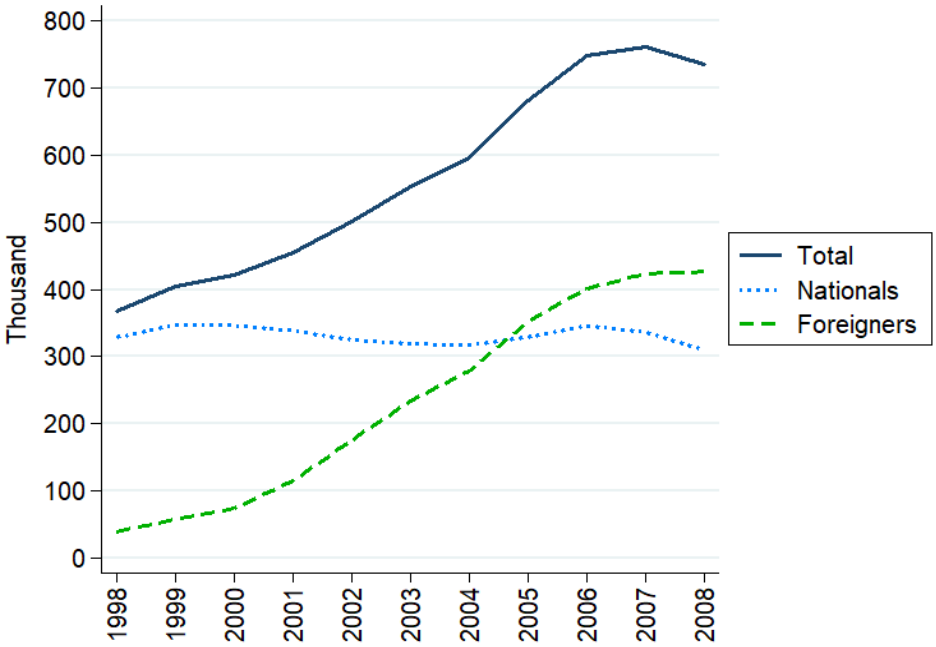


Source: 2008 Municipal Register (INE).

It is also noteworthy that a large fraction of the foreign population come from Spanish-speaking countries, making them suitable for occupations requiring interactive-communication skills, and potentially increasing labor market competition. Still, since Carrasco et al. (2008) first analyzed the economic impact of immigration in Spain, researcher found no evidence of detrimental effects on natives' employment and wages. These results were also found in other developing countries and led scholars to consider alternative adjustment channels. In this line, Gonzalez and Ortega (2011) found changes in skill intensity at the industry level in Spain. Regions that received a large inflow of unskilled immigrants increased the intensity of use of the more abundant unskilled labor. From another angel, Ottaviano and Peri (2012) noted that the effect of immigration

depends on whether immigrants and native workers are substitutes or complements, this is, the extent to which they possess different complementing skills and specialize in distinct occupations. In Spain, native and immigrant workers of similar educational attainment are not perfect substitutes (Amuedo-Dorantes and De La Rica, 2011).

Figure 3. Evolution of household employees.



Source: Spanish Labor Force Survey, LFS (INE).

Concurring with the main interest of the paper, immigration can affect natives' labor supply though an additional channel: by supplying domestic work and substituting women as caretakers. This mechanism is likely to prevail in Spain, one of the clearest examples of the southern "migrant in the family" care regime described in Bettio et al. (2006), which is inexistent in other European regions. Indeed, as Figure 3 illustrates, the massive expansion of the household sector is largely explained by the influx of foreign-born workers, mostly females. For instance, household employed around 28% of immigrant women in 2008, who in turn represented 55% of total employment in the sector (LFS). In this regard, Farré et al. (2011) show that immigrants increased the availability and affordability of household services, rising the labor supply of skilled women with family responsibilities, relative to those without.

Given the limited provision of public childcare services, especially for 0-3 years education, and the unequal supply across Spanish provinces, we focus on childcare. The approval of the Spanish Dependency Law in 2006 also makes the elderly care channel

interesting, as it provided households with social allowances to hire domestic caretakers, but we leave aside this mechanism due to data constraints. Our main database informs us about individuals' household composition (see Section 4), so we know whether they live with elderly relatives, but we do not know if elderly coresidents are dependent, or if, on the contrary, they help with the children and other family responsibilities. Moreover, individuals may be caring for elderly relatives that live in separate households, but this information is neither available. The following lines present the strategy we follow to identifying how immigrants affect women-men labor gaps through a childcare substitution effect.

3. Empirical Approach

3.1 Basic specification

The empirical strategy of this paper relies on a specification that relates several individual labor outcomes (Y_{itr}) with the regional share of immigrants (Im_{rt}) and its interactions with gender and family characteristics. Following Peri et al. (2015), we estimate a regression of the following form:

$$Y_{itr} = \mu_1 Child_{itr} + \mu_2 (Female_i * Child_{itr}) +$$

$$\alpha_1 Im_{rt} + \alpha_2 (Female_i * Im_{rt}) + \alpha_3 (Child_{irt} * Im_{rt}) + \alpha_4 (Female_i * Child_{irt} * Im_{rt}) \quad (1)$$

$$+ \beta' X_{itr} + \delta_r + \delta_t + \delta_i + \varepsilon_{itr}$$

The dependent variable (Y_{itr}) captures alternative labor outcomes of individual i in region r in year t. We consider 52 regions (Spanish provinces) and 11 years (from 1998 to 2008). We start studying the extensive margins of the labor supply by using a dummy variable that indicates whether an individual has been working during the reference year. Then, we explore the intensive margins by looking at the number of days annually worked and the number of weekly hours worked.[4] To deal with non-linearities, we transform these variables using the inverse hyperbolic sine function (HIS).[5] For working individuals, we also consider a binary indicator for full-time versus part-time employment. Finally, we

[4] Our database does not include information on hours worked, but it provides a part-time coefficient. Exploiting the coefficient, we determine how many hours each individual works in a week. Following Fernandez-Kranz and Rodriguez-Planas (2011), we assume a regular working week of 40 hours.

[5] These variables equal zero when the individuals do not work. Given that the logarithmic function is not defined at 0, we could add a constant. However, the inverse hyperbolic sine transformation - $IHS\,(y) = ln\,(y + \sqrt{y^2 + 1})$ - offers a better alternative. Besides from being interpreted as the log of the transformed variables, it is well defined at zero.

explore the IHS of real annual and daily labor earnings, the latter being expressed as euros per day of full-time equivalent work.

The right-hand side of the equation includes a dummy variable taking value 1 when the individual has a child ($Child_{itr}$), its interaction with the female dummy ($Female_i * Child_{itr}$) and all the immigration variables: the regional share of immigrants (Im_{rt}), the interaction of that share with a female dummy ($Female_i * Im_{rt}$), one with a dummy for the presence of children ($Child_{irt} * Im_{rt}$), and the double interaction between the presence of children, the female dummy and the share of immigrants ($Female_i * Child_{irt} * Im_{rt}$). This double-difference approach will identify the effect of interest ($\hat{\alpha}_4$), i.e., the domestic labor substitution effect of immigrants.

The interaction terms allow immigrants to have a differential effect on individuals according to their gender and family type. However, we focus on women-to-men differentials to identify their role as substitutes for domestic work. The gender-based differential effect is captured by $\hat{\alpha}_2$ in families without children, but it equals the sum of both, $\hat{\alpha}_2 + \hat{\alpha}_4$, for families with children. More precisely, $\hat{\alpha}_2$ may capture two different effects of immigration: a substitution effect of women's housework, but also a competition effect that may differently affect men and women. Assuming that this gender-based unequal competition effect does not vary across family types, we consider that the additional effect $\hat{\alpha}_4$ comes exclusively through immigrants' role as childcare substitutes. This parameter captures the additional effect of immigrants on the women-men differential in families with children relative to the childless ones, deriving from domestic help with children.

The specification in equation (1) also includes a vector of individual controls (X_{itr}), region (δ_r), year (δ_t) and individual (δ_i) fixed effects.[6] The individual fixed effects (δ_i) capture time invariant characteristics (including gender) and account for individual heterogeneity. This way, we control for self-selection in parenthood and overcome one of the limitations of Farré et al. (2011). Vector X_{itr} additionally controls for individual time-varying characteristics that might affect labor outcomes. It includes age dummies,

[6] Note that the analysis is focused on the first child. This approach is common in the literature as it has been argued that the first child is what most matters in the labor market. In Spain, de Quinto et al. (2021) demonstrated that motherhood explains a relevant part of the gender gap in earnings because, following the birth of the first child, women reduce their working time and hold more fixed-term contracts relative to men.

labor market experience (expressed in years) and its square value, the total number of children, the age of the eldest child or the occupational skills (ranges from 0 to 5).

Regarding the identification of the parameters, we exploit the longitudinal dimension of the data by including individual fixed effects and, thus, control for individual heterogeneity that might correlate with the existence of immigrants and labor market decisions. The fixed effects reduce problems of selection on unobservable characteristics, but we might still get biased estimates if time-varying unobservable regional variables affect immigrants as well as women's disposition to work relative to men. As Peri et al. (2015) noted, since we use a double difference identification strategy, we differentiate out several unobserved factors common to families with and without children. Only economic factors that affect the women–men gap differentially across the two-family types and that may be correlated with immigration at the regional level would bias our OLS estimates. Yet, we remove any unobserved (omitted) variable bias that survive to the double differencing by adopting the instrumental variable approach proposed by Altonji and Card (1991) and Card (2001). As we carefully explain in the next subsection, the instrument isolates immigrant's location choices that are driven by networks oo preferences, thus leaving aside local labor demand and productivity shocks that may also influence natives' labor decisions.

3.2 Instrumental variable

Based on the "shift-share" or Bartik methodology, the instrument isolates the exogenous part in immigration inflows by exploiting pre-existing ethnic networks. Given that immigrants tend to disproportionately locate in areas where previous waves from similar nationalities or ethnicities settled, the instrument draws on the past spatial distribution of immigrants to predict current location patterns. Intuitively, this approach uses ethnic enclaves and their influence on immigrants' location decisions to predict the stock of foreigners at the regional level in a given year. Formally, we compute the instrument as follows:

$$IV_{rt} = \frac{\sum_c \left(\frac{Totmig_{crt_0}}{Totmig_{ct_0}} \right) Totmig_{ct}}{Pop_{rt_0}} \qquad (2)$$

The term in brackets is the "share" part of the instrument and represents the share of immigrants from country of origin c located in province r in the base year t_0. We rely on the 1991 Census (see data section below), so the historical distribution of immigrants

refers to the year 1991. $Totmig_{ct}$ is the stock of immigrants from country c living in Spain at year t. It constitutes the "shift" part of the instrument. We normalize the imputed stock of immigrants using Pop_{rt_0}, the total population in region r at the first year of the analysis (1998). In doing so, rather than using the current population in the province, we reduce the possibilities that endogenous changes in the native population alter the instrument. Note that the only time varying factor in equation (2) is Im_{ct}. Thus, any variation in the predicted stock or share of immigrant comes from yearly changes in the national stocks of immigrants of different origin.

3.3 Instrument validity

The validity of the instrument relies on two identification assumptions: the relevance and the exclusion restriction (or exogeneity). Although the ethnic-networks instrument has already been used Spain (e.g., Gonzalez and Ortega, 2009; Amuedo-Dorantes and De La Rica, 2011; Farré et al. 2011; Jofre-Monseny et al., 2016; Bellés-Obrero, et al. 2021), this subsection discusses its validity.

The relevance assumption requires past and current regional distributions of immigrants to be correlated. There is ample empirical evidence proving that newly arrived immigrants tend to cluster in regions with high representation of immigrants from the same country to benefit from pre-established networks (Cutler and Glaeser, 1997; Åslund, 2005). As Sandell (2008) shows, this rational also applies to Spain, where networks strongly affect immigrants' location choices. Providing more evidence, in the next lines we explain how we can empirically test this assumption.

As a preliminary test, Table A1 in the Table Appendix assesses the relevance of the instrument by performing the first stage analysis at the provincial level. We show the results from regressing the regional share of immigrants on the instrument defined in equation (2). Column 1 shows the unconditional correlation, Column 2 includes region and year fixed effects, and Column 3 also contains the average regional-year level of the variables included in the individual level specification (Vector X_{itr}). Despite the small sample size and the clustering of the standard errors at provincial level, all F-statistics are above 10, thus avoiding weak instrument concerns. The coefficient of the imputed share

of immigrants is also significant and its size compares well with other estimates previously obtained for Spain.[7]

In our main regressions, the vector of instruments additionally includes the interaction of the instrument with dummies indicating gender and the presence of children. Table A2 in the Table Appendix reports the corresponding first-stage regressions. Moreover, all the forthcoming results Tables report the joint and individual F-statistics obtained from the first stage of the instrumented effects. Those F-statistics are largely above any standard critical values, enabling us to reject the null of weak instruments.

Regarding the exclusion restriction, immigrants' location patterns prior to 1991 should be orthogonal to local labor demand conditions during 1998-2008. This is, the unobserved factors explaining why immigrants unevenly settled across Spain in the 1980s cannot be correlated with our outcome of interest, in particular, those affecting the women–men labor market gap. In fact, there are several reasons to believe it holds.

The time span between the measurement of the ethnic enclaves and our analysis is sufficiently long to make the former assumption plausible. Moreover, the strength of the instrument is largely driven by Latin Americans and Moroccans, who had a longer tradition of immigration and a greater representation relative to other nationalities in 1991. As Figure A2 and A3 in the Figure Appendix show, the geographical distribution of these two groups presented relevant differences in 1991. Excluding Barcelona and Madrid, which rapidly became the main poles of attraction, Moroccans clustered across the Mediterranean Sea, possibly due to the geographic proximity to their homeland. On the contrary, Latin Americans settled in the northwest of the peninsula. Given that a great number of Spaniards emigrated from these regions to Latin America at the beginning of the 20th Century, we have reasons to believe that part of the Latin Americans who settled in these areas during the 1980s were connected to past emigrants. These unequal patterns suggest that economic conditions are not the only factors determining immigrants' location in Spain. Hence, it provides evidence in favor of the exogeneity assumption.

Finally, as Jaeger et al. (2018) noted for the US, the networks instrument may encounter problems if the regional distribution of immigrants by country of origin is stable across time, but this is unlikely to happen in Spain. Both Figures A4 and A5 in the Figure

[7] Farré et al. (2011) and Farré et al. (2015) got values of 0.29 and 0.21, respectively.

Appendix show that the composition of immigrants by regions of origin has changed across time and that the serial correlation of immigrant flows is not as strong as in the US.

4. Data

Our analysis is based on three different data sources. The individual labor market information comes from the Continuous Sample of Working Histories, whereas the Municipal Register and the 1991 Decennial Census provide data on immigration.

4.1 Labor Market Data

Our main data source is the 2006-2008 Continuous Sample of Working Histories (Muestra Continua de Vidas Laborales, MCVL onwards), an administrative database containing social security, income tax and census records. The data is composed by a 4 % non-stratified random sample of the population that during the year have had any relationship with the Social Security, so it represents individuals who are working, receiving unemployment benefits or a pension.

The MCVL provides social security records covering the complete labor history of the selected sample. It contains information of all changes that any individual has experienced in her/his labor market status or job characteristic, including occupational or contractual variations within the same firm. For every individual, we have the detailed information of each job spell since the first employment. We know its start and end date, the occupation, type of contract, sector, working hours expressed as a percentage of a full-time equivalent job, the province where the establishment is located and monthly earnings. Although earnings are top and bottom coded, we compute real daily labor earnings, expressed as euros per day of full-time equivalent work.[8] We additionally construct a precise measure of experience using the actual number of days the individual has been employed. Essential for our analysis, the MCVL also contains census records that include individuals' sociodemographic information such as gender, age, nationality, birthplace, educational attainment and the household composition.[9]

[8] Uncensored labor earnings coming from income tax records are also available, but only since 2005. Therefore, here we are limited to using the social security contributions. The MCVL does not include information on hours worked, but it provides a part-time coefficient. Ranging from 0 to 1000, this measure expresses the duration of the working day that a part-time worker performs as a fraction of the usual full-time workday in the company. For instance, the coefficient equals 500 for a half-day worker. This way, full-time equivalent earnings is capturing what part-time workers would earn under a full-time schedule.

[9] The educational level tends to be outdated because it relies on the information individuals provide upon Census registration. However, since 2009 the Ministry of Education directly reports individuals' highest

The MCVL follows individuals over time insofar as they keep affiliated to the Social Security, so only a few new members are included each year to maintain representativeness. Drawing on the panel design, we combine multiple waves of the MCVL to construct a yearly panel that covers employment histories from 1998 to 2008.[10] Note that whenever an individual stops working for one or several years but re-enters later, we identify that gap as an unemployment spell and set labor earnings to zero. Combining consecutive waves allows us to maintain the representativeness of the sample throughout time by including individuals affiliated to the Social Security in one year, but not in another. Only individuals who pass away, stop working or leave the country permanently and do not receive unemployment benefits or a retirement pension are lost from the sample.

We restrict our sample to workers registered under the General Regime of the Social Security system because information on earnings is not reliable for the remaining schemes.[11] We also restrict the sample to native individuals aged 25 to 45 years. While the lower age bound avoids including student jobs and favors that our sample of interest has completed their education, the upper bound helps us to identify the child-parent relationship.[12] In fact, these restrictions focus the analysis on individuals with young children or in fecund age, for which there is a stronger connection between the time allocated to household duties and the labor market.[13] Our final sample includes 144,994

educational attainment to the National Statistical Institute, which is then used to update the Census records. Following Roca and Puga (2017), we use subsequent editions of the MCVL to benefit from improved data on educational attainment. However, this educational adjustment is not possible if individuals do not appear in future waves. In those cases, we correct this educational downward bias by classifying individuals as highly educated if they hold a college degree or worked under the contribution group 1 (i.e., Engineers, Graduates and Senior Managers).

[10] If the worker had more than one job per year, we define a "main job". Following Fernández-Kranz and Rodríguez-Planas (2011) and Guner et al. (2019), we establish a ranking-based approach. We select the job in which the individual worked the largest number of days in that particular year. In the case of multiple jobs with the same duration, we choose the one with the highest earnings. Moreover, the initial date is conditioned by the data we use to count the stock of immigrants, as the Municipal Register is published annually since 1998. Anyway, the information on type of contract in the MCVL is not reliable until 1996, so we would still be limited to analyzing the late 90s. We consider 2008 to be a reliable cutting-point, due to the large impact that the Great Recession had on employment.

[11] Over 80% of Spanish workers are enrolled in the general scheme of the social security system.

[12] The MCVL provides information on the number of household members, their sex and birth date, but the precise family relationships are not made explicit. Restricting the maximum age to 45 years reduces the risk of classifying as childless those individuals whose children have already left the household. Additionally, we minimize the possibility of assigning births to individuals who are not their parents by dropping from the sample those adults living in households with other potential parents and limiting the analysis to households with five or less members.

[13] Indeed, this restriction is common in the literature relating labor supply and motherhood. For instance, Forlani et al. (2015) limit the analysis to women aged 22 to 45.

employees and 1,556,806 yearly observations from 1998 to 2008. Moreover, 56% of the sample (43,145 women and 38,402 men) have a child by 2008. The interested reader can find the summary statistics in Table A3 in the Table Appendix.

We benefit from the data in several ways. First, its large sample size and administrative nature reduce small sample and recall biases, allowing us to obtain more precise estimates. Second, it includes historical labor market information, so we can accurately study career profiles of individuals before and after childbirth. Third, the data allows us to track individuals across time and space based on their workplace location, which is crucial for determining whether the arrival of immigrants had any impact on their labor outcomes.

4.2 Data on Immigration

Once we have explained the core features of our main data, we turn to describe the sources we use to measure the immigrant population. We combine data from the 1991 Decennial Census and the 1998-2008 Municipal Registers (Padrón Municipal de Habitantes).[14] The Spanish Statistical Institute (INE) provides both datasets. The Census is used to construct the "share" part of the instrument defined in equation (2), so the distribution of immigrants by country of origin across the Spanish provinces in 1991 is the base of our ethnic networks instrument. The "shift" part is built with data from the Municipal Register, the official population registry that municipalities collect. We also use the Register to measure the concentration of immigrants at the regional level. However, it does not provide the educational level of individuals, thus preventing us from calculating the share of the less skilled immigrants, who are more likely to increase the supply of household and care services. To overcome this limitation, we exclude immigrants born in EU-15, US, Canada, Australia or New Zealand when measuring the immigrant population. This way, we exclude the potentially most educated group of immigrants from the analysis.[15]

The main advantage of the Register lies on its structure. Although the law obliges any citizen to register (de-register) upon arrival (departure), foreigners have additional incentives to do so. While registration grant access to municipal services such as the

[14] Although an older Census is available, the one of 1981, the number of foreigners living in Spain was still too small to construct a strong instrument.
[15] Results are robust to defining foreigners based on nationality, which captures more recent immigrants.

education and health services, this data is not shared with the Police. Hence, it provides trustful numbers of immigrants that live in Spain with or without legal documents, allowing us to reduce measurement errors in our main explanatory variable. Regarding the de-registration process, not all individuals do so when leaving Spain. Some may plan on retuning soon, but other may have simply forget about it. Given the lack of benefits associated with de-registration, the INE started making its own corrections in 2006. Since then, immigrants who do not confirm their residence within two years are automatically deleted from the municipality records.[16] Nevertheless, the 1998-2008 period was characterized by having negligible migration outflows (Izquierdo et al., 2015).

5. Results

This section discusses our main results, which focus on identifying the effect of immigration on the relative women–men labor outcomes through the supply of childcare activities. First, we analyze the extensive and intensive margin of the labor supply. We study the effect of immigration on the working-nonworking decisions of men and women and the intensity of the work supplied. We consider annual working days, weekly hours work and full-time employment. Then, we check whether immigration affects natives' earnings by examining total annual earnings and part-time adjusted (pta) daily earnings. Finally, we explore the heterogeneity of the impact of immigration by educational levels.

5.1 The extensive margins of the labor supply

Table 1 shows the results we obtain when the dependent variable is a dummy variable taking value 1 if the individual worked in a given year and 0 otherwise. All specifications in this Table include individual, regional and year fixed effects together with the controls we have described in Section 3. The first two columns are estimated with ordinary least squares (OLS), whereas columns 3 and 4 use two-stage least squares (2SLS) with the instrument defined in equation (2). At the bottom of the Table, we report the joint and individual F-statistics obtained from the first stage of the instrumented effects.

[16] This adjustment is applied to non-EU foreigners without a permanent residence permit, thus correcting for unrecorded departure.

Table 1. Immigration and natives' labor supply: working decision

	(1) OLS	(2) OLS	(3) IV	(4) IV
Im. Share	-0,328***	-0,385***	-0.405***	-0.483***
	(0,059)	(0,055)	(0.146)	(0.129)
Im. Share x Female	0,289***	0,204***	0.289***	0.193***
	(0,049)	(0,049)	(0.066)	(0.067)
Im. Share x Child		-0,034		-0.028
		(0,028)		(0.051)
Im. Share x Female x Child		0,373***		0.403***
		(0,028)		(0.035)
Child		0,016***		0.015***
		(0,003)		(0.003)
Child x Female		-0,059***		-0.061***
		(0,006)		(0.005)
Absolute effect				
Men	-0,328***		-0.405***	
Women	-0,038		-0.117	
Men without Children		-0,385***		-0.483***
Men with Children		-0,419***		-0.511***
Women without Children		-0,181***		-0.290***
Women with Children		0,158***		0.084
Differential effects				
Women-men	0,289***		0.289***	
Women-men without Children		0,204***		0.193***
Women-men with Children		0,577***		0.596***
Double differences		0,373***		0.403***
Obs.	1,556,806	1,556,806	1,556,806	1,556,806
Ind.	144,994	144,994	144,994	144,994
F-statistic				
Joint			9.545	34.09
Im. Share			28.80	24.47
Im. Share x Child				49.35
Im. Share x Female			116	158.2
Im. Share x Female x Child				75.35

Note: The estimation methods are OLS and 2SLS (see columns' headings). The dependent variable is a 1–0 dummy indicator for working/not working. All regressions include individual, year and region fixed effects and the following controls: age dummies, labor market experience and its square value, the total number of children, the age of the eldest child and the occupational skills. Columns (2) and (4) include a child dummy and its interaction with gender. Standard error clustered by province are reported in parentheses. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Column (1) and (3) show the base specification without the major interactions because it aims to analyze the overall effect of immigration when we just differentiate by gender. Both, the OLS and the 2SLS estimators, identify a positive and significant woman–men

differential of such effect. While immigrants negatively affect men's employment probability, this negative effect is much smaller for women, despite not being significant. In particular, the fall in the employment probability that comes from a 10 percentage-point increase in the regional share of immigrants is 2.9 percentage points smaller for women than for men. Since family responsibilities are likely to constrain labor supply, columns (2) and (4) include all interactions and decompose the women–men differential effects across individuals with and without children, thus unveiling the difference between these two-family types.

First, notice that the OLS and 2SLS estimates are quite similar, especially those attending the differential effects, hence suggesting a small endogeneity bias. Both estimation methods show that, regardless of whether or not men have children, immigration inflows negatively affect their working decision. For women, this effect is only negative among the childless and, even then, much smaller than for men. This result goes in line with Farré et al (2011), who found that immigration exerted downward pressure on the employment rate of women without family responsibilities when they constructed the sample with women of all educational level, as in our case. Most remarkably, it seems that in both family types considered, men experience a greater detrimental effect from large immigration flows. Indeed, as Ottaviano and Peri (2012) noted, the mass arrival of immigrants has different consequences depending on the effect (competition or complementarity) that prevails, and the dominating effect can vary across groups.

In Spain, females present a higher degree of complementarity, which helps explain why women's labor supply is less negatively affected by immigration. Indeed, whilst native workers relocated towards relatively less manual occupations in response to the wave of immigration that Spain received between the late 1990s and the early 2000s, task specialization and job relocation was greater for women than for men (Amuedo-Dorantes and De la Rica, 2011). It seems that this relocation mechanism allowed women to mitigate more effectively the negative labor competition induced by immigrants.

Yet, there is another effect coming from the supply of domestic and care services, which is more likely to affect women through a home-care substitution. As the differential effects reported in Table 1 show, the women-men differential in employment probability increases by 0.6 percentage points per point increase in immigration for families with children, while the effect just reaches 0.2 for the childless. The additional effect of 0.4 points on families with children is indeed the contribution of immigrants as childcare

takers, and highlights the incentive effect that immigrants have on women by substituting domestic labor. As in the case of women with children, the housework substitution effect can even compensate the negative impact that immigrants have in the form of labor competition. Looking at the absolute effect reported in column (4), a 1 percentage point increase in the regional share of immigrants rises mothers' employment probability by approximately 0.1 points. In this context, previous studies have already shown that migration inflows into a region increase the labor supply of skilled native women by providing caring activities both in Spain (Farré et al., 2011) and other developed countries (Barone and Mocetti, 2011; Cortés and Tessada, 2011; Forlani et al, 2015, Romiti, 2018).

It is also important to remark that the main effect of parenthood on the labor supply considerably differs by gender. While having children positively affects men, it represents a setback for women in the workforce. These results go in line with the motherhood penalty extensively discussed in the literature. De Quinto et al. (2021) have recently confirmed that motherhood explains an important part of the Spanish gender gap in earnings. As they noted, despite no remarkable differences until the first childbirth, women reduce their working time and hold more fixed-term contracts afterwards. Some theories claim that gender norms and differences in preferences for certain job attributes, such as workplace flexibility, explain why mothers are less actively involved in the labor market (Bertrand, 2011, and Blau and Kahn, 2017 review recent work). However, our result suggest that mothers' labor supply responds to an increase in the availability and affordability of household services, providing some evidence against those theories.

5.2 The intensive margins of the labor supply

Here we analyze the effect of immigration on the extensive margins of the labor supply. For ease of understanding, we only report the absolute and differential effects for the 2SLS estimations, but these can easily be calculated for OLS following the explanations in Section 3.1. Now, Table 2 reports the results of the specification with all interactions for three dependent variables: the number of annual days worked, weekly hours worked and a dummy equal to 1 when the job is full-time and 0 if part-time.

In the case of annual working days and weekly hours worked, the results go in the exact same direction as for the extensive margins (see Table 1). There is a significant positive effect of immigrants on the women–men differential in both family types, but this effect is larger among individuals with children. In particular, the difference in the women–men

differential between families with and without children equals 2.5 for the number of days worked and 1.5 for weekly hours worked. As already mentioned, the double difference between family types is attributed to the impact of immigrants through the supply of childcare services, which is especially benefiting women with children. The absolute effects in column (4) show that mothers increase their weekly hours worked by 0.3% when the regional share of immigrants increases by one percentage point. Moreover, whilst annual working days of mothers are unaffected by migration inflows, the absolute impact is negative for fathers.

The fact that the impact of immigrants substantially differs between genders makes the women–men differential clearly positive, but finding this positive differential effect does not mean that the gender gap is broadened. Just the opposite, immigrants increase the employment probability and work intensity of mothers, relative to fathers. Hence, our results suggest that the house/child-care substitution effect of immigrants can narrow gender gaps in the labor market by reducing some of the barriers to women's labor supply.

The housework substitution effect helps explain why men's working days and hours are more negatively affected by immigration than women's: outsourcing housework allows females to increase their labor supply. Still, additional mechanisms can make women more capable of attenuating the labor-market competition effect exerted by immigrants. In this regard, Amuedo-Dorantes and De la Rica (2011) proposed different reasons why immigrants caused greater task specialization and job relocation among women, and some factors can also explain our findings.

First, occupational segregation by gender is an important feature of the Spanish labor market, but the concentration of immigrants is higher in female-dominated occupations (Alonso-Villar and Del Río, 2017a). Although this occupational distribution implies a greater competition, it may favor higher responsiveness rates among women. Second, as summary statistics in Table A3 show, on average, Spanish women are more educated than men. A higher educational attainment may ease job mobility and relocation towards relatively less manual occupations, so women might be more likely to avoid direct competition with immigrants. Finally, job tenure is usually shorter among women, so job-specific human capital and job relocation costs are also potentially lower for them. All these mechanisms may have increased the ability of women to protect themselves from negative migration effects by facilitating job mobility.

Table 2. Immigration and natives' labor supply: intensive margins

	Days annually worked		Weekly hours worked		Full-time/Part-time	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Im. Share	-2.172***	-3.566***	-1.599***	-2.155***	-0.172***	-0.140**
	(0.251)	(0.543)	(0.145)	(0.343)	(0.042)	(0.069)
Im. Share x Female	1.332***	1.334***	0.975***	0.980***	0.036	0.045
	(0.221)	(0.336)	(0.172)	(0.251)	(0.027)	(0.027)
Im. Share x Child	-0.385**	-0.345	-0.083	0.001	0.166***	0.177***
	(0.189)	(0.368)	(0.131)	(0.214)	(0.027)	(0.035)
Im. Share x Female x Child	2.247***	2.500***	1.350***	1.481***	-0.307***	-0.309***
	(0.183)	(0.255)	(0.116)	(0.146)	(0.052)	(0.068)
Child	0.116***	0.115***	0.067***	0.063***	0.007**	0.007**
	(0.019)	(0.020)	(0.012)	(0.012)	(0.003)	(0.003)
Child x Female	-0.456***	-0.474***	-0.269***	-0.279***	-0.043***	-0.044***
	(0.041)	(0.034)	(0.026)	(0.022)	(0.006)	(0.006)
Absolute effect						
Men without Children		-3.566***		-2.155***		-0.140**
Men with Children		-3.912***		-2.153***		0.037
Women without Children		-2.233***		-1.175***		-0.095
Women with Children		-0.077		0.307		-0.228***
Differential effects						
Women-men without Children		1.334***		0.980***		0.045
Women-men with Children		3.834***		2.460***		-0.265***
Double differences		2.500***		1.481***		-0.309***
Obs.	1,556,806	1,556,806	1,556,806	1,556,806	1,359,382	1,359,382
Ind.	144,994	144,994	144,994	144,994	142,777	142,777
F-statistic						
Joint		46.33		60.67		8.318
Im. Share		24.47		24.47		22.87
Im. Share x Child		49.35		49.35		51.15
Im. Share x Female		158.2		158.2		162.5
Im. Share x Female x Child		75.35		75.35		166.6

Note: The estimation methods are OLS and 2SLS (see columns' headings). The dependent variables are the hyperbolic sine transformation of weekly hours worked and a 0–1 indicator for full-time/part-time employment. All regressions include individual, year and region fixed effects and the following controls: age dummies, labor market experience and its square value, the total number of children, the age of the eldest child, the occupational skills, a child dummy and its interaction with gender. Standard error clustered by province are reported in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

The results change when we analyze full-time versus part-time employment. Although some coefficients in Table 2 are small and not significant, the absolute effects indicate that immigrant do not increase the probability of working full-time. Regarding the effect

of immigrants on the women-men differentials, it is insignificantly small among the childless but negative and significant for families with children. More specifically, mothers reduce the probability of working full-time by 0.27 points more than fathers when immigration shares increase one percentage point. Even if our previous results indicate that migration inflows enable mothers to increase their labor supply, this is not accompanied by an increase in full-time employment.

The literature has indeed proven that Spanish mothers are more likely to work-part time after the first childbirth, both relative to childless women and men (Fernández-Kranz et al., 2013; De Quinto et al., 2021). Focusing on paternity leaves, which may also boost women's labor supply by providing men with time to actively engage in childcare, Farré and González (2019) also noted the important role that part-time employment plays. According to their findings, the introduction of two weeks of paid paternity leave in 2007 made women who would have taken unpaid leave to work part-time instead.

Overall, our results prove that immigration facilitates women's employment possibilities and work intensity up to a point. Despite data limitations prevent further empirical analyses, we hypothesize that a trade-off exists between the earnings women derive from increasing their labor supply and the cost of hiring domestic and childcare services. There is an equilibrium where the benefits of outsourcing household production compensate its costs, and our findings suggest that part-time employment is part of this balance. This form of employment seems to allow hiring caretakers without surpassing expense limits. As already noted, part-time employment is indeed a common strategy adopted by Spanish women to reconcile paid work and family responsibilities.

In this line, the estimated coefficients listed in Tables 2 for the "Child" dummy ($\widehat{\mu_1}$) and its interaction with gender ($\widehat{\mu_2}$) provide more evidence of the motherhood penalty we previously identified. We find that having a child pushes men to increase the intensive margins of their labor supply but reduces women's intensity of work. Besides from confirming the existence of a work-family conflict, this result also provides evidence on how households take time-use decisions. While the increasing need of income around the arrival of a child induces men to work more, childcare responsibilities fall to a great extent over women, who seem to trade market work for household work. Interestingly, our previous results show that the presence of immigrants attenuates this trade-off by substituting women on domestic services, thus suggesting a channel to reduce barriers to women's work supply and narrow the persistent gender gap.

5.3 Earnings

So far, we have focus on variables related to the labor supply, but we now study a different labor outcome. This section addresses the question of whether immigration also affected natives' earnings by increasing the availability and affordability of household services. Besides from Peri et al. (2015), who considered wages in a falsification exercise, and Cortes and Pan (2019), this work is one of the few isolating the effect that immigration has on earnings through the supply of care services for children. Table 3 reports the results we obtain from estimating equation (1) using the total real annual earnings and the part-time adjusted (pta) real daily earnings as the dependent variable. Although both variables measure labor income, their separate analysis is pertinent because the former mixes two levels of analysis -working time and hourly earnings-, while the latter can be interpreted as a proxy of productivity.[17]

In line with our previous findings, there is a positive effect of immigrants on the women–men differential in earnings in both family types, but the effect is larger among those with children. Looking at annual earnings, column (2) shows that the women–men differential rises by 7.3% per percentage point increase in the share of immigrants for families with children, whereas the effect is 2.6% for the childless. The double difference between the two families is significantly positive (4.7), thereby corroborating the important role that immigrants play as home-care substitutes. This result has relevant implications for the gender wage gap. Focusing on individuals with children, who are mostly affected by the availability of household services, we have revealed that immigration led mothers to increase their labor supply and work intensity, relative to fathers, but this subsection confirms that such effect translates into earnings. In regions with large migration inflows, the household substitution effect associated to immigrants can reduce the gender pay gap by increasing the labor supply of mothers more than fathers.

This effect also applies to part-time adjusted daily earnings. The double-differential in Column (4) reveals that the increase in the women–men differential in daily earnings is 1.1 points larger in families with children than in childless ones. Since this variable controls for the amount of time worked, we confirm that labor productivity is also affected by the homecare substitution associated to immigrants. This finding has further

[17] Hourly wages also proxy labor productivity, but since our database does not directly report hours worked, we have decided to use it as robustness. Results remain and are available upon request.

implications for gender inequalities in the labor market, as it outlines an additional channel to close the gender wage gap. While immigration can reduce gender differenced in earnings by enhancing women to increase working time, it also narrows the gap in the rate at which market work is being remunerated.

Table 3. Immigration and natives' earnings: annual and daily earnings (pta)

	Annual earnings		Daily earnings (pta)	
	(1) OLS	(2) IV	(3) OLS	(4) IV
Im. Share	-5.207***	-7.196***	-1.160***	-1.700***
	(0.718)	(1.800)	(0.205)	(0.503)
Im. Share x Female	2.658***	2.612***	0.609***	0.613***
	(0.589)	(0.834)	(0.158)	(0.215)
Im. Share x Child	-0.347	-0.316	-0.127	-0.119
	(0.345)	(0.729)	(0.101)	(0.208)
Im. Share x Female x Child	4.241***	4.688***	1.021***	1.138***
	(0.368)	(0.451)	(0.099)	(0.120)
Child	0.240***	0.240***	0.078***	0.079***
	(0.038)	(0.045)	(0.011)	(0.013)
Child x Female	-0.905***	-0.935***	-0.244***	-0.253***
	(0.078)	(0.069)	(0.020)	(0.019)
Absolute effect				
Men without Children		-7.196***		-1.700***
Men with Children		-7.512***		-1.819***
Women without Children		-4.584***		-1.087***
Women with Children		-0.212		-0.068
Differential effects				
Women-men without Children		2.612***		0.613***
Women-men with Children		7.300***		1.751***
Double differences		4.688***		1.138***
Obs.	1,556,806	1,556,806	1,556,806	1,556,806
Ind.	144994	144994	144994	144994
F-statistic				
Joint		38.87		33.96
Im. Share		24.47		24.47
Im. Share x Child		49.35		49.35
Im. Share x Female		158.2		158.2
Im. Share x Female x Child		75.35		75.35

Note: The estimation methods are OLS and 2SLS (see columns' headings). The dependent variables are the hyperbolic sine transformation of annual and part-time adjusted daily earnings, respectively. All regressions include individual, year and region fixed effects and the following controls: age dummies, labor market experience and its square value, the total number of children, the age of the eldest child, the occupational skills, a child dummy and its interaction with gender. Standard error clustered by province are reported in parentheses. Significance: *** p<0.01, ** p<0.05, * p<0.1.

Data limitations prevent us from providing further evidence, but as a possible explanation, we hypothesize that outsourcing household production by hiring immigrant domestic workers allows native women to change time allocation strategies and increase relative wages. By reducing the time devoted to house/child-care, women can increase their human-capital accumulation, work experience and attachment to the labor market. These events may, in turn, allow women to access better paid jobs, or demand higher salaries, given their effort to stay in the labor market.

Previous research provided evidence in this direction. Using American data, Cortes and Tessada (2011) and Cortes and Pan (2019) show that low-skilled immigrants reduced barrier to women's supply of long hours and overtime, who carry out less household work by expending more in housekeeping services. Moreover, these immigration inflows induce women to enter occupations with higher returns to overwork, shifting women toward higher quantiles of the male wage distribution. Similarly, Amuedo-Dorantes and Sevilla (2014) find that low-skilled immigration to the US lead college-educated mothers to reduce the time allocated to basic childcare activities. Overall, although different mechanisms explain the wage gap, we highlight the importance of home and personal care in constraining work hours, earnings potential and pay equality.

5.4 Heterogeneous effects by educational level

The increasing availability and affordability of household services that immigrants brought to Spain can unequally affect individuals. For instance, the opportunity cost of staying at home is larger for high-wage workers, so they may be more prone to hire domestic workers. However, the arrival of immigrants and the emergence of cheaper household services need not favor richer families, as they could already outsource domestic services by employing natives. A such, demographic groups with lower potential earnings or hiring capacity could have benefited from these migration inflows. This subsection analyzes the heterogeneity of the impact of immigration by educational attainment, which is the best variable we have to proxy income.

We separate high from low educated individuals and replicate the previous analysis for the following labor market outcomes: working decision, weekly hours worked, full-time employment and part-time adjusted real daily earnings.[18] For simplicity, Table 4 focuses

[18] Highly educated individuals completed, at least, some tertiary education.

on the absolute and differential effects of immigrants for individuals with different educational levels using 2SLS (the complete results are available upon request).

Table 4. Effects by educational level

	High educ.	Low educ.	High educ.	Low educ.
	Work/not-work		Weekly hours worked	
	(1)	(2)	(3)	(4)
Absolute effect				
Men without Children	-0.503***	-0.280	-2.003***	-1.372**
Men with Children	-0.354***	-0.309	-1.306***	-1.378*
Women without Children	-0.320***	-0.024	-0.982***	-0.145
Women with Children	-0.223***	0.276	-0.439**	0.930*
Differential effects				
Women-men without Children	0.184***	0.256***	1.021***	1.227***
Women-men with Children	0.131*	0.585***	0.867**	2.309***
Double differences	-0.053	0.330***	-0.154	1.081***
	Full-time/part-time		Daily earnings (pta)	
	(5)	(6)	(7)	(8)
Absolute effect				
Men without Children	-0.204**	-0.079	-2.184***	-0.787
Men with Children	-0.020	0.058	-1.868***	-0.880
Women without Children	-0.005	-0.138	-1.309***	-0.156
Women with Children	-0.057	-0.303***	-1.230***	0.723
Differential effects				
Women-men without Children	0.199***	-0.059	0.875***	0.631**
Women-men with Children	-0.036	-0.361***	0.638*	1.602***
Double differences	-0.236***	-0.302***	-0.237	0.971***

Note: Each column reports the estimates obtained using 2SLS for the samples of high- and low-educated individuals. As defined in the heading, the dependent variables are a dummy for working/not working and for full-time employment and the hyperbolic sine transformation of weekly hours worked and part-time adjusted daily earnings. All regressions include individual, year and region fixed effects and the following controls: age dummies, labor market experience and its square value, the total number of children, the age of the eldest child, the occupational skills, a child dummy and its interaction with gender. Standard error clustered by province are reported in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Focusing on the differential effects, which are the main coefficients of interest, we find that excluding full-time employment, the effect of immigrants on women–men differentials is significantly positive for both educational groups regardless of the presence of children. For instance, the women–men differential in weekly hours worked increases by 2.31% and 0.87% per percentage point increase in the regional share of immigrants for low- and high-educated individuals with children, respectively. This differential effect is also positive and significant for childless individuals from all

educational levels, but the double difference effect between the two-family types is only significant for the less educated. This suggests that the effect of immigrant through childcare particularly benefits low-educated women, who would otherwise be more likely to supply less labor when having children.

Looking at the specific value that the double difference takes for the less skilled, increasing the share of immigrants by 1 percentage point increases the women–men differential in employment probability by 0.33 points more in families with children than in the childless ones. This additional effect, which signals the domestic labor substitution exerted by immigrants, equals 1.08 for weekly hours worked and 0.97 for daily earnings. Despite not being reported in the table, we have also checked that such effect is positive for the days annually worked and annual earnings. After splitting the sample by educational levels, the impact of immigrants through the supply of care-services for children is especially strong for the low skilled, so the effect of immigrants on women–men labor gaps is largely driven by this group.[19]

Despite focusing on family responsibilities coming from the presence of old parents in Italy, Romiti et al. (2015) found that less educated and low wealth households were the ones who mostly benefited from the caretaking role of immigrants, as they relieved women with elderly family members and allowed increasing their labor supply. According to our results, migration inflows in Spain also provided more opportunities for low educated natives to purchase household services and thus favor women's labor outcomes, relative to men. It seems that less educated families, who are potentially less wealthy, relied more on immigrants to share childcare and related tasks, therefore the larger effect.

6. Robustness checks

In this section we perform two robustness check to strengthen the validity of our results. First, we address the issue that household services are not equally supplied by all immigrants. The second exercise is related to the annualization of the MCVL.

[19] We have also constructed three educational classes: tertiary, secondary and below secondary. The results are mainly driven by the medium- and low-educated, the effect being slightly larger for the low-skilled.

6.1 Immigrants and household services

In order to capture the migrant population that actually supplies household services, and thereby may affects the labor outcomes of women relative to men, we have excluded from the analysis immigrants born in EU-15 countries, US, Canada, Australia or New Zealand. This subsection checks that the household substitution effect we previously identified is indeed associated to the presence of immigrants that are more prone to work in the domestic sector. First, we perform a falsification test by only considering immigrants from the countries listed above, as they are overall more educated and less likely to supply house-caring activities. Correspondingly, the IV only includes those countries of origin. Then, since 55% of household employees were immigrant women in 2008, most of who came from Latin America and east Europe (LFS), we check whether the results change when we just include immigrant women from those regions. Finally, we have replicated the analysis only considering female or male immigrants.

Table 4. Falsification test: high-skilled immigrants

	(1) Work decision	(2) Days annually worked	(3) Weekly hours worked	(4) Full/Part-time	(5) Annual earnings	(6) Daily earnings (pta)
Absolute effect						
Men without Children	-0.631**	-3.459**	-2.118**	0.222	- 8.495**	-2.204***
Men with Children	-1.069***	-6.078***	-3.827***	0.433*	-13.77***	-3.569***
Women without Children	0.356*	2.649**	2.107***	0.345	3.977	0.699
Women with Children	0.523***	3.923***	2.591***	0.004	5.390**	1.096*
Differential effects						
Women-men without Children	0.986***	6.108***	4.225***	0.123	12.472***	2.903***
Women-men with Children	1.592***	10.001***	6.418***	-0.430***	19.165***	4.665***
Double differences	0.606*	3.893*	2.193	-0.552*	6.693	1.762

Note: The estimation method is 2SLS. Excluding the dependent variables working decision and full/part-time employment (both are 0-1 dummies), the remaining are the hyperbolic sine transformation of the variables defined in the heading. All regressions include individual, year and region fixed effects and the following controls: age dummies, labor market experience and its square value, the total number of children, the age of the eldest child, the occupational skills, a child dummy and its interaction with gender. Standard error clustered by province are reported in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

Table 5 shows the results of the first falsification test. Focusing on the differential effects, immigrants from EU-15, US, Canada, Australia and New Zealand have a different effect over women and men regardless of the presence of children. However, the double differential between both family types is barely significant, so these immigrants are not affecting relative women-men labor outcomes through a childcare substitutes effect. This

proves that the results we previously identified are not driven by spurious correlation. The effects observed when selecting high-skilled immigrants with few household workers should be significantly larger for that to happen.

Moreover, Table 6 confirms that the household substitution effect (captured by the double difference) is stronger when we consider female immigrants (columns 3 and 7), especially, if we select women originating from Latin America and east Europe (columns 2 and 6).[20] For a reference, Columns 1 and 5 report the results we have described throughout the paper.[21] As expected, the effects become smaller when we limit the analysis to male immigrants (columns 4 and 8), as they participate less in the domestic sector. Besides from confirming that the differential effects become stronger when we concentrate the analysis in the group of immigrants who largely supplied household services, finding smaller effects from male immigration also increases confidence in our main results.

Table 5. Robustness: immigrants in the household sector

	Working decision				**Days annually worked**			
	(1) All immigrants	(2) Female: LA + East EU	(3) Female immigrants	(4) Male immigrants	(5) All immigrants	(6) Female: LA + East EU	(7) Female immigrants	(8) Male immigrants
Absolute effect:								
Men no child.	-0.483***	-0.553***	-0.489***	-0.471***	-3.566***	-4.190***	-0.489***	-0.471***
Men child	-0.511***	-0.572**	-0.517***	-0.499***	-3.912***	-4.521***	-0.517***	-0.499***
Women no child	-0.290***	-0.321***	-0.288***	-0.286***	-2.233***	-2.576***	-0.288***	-0.286***
Women child	0.085	0.155	0.098	0.073	-0.077	0.139	0.098	0.073
Women-men difference:								
No child	0.193***	0.232**	0.201***	0.185***	1.334***	1.614***	0.201***	0.185***
With Child	0.596***	0.727***	0.615***	0.572***	3.834***	4.660***	0.615***	0.572***
Double difference	0.403***	0.496***	0.414***	0.387***	2.500***	3.046***	0.414***	0.387***
	Weekly hours worked				**Daily earnings (pta)**			
Absolute effect:								
Men no child.	-2.155***	-2.533***	-2.228***	-2.058***	-1.700***	-1.911***	-1.707***	-1.662***
Men child	-2.153***	-2.453***	-2.213***	-2.069***	-1.819***	-2.012**	-1.827**	-1.779***
Women no child	-1.175***	-1.338***	-1.202***	-1.126***	-1.087***	-1.176***	-1.071***	-1.075***
Women child	0.307	0.552**	0.332	0.288	-0.068	0.125	-0.016	-0.103
Women-men difference:								
No child	0.980***	1.195***	1.026***	0.931***	0.613***	0.734**	0.636***	0.588***
With Child	2.460***	3.005***	2.545***	2.357***	1.751***	2.137***	1.811***	1.677***
Double difference	1.481***	1.810***	1.519***	1.426***	1.138***	1.403***	1.175***	1.089***

[20] Although to a lesser extent, some African women also supply household services. We have checked that the results are robust to just including African, Latin American and east European women.
[21] The findings also apply to full-time employment and the HIS of annual earnings, which are available upon request.

Note: The estimation method is 2SLS. Excluding the dependent variables working decision (a 0-1 dummies), the remaining are the hyperbolic sine transformation of the variables defined in the heading. The column names describe the definitions of immigrants used. When only selecting female or male immigrants, we have normalized the stocks with the total female and male population, respectively. All regressions include the controls mentioned in Section 4.3. Standard error clustered by province are reported in parentheses. Significance level: *** p<0.01, ** p<0.05, * p<0.1.

6.2 MCVL annualization

As described in the data section, 18% of the individuals hold more than one job in a given year, so we define a "main job" for each of these cases. This procedure is necessary to create a yearly panel including all the variables we consider in the analysis. For instance, if an individual holds two jobs during a year, the first one being part-time and the second one full-time, how would we determine the annual part- or full- time working decision, weekly hours worked or part-time adjusted daily earnings? We need to establish a main job. However, this method implies losing some information, as we reduce the total days annually worked or annual earning. This subsection checks that the results are robust to calculating the real annual working days and earnings. This is, instead of defining a main job for the above-mentioned 18% of the yearly-observations, we exploit all the information provided in the data regarding annual days worked and earnings. As shown in Table 7, we get similar results. Both the absolute and differential effects remain largely unchanged, proving that the annualization process does not condition our results.

Table 6. Robustness: real days annually worked and annual earning

	Days annually worked	Annual earnings
Absolute effect		
Men without Children	-3.683***	-7.291***
Men with Children	-4.005***	-7.583***
Women without Children	-2.272***	-4.602***
Women with Children	-0.0644	-0.166
Differential effects		
Women-men without Children	1.411***	2.688***
Women-men with Children	3.940***	7.417***
Double differences	2.529***	4.728***

Note: The estimation method is 2SLS. The dependent variables are the hyperbolic sine transformation of annual days worked and annual earnings. All regressions include the controls mentioned in Section 4.3. Standard error clustered by province reported in parentheses. Significance: *** p<0.01, ** p<0.05, * p<0.1.

7. Conclusions

The wave of mass migration that Spain experienced at the turn of the 21st Century went hand in hand with a huge expansion of the household sector, where immigrants also had an increasing presence. Hence, besides a competition effect, immigrants could also affect the labor market by substituting native women in house-caring activities. In particular, this substitution effect may have allowed mothers, who usually bear most family responsibilities, to increase their labor supply, which may, in turn, help reduce gender gaps associated with motherhood.[22]

Using a spatial correlations approach with instrumental variables, we show that migration inflows into Spanish regions had a positive impact on the labor supply of women relative to men. This effect was larger among individuals with children than childless ones so, given that Spanish women take on most household duties, the differential impact between the two-family types captures the role that immigrants play as childcare substitutes of women. This household substitution effect applies to both, the extensive (the probability of employment) and intensive (days annually worked and weekly hours worked) margins of the labor supply.

Most remarkably, we confirm that this effect also translates into earnings, being this especially interesting given the limited attention devoted to the matter so far. Looking at annual earnings, the women–men differential rises by 7.3% per percentage point increase in the regional share of immigrants for families with children, whereas the effect is 2.6% for the childless. The additional effect of 4.7 points on families with children is indeed attributed to the role of immigrants as child caretakers. Moreover, the results are similar when we analyze part-time adjusted daily earnings. These findings suggests that while immigration may reduce gender differenced in earnings by enhancing women to increase working time, it also narrows the gap in the rate at which market work is being remunerated.

In this way, although other different mechanisms also contribute to explain gender gaps in the labor market, we highlight the importance of home and family responsibilities in constraining work hours, earnings potential and pay equality. In fact, we show that mothers' labor supply and earnings respond to an increase in the availability and

[22] According to the 2009-2010 Time Use Survey, while men spend 2 hours on housework and family duties on an average day, women devote 4 hours.

affordability of household services. Yet, further analysis suggests that the house/child-care substitution particularly benefited less-educated natives. The availability of immigrants provided them with more opportunities to purchase household services, thus enhancing those women's labor outcomes.

Besides contributing to the immigration debate by remarking a channel (the domestic substitution effect) that should also be considered when assessing the costs and benefits of migration flows, we provide more evidence of the child penalty. We confirm that parenthood is positively associated with men's labor supply and earnings, whereas it represents a setback for women in the workforce. Having children induces men to work more days and hours, but childcare responsibilities fall to a great extent over women, who seem to trade market work for housework. As a result, even if our findings show that the presence of immigrants attenuates this trade-off by substituting women on domestic-caring activities, Spain needs more policies to reconcile family and work. Increasing the availability and affordability of public childcare services, supporting men's involvement in childcare and housework by enlarging paternity leaves or promoting flexible work arrangements could, inter alia, improve women's labor market performance.

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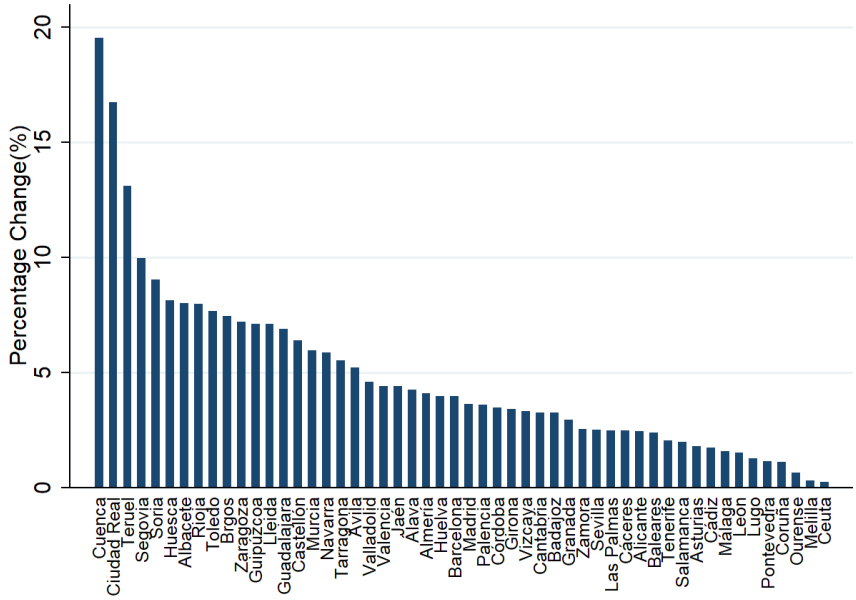
APPENDIX. GRAPHS AND TABLES

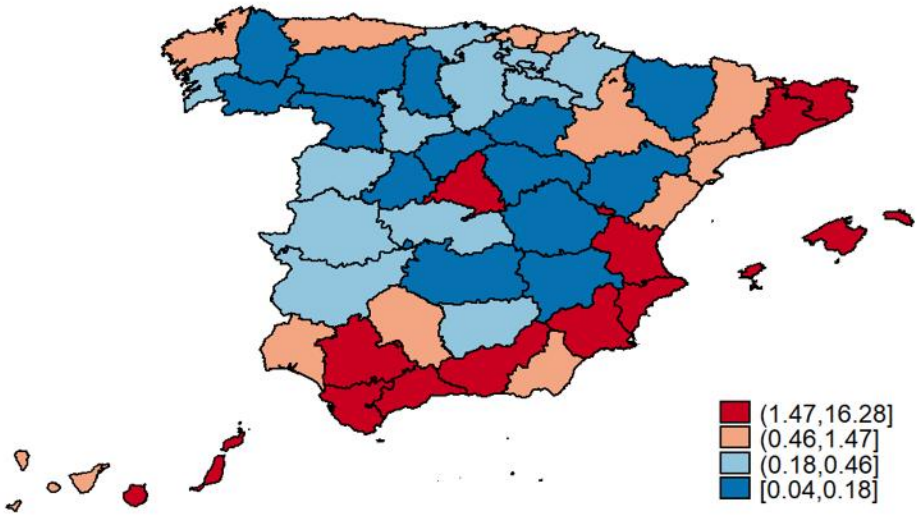
A1. Figure Appendix

Figure A1. Percent Change in the share of immigrants between 1998 and 2008.



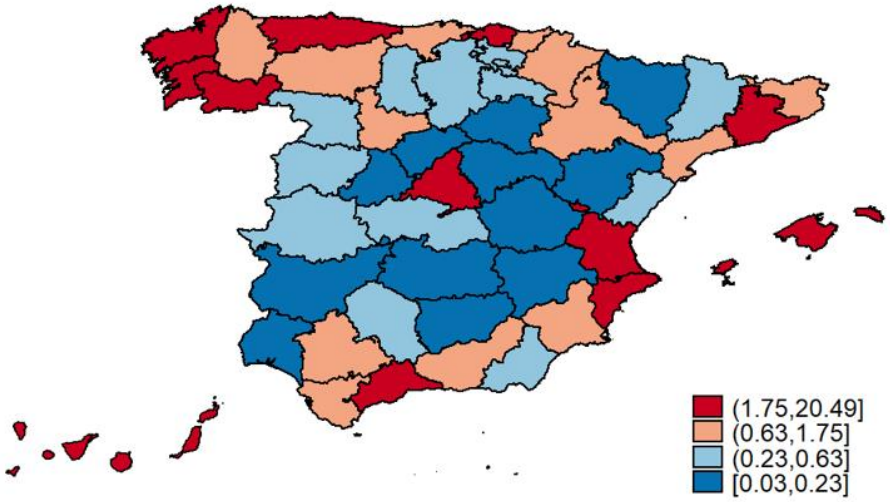
Sources: 1998 and 2008 Municipal Registers (INE).

Figure A2. Geographical distribution of Moroccans in 1991



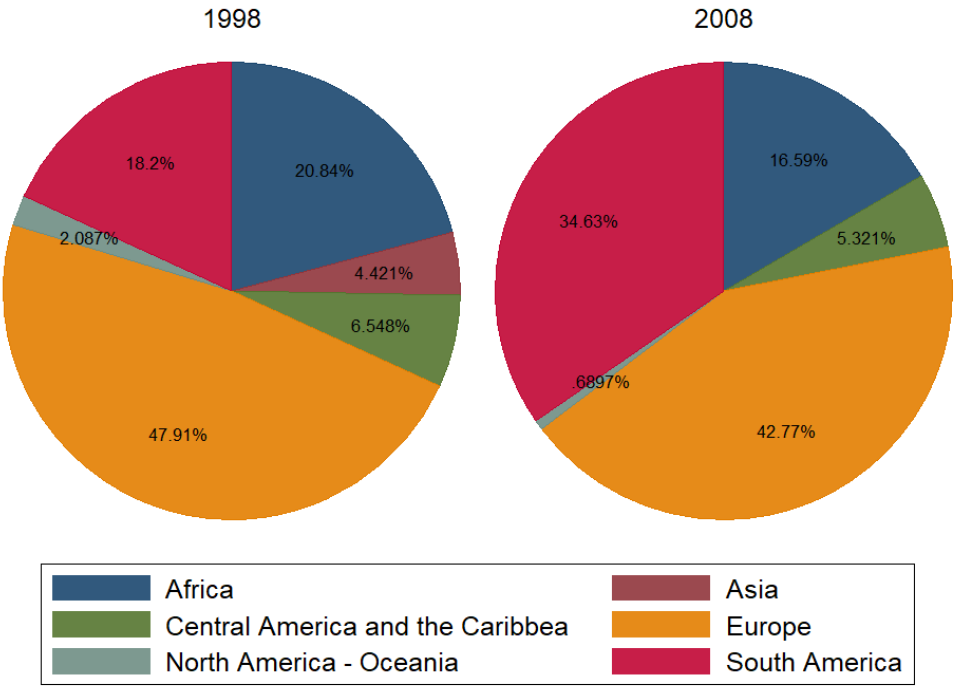
Source: 1991 Decennial Census (INE).

Figure A3. Geographical distribution of Latin Americans in 1991.



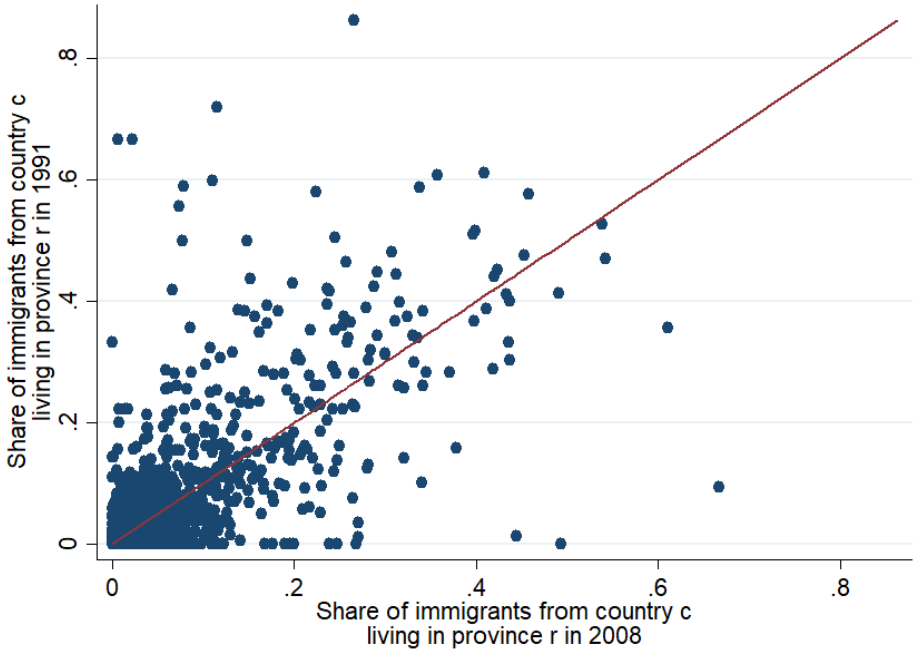
Source: 1991 Decennial Census (INE).

Figure A4. Composition of immigrants by region of origin in 1998 and 2008.



Sources: 1998 and 2008 Municipal Registers (INE).

Figure A5. Correlation between the distribution of immigrants by country of origin across Spanish provinces in 1991 and 2008.



Sources: 1991 Decennial Census and 2008 Municipal Register (INE).

A2. Table Appendix.

Table A1. Instrument relevance. Region-level regressions.

	(1)	(2)	(3)
Instrumented immigrant share	0.54***	0.31***	0.21***
	(0.082)	(0.094)	(0.067)
Region-Year FE	No	YES	YES
Controls	No	No	Yes
Cluster-Robust F-stat	43.87	11.18	10.23
Obs.	572	572	572

Note: Significance level: *** p<0.01, ** p<0.05, * p<0.1. Standard error clustered by province are reported in parentheses. The dependent variable is the provincial share of immigrants. Control variables are average regional-year level of variables: gender, age, the age of the eldest child, the occupational skill, labor market experience and its square vale. All regressions are weighted using the total population in the province in 1998. The number of observations is given by the number of provinces (52) by the years (11).

Table A2. First-Stage regression (for Tables 1, 2, 3 and 4).

Dependente var.	(1) Im.	(2) Im*Child	(3) Im*Female	(4) Im*Child*Female
IV	0.33***	-0.09***	-0.12***	-0.03***
	(0.084)	(0.020)	(0.028)	(0.008)
IV*Child	-0.02***	0.53***	-0.02***	-0.07***
	(0.007)	(0.067)	(0.007)	(0.021)
IV*Female	0.02*	0.01***	0.66***	0.01*
	(0.012)	(0.003)	(0.038)	(0.004)
IV*Child*Female	0.00	-0.05***	-0.06***	0.58***
	(0.006)	(0.010)	(0.020)	(0.050)
Observations	1,556,806	1,556,806	1,556,806	1,556,806
F-stat	23.26	37.85	161.4	51.22

Note: Significance level: *** p<0.01, ** p<0.05, * p<0.1. Standard error clustered by province are reported in parentheses. All regressions include age dummies, labor market experience and its square value, the total number of children, the age of the eldest child, the occupational skills, a dummy variable for the presence of children and its interaction with the female dummy. Individual, region and year fixed effects are also included.

Table A3. Summary Statistics (Percentage except where noted).

	All		Men		Women	
Mean Age	34.8	*(4.44)*	34.9	*(4.44)*	34.8	*(4.43)*
Collage graduate or above	26		22		30	
Children	44		39		49	
Mean age oldest child	8.27	*(5.22)*	7.83	*(5.02)*	8.65	*(5.36)*
For working individuals:						
Mean annual working days	294	*(102.7)*	301	*(98.17)*	285	*(107.56)*
Mean weekly hours worked	38	*(6.12)*	39	*(4.09)*	36	*(7.72)*
Full-time employment	89		96		80	
Mean annual earnings	13,003	*(8,923)*	14,245	*(9,044)*	11,439	*(8,516)*
Mean daily earnings (pta)	43.85	*(24.01)*	46.09	*(24.87)*	41.03	*(22.54)*
Mean skill	2.58	*(1.09)*	2.52	*(1.08)*	2.65	*(1.11)*
Mean years of experience	8.84	*(5.36)*	9.94	*(5.31)*	7.64	*(5.16)*
Observations	1,556,806		814,695		742,111	

Note: Statistics over the full period (1998-2008). Standard deviations in parenthesis. All earnings in Euros of 2008.